



# Western Wildlife



NEWSLETTER OF THE LAND FOR WILDLIFE SCHEME

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## FIRE, FRAUS AND THE CORD RUSH

from a paper by Bert Main

**L**ARGE tussocks of the cord rush, *Ecdiocola monostachya*, are a familiar sight among shrubs throughout the northern agricultural area and the wheatbelt. They are so common and widespread that no-one considered that they may be in danger. However, some long-term observations by Prof. Bert Main have raised some very worrying points.

The Web of Life is not at all simple – causes and effects interact together so that long-term results do not always match predictions – management needs care, even 'doing nothing' may not prevent local extinctions ...

### Life history

Cord rush forms a large, long-lived tussock. Seedlings have only been observed after fire.

The larvae of the ghost moth *Fraus simulans* create burrows up to 24cm deep within the tussock, from which they emerge to cut and feed on the leaf blades. Debris from feeding is webbed to form a large spacious vestibule at the burrow entrance and this is quite easy to see if you look carefully. Pupation takes place in March or April and, like other ghost moths, the pupal cases remain



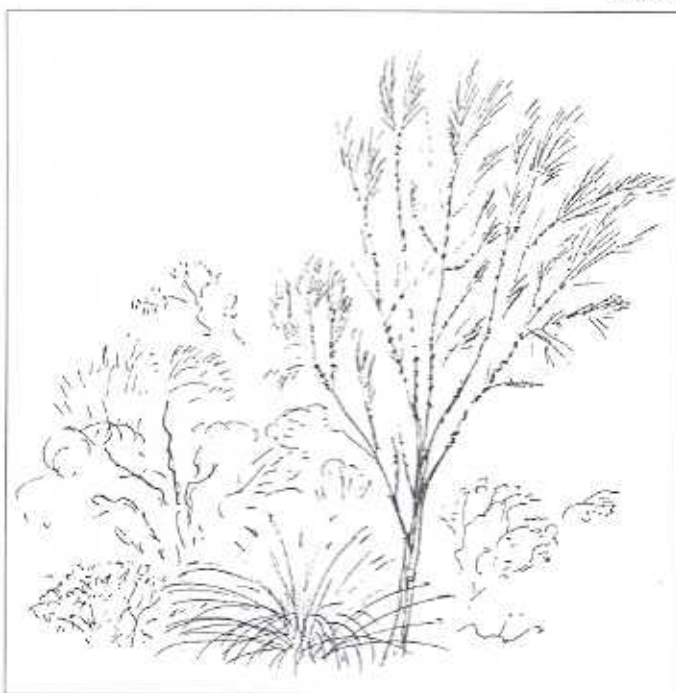
Ghost moth *Fraus simulans*

protruding from the upper surface of the vestibule after the adult has emerged, usually during rain in the first week in May. Mating follows and, at night, usually when light rain is falling, the female lays the eggs as she walks, flutters or flies close above the soil. After hatching, the larvae spend the first few stages of their life foraging among debris and leaf litter, before choosing a tussock in which to burrow. Within the burrow, the larvae are safe from summer heat, and also, if deep enough, from bushfires.

From 1967, Prof. Main has observed a number of sites where

the plant and the moth occur, in order to try to understand its natural history – that is, the effect of the inter-relationship between all the plants, animals and physical effects which occur at the site. In particular, he wanted to know what effect the herbivorous moth had on the survival rate of cord rush, the effect of fire on both, the ability of the moth to reinvade disturbed areas, and the effect of present management practices on the whole community.

The importance of this work is that it is long-term. Most studies of such detail – for a PhD for example – take three years and then end (or the funding runs



Cord rush with black tamma (*Allocasuarina acutivalvis*) in the wadjil. From "Between Wadjil and Tor" by Barbara York Main.

*Greetings everyone!*

**T**HANK you all for the great response to our questionnaire, you were very positive and made a lot of helpful comments. They will be very useful in enabling us to continue to develop the sort of magazine you want to read. As promised, some feedback on the survey results follows. We were delighted that 100% of respondents found Western Wildlife (WW) 'interesting and informative' - 94% 'agreed strongly'. The style of design and layout found favour with 91%, while 87% thought it covered most of the topics they were interested in. 78% read it 'from cover to cover', 31% read only the articles that interest them.

96% kept WW for future reference but several people noted that they couldn't do that if they *also* passed the magazine to others in the local community. Good point! Please note, you can reproduce articles from WW in other publications - see box on this page. Relating to this too, several people requested an index, one person suggesting it be on the front page, like our Victorian counterpart. In the original design, I rejected that as I felt it detracted from the appearance of the publication. But we'll try for one elsewhere, see below. A cumulative index is kept in each *Land for Wildlife (LFW)* office, if you'd like one, please ring.

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## EDITORIAL

We were very pleased with the responses to the last two questions in this section, as 74% said that they had used the info from WW to help manage their land, while many of the 26% who were neutral or disagreed with the answer commented that they were 'an advisor' or 'didn't have any bush to practice on'. The final question 'since receiving WW, I have had a better appreciation of my bushland' had 55% agree strongly, 27% agree slightly, 15% neutral and 3% disagree - several of the latter giving the same sort of reasons for their answer. This is most heartening, as it means we are not just providing information, you are actually finding it USEFUL - this is what *LFW* is all about.

With regard to which topics you are interested in, it was no surprise that fauna (100%), flora (99.5%) and revegetation (99%) elicited the most positive response. Other popular topics were weeds and research (97%), practicalities (96.5%) and *LFW* News (93.5%). (Many people commented that they wanted to read more about what other *LFW*ers are doing, we will do this wherever possible.) The least popular topic, at 73%, was funding, which was not expected. Perhaps those of you who are eligible for grants hear enough about them from elsewhere?

Several people put in a plea for colour pics, though one person did add "if it can be afforded". The short answer is, it can't. As you know, we provide all our information free, adding colour to the magazine would be too costly. But we will follow up someone else's suggestion to ensure that pic captions include comment on colour, that's a very good idea. There were also some requests for WW to be in electronic form - this may not happen for some time, but we will continue to consider this option.

We received lots of helpful suggestions about what you would like to see in the magazine, including: soil micro-organisms, practical fauna care, how to identify 'little brown birds' (I need this too - Ed!), native aquatic life, *native* weeds, difficult

flora propagation, fire retardant plants, prototype management plans, tips on 'teaching' bush values, more on the 'spiritual' dimension, occasional articles on significant regional bushland areas, the views of politicians and political parties and legislation.

The most thought-provoking comment undoubtedly came from Bruce Ivers of Kojonup, who wrote: "I wish to replace normal farming enterprises with multi-species perennial (shrub/tree) crops (preferably Australian natives) that make 4 times the gross margin of canola. (a) What are the products of these crops and who buys them? (b) What are the management systems needed to grow them? (c) If you don't know the answer, when are we going to start to solve this puzzle?" In all our dreams, Bruce! We promise, if we get even a whiff of a possibility, we'll share!

What about the negatives? Well, there were some, mostly on the design of the questionnaire. It was done in five columns because that is a standard statistical method, even though a yes/no answer would be simpler. And several people took me to task for very poor English, columns were headed 'disinterested' when what was meant was 'uninterested'. I copied the wording from elsewhere and didn't check - *mea culpa!*

A detailed analysis of the responses has been prepared and if you would like a copy, ring me. Please keep the suggestions coming, I really appreciate the feedback.

The winners of the Landscape Calendar were:

Sue Witham, Broomehill  
D. & J. O'Dwyer, Margaret River  
J. & L. White, Darkan  
Neville Sparrow, Darlington  
Robyn Soullier, Yandanooka.

*Penny Hussey*



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*Fire, Fraus and the Cord Rush continued from page 1*

out!). In nature, this is not long enough to show real trends.

The results provide a fascinating insight into what is actually happening in our wheatbelt remnants.

### Bungulla Nature Reserve (site 1)

Like most others, this central wheatbelt Nature Reserve is an island within cropland. In 1967, when the study started, the study site was a low heath dominated by cord rush and surrounded on all sides by a tall shrubland of black tamma, hakea, grevillea and wodjil (wattles), growing on sandy soils over lateritic clay. Since then the only disturbance has been due to the feeding activities of rabbits, kangaroos, echidnas - and locusts in 1990-91.

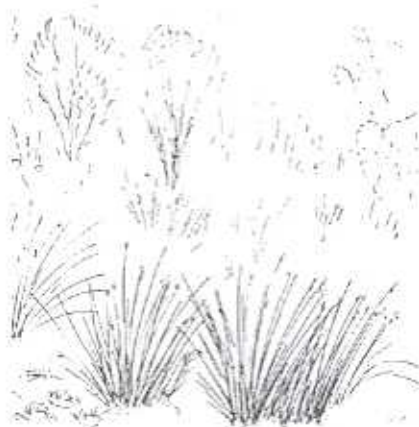
The cord rush and the moth are both favoured by the shade caused by the wattles, but grazing by an increased number of moth larvae eventually killed the cord rush. Drought and grazing killed seedling hakeas and grevilleas. The wattles aged and gradually died out. Black tamma seedlings survived in all the areas where plant death had left a space, and their needles smothered and killed ground vegetation, including cord rush. Thus the entire community on this site has changed to one dominated by black tamma - with important implications for other fauna.

### Durokoppin Nature Reserve (site 2)

This site was on high ground, on sandy laterite, in a thicket dominated by tamma, wattle and grevillea, with a cord rush understorey. It was burnt with a low intensity patchy fire in the late summer of 1988.

Some of the tussocks survived the fire and a number of seedlings germinated in the first winter after it. They survived summer heat and water stress in the shade of still standing burnt shrubs. However,

## FAUNA



drought and grasshoppers eliminated much of the regrowth. Nine years after the fire, one young plant provided enough food (12 leaf blades) to support one moth larva through to adult, although none of the seedlings had yet flowered. Note that seedling recruitment did not replace fire-induced mortality of established tussocks - ie there are now fewer cord rush plants at this site.

### Durokoppin Nature Reserve (site 3)

There were two study sites here, one within an area of regrowth in an area that had been cleared and cropped in the 1930s, and another on never-cleared land close by. The vegetation in both sites was typical kwongan on yellow sand, with woody pear over cord rush. The regrowth area was experimentally burnt in a very hot fire in the summer of 1989.

There was little change to the unburnt site, except that some of the shrubs died and black tamma invaded in small numbers.

Some tussocks survived the very hot burn, but very few cord rush seedlings germinated and none survived the summer. However germination and establishment of shrubs was good. Three years after the fire, pupal cases in regenerating tussocks showed that moths had recolonised the area from the adjacent unburnt areas. Superficially the area looks excellent, but there are far fewer cord rushes than before.

### East Yorkrakine Nature Reserve (site 4)

A gently sloping north-facing sandplain with similar, but sparser, vegetation to the other sites. A very hot experimental burn was conducted in the summer of 1991.

After 2 years, about 30% of the tussocks had survived the fire but none had flowered or set seed. Moths had also invaded from adjacent unburnt areas and started to re-use the regenerating tussocks. Three years after the fire, one reached adulthood. A very large number of seedlings germinated in the spring after the fire but, on the shadeless seedbed, by seven years later, all had died.

### Conclusions

This study shows that cord rush regenerates after fire, but it needs to be a low intensity, patchy one and even then, regrowth is very slow. Large cord rush plants are thus likely to be as old, or older than the shrubs in the same community. The moth, *Fraus*, can invade burnt areas from adjacent unburnt ones but it takes a minimum of 9-10 years under favourable conditions before a seedling can support a moth larva to maturity. It is even longer before the seedlings themselves will set seed. To preserve both the moth and cord rush in a small reserve may be very difficult.

Thus one should not become complacent about biodiversity conservation. Even apparently common flora and fauna may not be safe. The risks faced by them will only become apparent when life history and other biological requirements are known.

Ecosystems are dynamic, not static, and we need as much long-term data as we can gather, to make decisions for the survival of biodiversity based on the best possible information.

*Emeritus Professor A.R. (Bert) Main can be contacted through the Dept of Zoology, UWA.*

THE recent wet summer has led to a proliferation of our summer active native perennial grasses and *Land For Wildlife* member Roy Butler has enjoyed watching the grass grow.

In 1992, shortly after veterinarian Roy Butler moved to Merredin to join Agriculture WA, he and his wife Judith bought 33 ha of cleared farmland on the outskirts of town. The previously cropped and grazed paddock became home to a couple of horses and under this grazing regime, native perennial grasses persisted and started to spread.

Eight years later, Roy's permanent pasture consists of perennial native grasses *Enteropogon acicularis* (curly windmill grass), *Chloris truncata* (windmill grass), *Enneapogon polyphyllus* (canary grass) and *Aristida contorta* (bunched kerosene grass). Being summer active, these grasses provide the bulk of summer feed. When they become dormant during winter, clovers, sub-clovers, medics, barley grass, rye grass and the native perennial spear grasses provide lush winter feed.

In 1997 Roy bought some Dorpino sheep (a cross between a South African meat sheep and wool growing merinos) to manage the pasture and obtain some useful data. The sheep are grazed in rotation over four paddocks that average 8 ha each.

Roy began monitoring the sheep's condition in November 1999. Most ewes lost weight until the end of December then started to gain an average of 89g/head/day. Lambs gained an average of 95g/head/day throughout this time.

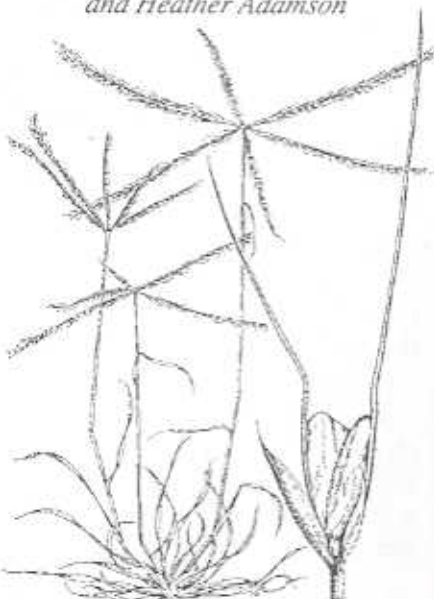
The feed value of the actively growing native grasses compares well with more traditional feed. In late January *Enteropogon acicularis* had a dry digestible matter (DDM) of 66% and 19.6% crude protein (CP). *Enneapogon polyphyllus* had 62.1% DDM and 15% CP.

Roy concluded that in the eastern wheatbelt, stock can benefit from the inclusion of summer active native perennial grasses and in years of summer rainfall, supplementary feeding may be reduced. This may remove some of the anguish farmers

## REVEGETATION

### Summer active native grasses support agriculture and wildlife

by Avril Baxter and Heather Adamson



Windmill grass, *Chloris truncata*.



Roy is most impressed with the mix of species in his pasture.

feel when watching the nutrition stored in winter grown pastures being washed out by summer rains.

He sees the main benefits being water use over summer. The native grasses dry out the soil profile and allow it to absorb more of the winter rains before the excess seeps to the ground watertable. Wind and water erosion is negligible.

Animal life is certainly on the increase. Grasslands provide seeds, nesting material, nesting sites and

cover. Grasshoppers, caterpillars, moths, native cockroaches, spiders, ants, crickets and bees abound. Ground nesting birds such as brown quail and Richards's pipit thrive in the area along with robins, willie wag tails, white fronted chats, magpies, mudlarks, bobtails, western blue tongue lizards, western bearded dragons, field mice and rats. This allows larger birds such as barn owls, nankeen kestrels, black-shouldered kites, butcher birds and brown falcons to hunt continually over the grassland feeding on smaller prey.

Roy is most impressed with the mix of species in his pasture, which make use of different climatic conditions. This year's summer rains have led to a green pasture heavily dominated by *Chloris truncata*. This grass lives for about three years and sets large amounts of seed which germinate very quickly after summer rains while the longer lived *Enteropogon acicularis*, can produce green leaves in the hottest and driest summers. Within the system, winter legumes provide nitrogen for stock and summer pasture growth.

Roy sees it as a robust system. There is always something "on offer" and encourages other farmers to investigate it's use within their own system.

Through his work with Agriculture WA, Roy is investigating the use of *Chloris truncata* as a summer growing native grass sown with serradella on acid yellow sands. In this mix the windmill grass provides soil cover to stabilise the erodible sands and make use of any summer rain and the serradella will provide winter feed and a nitrogen source for the grass.

After hearing of Roy's success, last year Bruce Rock farmer Michael Buegge stopped spraying *Chloris truncata* out of a paddock which has been continuously cropped since 1997. It has proliferated with this summer's rain at the expense of other summer growing weeds such as paddy melons. Michael sees this as an advantage, he can crop over the windmill grass but would have had to spray the melons which get caught in the knife points of his seeding equipment. Michael also believes

## ECONOMIC ASPECTS OF BIODIVERSITY

### AGONIS OIL AND THE CURSE OF POTENTIAL!

By Chris Robinson



Agonis sp. Coarse Teatree.  
Photo: C. Robinson

IN 1996 when I was working on a bush management project to increase cut flower production on the south coast, I became aware of a very interesting species (as yet undescribed) of *Agonis*. Commonly called coarse teatree, it flowers in late summer and is picked for both fresh and dry flowers, mostly for export. As a field botanist I was most fascinated by the beautiful scent the leaves produced when squashed or rubbed in the hand. The plant was a vigorous grower and was likely to have a fair amount of this oil, I thought, maybe this plant has some commercial **potential** for essential oil. The mobile oil mallee still came to town and I extracted a sample of this lovely oil. QEII Medical Centre tested it against *Melaleuca alternifolia* (eastern states teatree) oil and found it to have an excellent level of antimicrobial ability. It was also analysed at WA Chemistry Centre.

The **potential** was there all right, but how could we transform that into commercial reality?

After finding funds last year to employ a consultant to investigate the potential of this oil, it is now apparent that the road to converting it to a broader market place reality is a long and very expensive one. Only the big pharmaceutical companies may have the capacity to fund product development and TGA (Therapeutic Goods Act) approval. We didn't have enough oil for them to even start to test it (+100 litres). Another obstacle is the vested interest already in *Melaleuca*

*alternifolia* oil, which has massive plantations and tax driven research and product development on the East Coast.

Currently the best prospect may be to develop a smaller local industry based on local cultivation, extraction and processing into an innovative range of products that do not require TGA listing such as soaps and other products which do not make therapeutic claims. Already there is a landholder growing this plant as a row crop (for flowers) and at least four south west firms interested in using this oil in a range of products, which can capitalize on its great perfume and antimicrobial character. There is interest too in expanding current distillation

capacity, which could be used for other products.

The challenge for me in 2000 is now to assist that group to explore ways to increase production of the oil through expanded cultivation and distillation and the critical product development.

Maybe this time we can convert the **potential** of a fascinating local species to provide a real option for rural diversity and a contribution to a sustainable environment.

*Chris Robinson is a Development Officer at AGWA, ALBANY. He can be contacted on 9892 8486.*



Do you want to be a part of this?

Do you live from Pemberton across to Manypeaks, and have wet peaty-sand heathlands on your property? Perhaps you already harvest coarse teatree (*Agonis* sp.) or fine teatree (*Agonis parviceps*) for cufflowers? If so, you have the right conditions for this project. You might like to learn more about the potential - ring Chris for further detail. In addition, LFWOs Jenny Dewing, 9761 2318, (for Manjimup Shire) and Sylvia Leighton, 9842 4500, (south coast) have information on managing these two species in remnant vegetation.

*continued from page 4*

that if this winter starts off wet, then he will still be able to seed the paddock, which with the absence of windmill grass could have been too wet. This year the *Chloris truncata* had a crude protein level of 14.2% and digestible dry matter of 63.4%.

There are many questions to be answered. Will the grass carry over any diseases, will it make sandy soils non-wetting, will it mean that winter crops get off to a later start due to a decrease in stored soil moisture? Farmers with an interest

in perennial agricultural systems may have to drive the research.

*Michael Buegge has Chloris truncata seed for sale Ph/Fax 9061 1298. Roy Butler can be contacted on 9081 3111 (wk) 9041 2818 (ah).*

**W**HY have Thick-billed Grasswrens disappeared from the wheatbelt, and from most of their former range in pastoral areas? This was one of the questions I set out to try to answer as I studied the ecology of five bird species at Shark Bay for my PhD thesis.

Though probably never common, Thick-billed Grasswrens (*Amytornis textilis*) once occurred over the wheatbelt and much of the adjacent pastoral area (see map). However, the bird has not been seen in the wheatbelt since 1910, and in WA now only occurs near Shark Bay. They are small, active birds, spending most of their time on or near the ground.

Grasswrens feed on both bare soil and among leaf litter, searching for invertebrates and plant food. They are particularly partial to ants of *Crematogaster* species, but they also take spiders, termites, beetles, moth/butterfly larvae and bugs. Grasswrens also consume vegetable food, in particular the fruits of *Enchylaena tomentosa* (ruby saltbush) and *Rhagodia eremaea* (tall saltbush). Both of these plants produce an orange/red succulent fruit with a black seed which remains intact and easily recognisable in the scats – seed dispersal for the plant, presumably.

Grasswrens pair up and establish a territory of between 1.2 to 2.0 ha, in which they breed and live throughout the year. They defend the boundaries of their territories by song and by chasing intruders.

The birds start breeding in winter or early spring; in this arid area, the onset of breeding may be related to good rains in a previous month. They build a deep, cup-shaped nest towards the centre of a climbing plant or shrub, usually between 20 and 70 cm above ground. In dense vegetation the nest may not be covered, but in more open situations a hood is constructed over it. The nests consist of woven strips of bark, dry grass and flowering stems of *Ptilotus obovatus* (cotton bush), sometimes with strips of fine bark around the entrance. They are lined with narrow strips of bark, fine grasses and occasionally plant down such as

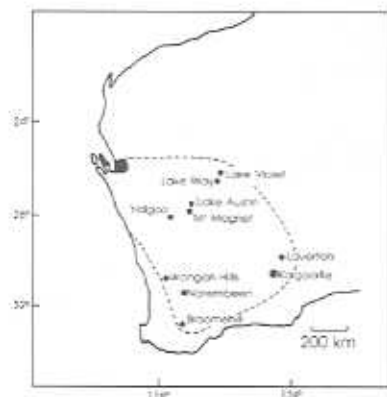
## FAUNA

### THICK-BILLED GRASSWRENS

by Belinda Brooker



Grasswren performing a 'dodgem-car' display to draw predators away from the nest.



Map showing present and former localities of the grasswren in Western Australia.

*Ptilotus* flower heads. The female builds the nest and the male feeds her during the pre-laying period and incubation. One to four eggs are laid. The nestlings are fed the same food as adults, but with a higher proportion of caterpillars.

Nests sometimes failed because of predation, probably by the mulga

snake or Gould's monitor. Although cuckoos exist in the area, during this study I did not record them parasitising grasswren nests. It seems from this study that the degree of nesting cover was an important determinant of nesting success. This may provide a pointer as to why these birds have declined elsewhere in WA.

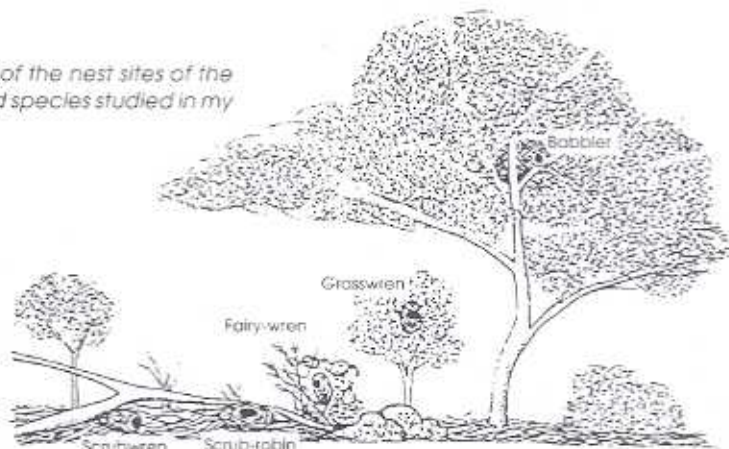
The grasswren has a preference for litter substrates in which to forage, and it prefers to nest in dense low shrubs. It may also eat the seeds of plants which are selectively grazed by stock. In the wheatbelt, grazing has removed the litter layer, and often the shrubs as well. Even in the pastoral region, grazing by sheep, goats and rabbits has significantly changed the shrub community, especially its density at low level, making it not only less suitable for grasswrens but exposing them to more predation.

In summary, it is not possible to attribute the decline of the Thick-billed Grasswren to any single factor, rather, it appears likely that an interaction of several features of its life history made it sensitive to disturbance. If this bird is ever to expand back into some of its former range, land management will need to alter to permit leaf litter accumulation and dense low shrub growth.

(Nb: For an illustration of the Cocktail Ant, *Crematogaster* sp, see *Western Wildlife* 3/1)

Belinda Brooker is a zoologist who has, until recently, been working on recovery plans at CALM, Woodvale. She can be contacted on 9387 4223.

Sketch of the nest sites of the five bird species studied in my thesis.



## FAUNA

## THE WEED WITH WINGS: RAINBOW LORIKEETS

by David Lamont

**I**n recent years there has been concern about the increasing population of rainbow lorikeets in Perth. Post-graduate research, completed in 1997, investigated the impact of this bird on the conservation and agricultural areas of south western Australia.

This research found that critical elements for their successful establishment in Perth have been:

- ◆ the existence and continued expansion of an under-utilised and evolving niche, consisting of a mosaic of mature exotic and native vegetation
- ◆ the generalist tendencies of rainbow lorikeets with regard to diet and nest requirements and their aggressive nature
- ◆ their 'native' status and colourful plumage which has evoked ready community acceptance
- ◆ inaction by government agencies whilst their population numbers were low.

Rainbow lorikeets are now well established in the Perth urban area, being found within a coastal strip from Fremantle to Mullaloo, ~50 km south to north. They are also present along the Canning River at Kelmscott and nearby at Armadale. Areas adjacent to the Swan River from Perth to Midland and also along the Helena River to Hazelmere, ~30 km from the coast, have also been colonised. Based on sightings from previous years there appears to be a contraction of the range, in some locations. In 1992 rainbow lorikeets were noted at Gooseberry Hill, Darlington and Middle Swan but despite concerted attempts to locate rainbow lorikeets at these localities none were observed during my survey. Earlier this year (2000) there has been a sighting of rainbow lorikeets at Darlington and at Northam feeding amongst marri blossom. The extent of their

establishment is still being defined and it may well be a number of years before this becomes apparent and stable.

The range of foods used by rainbow lorikeets in Perth appears to vary little from that described for the bird within its natural range in eastern Australia. Blossom from eastern states Eucalypts such as *E. maculata*, *E. citriodora* and *E. cladocalyx* were highly favoured and have been a significant factor in rainbow lorikeet establishment in Perth. The blossom of local Eucalypts, e.g. quart, marri, flooded gum and jarrah are also taken freely. During field observations rainbow lorikeets were noted feeding from more than 20 species of plants, with seeds, fruits, nectar, pollen and flower parts being eaten. A high proportion (77.1%) of the food taken was of an exotic origin, i.e. not native to the Perth region.

#### Implications for Agriculture

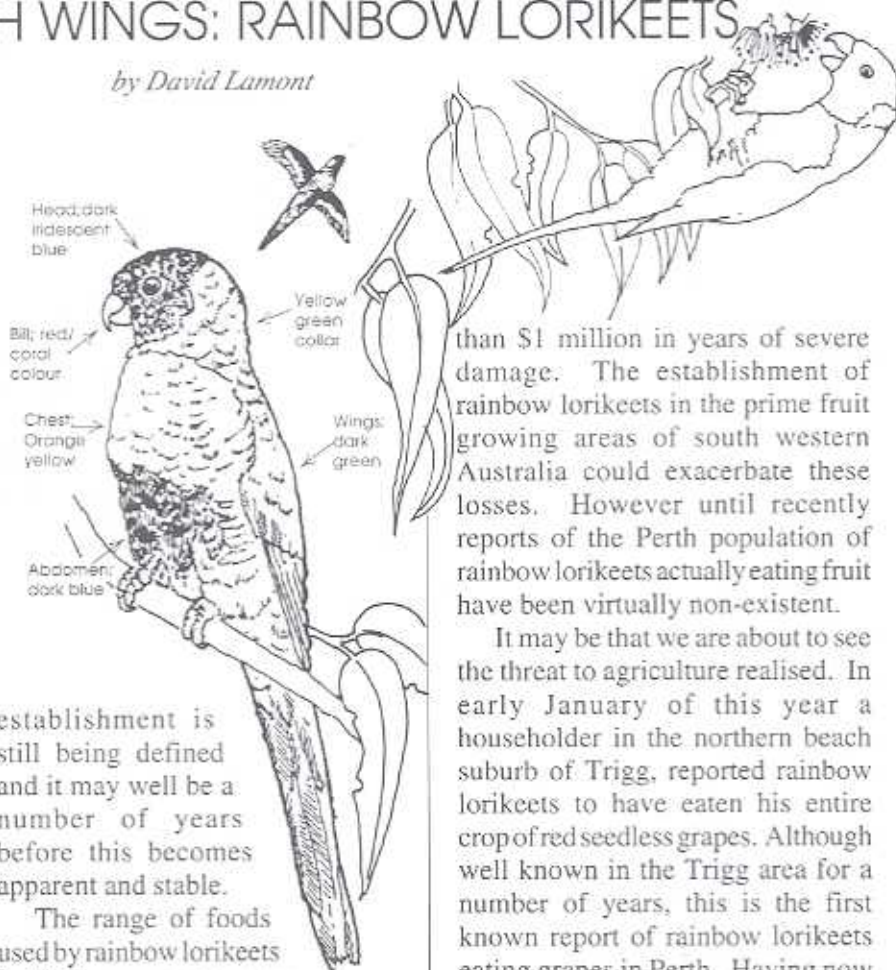
Parrot damage to commercial fruit crops by parrots has occurred in WA for more than 50 years, with annual cost being estimated at more

than \$1 million in years of severe damage. The establishment of rainbow lorikeets in the prime fruit growing areas of south western Australia could exacerbate these losses. However until recently reports of the Perth population of rainbow lorikeets actually eating fruit have been virtually non-existent.

It may be that we are about to see the threat to agriculture realised. In early January of this year a householder in the northern beach suburb of Trigg, reported rainbow lorikeets to have eaten his entire crop of red seedless grapes. Although well known in the Trigg area for a number of years, this is the first known report of rainbow lorikeets eating grapes in Perth. Having now learnt that grapes can be utilised as a component of an already diverse diet, it may be only a matter of time before commercial grapes growing near Perth are utilised. Reports from South Australia suggest that rainbow lorikeets are quickly developing as the principal pest species of commercial orchards there.

Rainbow lorikeets have been gazetted as an unprotected species under the Wildlife Conservation Act, 1950, and as such may be taken by prescribed methods. However they have not been gazetted as a declared species under the Agriculture and Related Resources Act, 1976, and this can not occur until it is demonstrated that they are a threat to agriculture.

*David Lamont is Executive Officer for the Roadside Conservation Committee. He researched rainbow lorikeets for his Masters Degree. He can be contacted on 9334 0423.*



## RESEARCH

IMPACT OF CLIMATE CHANGE ON THE DISTRIBUTION OF THE GENUS *DRYANDRA*

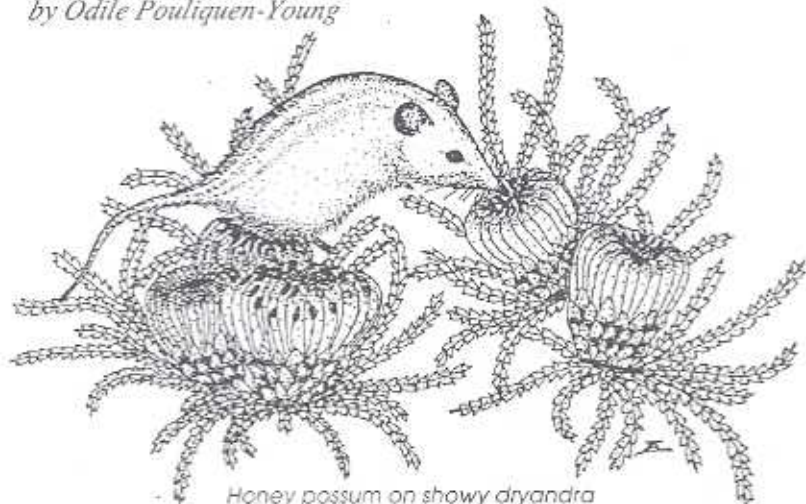
by Odile Pouliquen-Young

CLIMATE change has the potential to become the most important threat to the world's biodiversity to date. Realistically, it is unlikely that the rate of production of anthropogenic greenhouse gases is going to be slowed down enough in the next 50 years to delay climate change. We should seriously begin to look now at what impacts climate change will have on the natural environment, especially in those parts of the world with a high endemic biodiversity such as the south-west of WA.

The immediate consequence of the enhanced greenhouse effect is to increase global temperatures. This in turn has an impact on regional temperatures and rainfall patterns, in short on regional climate. Some researchers are arguing that climate change could already be responsible for the lower rainfall patterns of the last few decades in the south-west. Whether climate change has already put its mark on the region, or is going to be of more importance in the next century, is a matter of debate. Whatever the case, those species which have evolved to take advantage of specific climate patterns such as the Mediterranean winter rainfall, will have to adapt to changing climatic conditions.

In 1996, CSIRO climate change scenario based on estimates of greenhouse gas emission rates indicates a further decrease in rainfall over the whole south-west, particularly in summer. There is a marked southern shift of the regional isotherms and a contraction of the lower temperature areas of the region. As global temperature increases, changes in the region's climate are more noticeable.

Because we do not know much about the requirements of native plants, the easiest way to estimate the impact that climate change may have on native species is to look at



Honey possum on showy dryandra (*D. formosa*). Drawing by Angela Wardell-Johnson

how the species' distribution will respond to changes in local temperature and rainfall. To do that, the species' current distribution was matched to a set of climatic variables using a specialised computer software specifically designed for Australian conditions, to define the species' climatic envelope. This envelope is much larger than the species' real distribution which is usually constrained by other things than just climate. For plants, the main element constricting the distribution of species is the type of soils that it prefers. By adding for each species its preferred soils to its preferred climate, we obtained what we called the species' 'environmental envelope'.

We use the CSIRO climate change scenario with three different global temperature increases: 0.5°C, 1°C and 2°C depending on the rates of emission of the greenhouse gases, an increase of +0.5°C should occur between 2015 and 2045, while a +2°C would happen between 2070 and post-2100. For each of these global temperature increases, the CSIRO scenario gives the expected changes in local temperature and rainfall over grid boxes of about 125 km by 125 km.

Our results on the 92 species of the endemic genus *Dryandra* indicate that we can expect a range of responses to climate change (Table 1). It is clear that a reduction of the species' distribution areas is

Table 1. Responses of *Dryandra* species to climate change (n=92). Overlap between current and predicted environmental envelopes: \* >75%, \*\* <50%. Some species display multiple types of responses to climate change.

Response types	Number of species		
	+0.5°C	+1°C	+2°C
1. Decline within current environmental envelope*	64	36	16
2. Decline with partial** or total displacement between current and predicted environmental envelopes	2	4	12
3. Total disappearance	26	43	61
4. Increase in environmental envelope area	1	1	0
5. Contracts from the north	55	40	27
6. Contracts from the east	15	20	7

continued on page 9



continued from page 8

by far the most common response. There is also a trend for the impacts of climate change to be more severe as global temperatures increase.

Most researchers expect that species will move to track their preferred climate. After the last glaciation, trees and other plant species from Europe and North America migrated northwards (and some are still doing so) as ice sheets have retreated. Our results do not show any such large scale movement. Instead, 26 dryandras disappear at +0.5°C, raising to 61 species at +2°C. These species will not be able to find their preferred environmental envelope anywhere in WA. This important result is due to the fact that most dryandras have very specific soil requirements and that their preferred soil types are not widespread. Because of the southern shift of the isotherms, the decline that most species experience within their current environmental envelope occurs through a contraction of the northern part of their distributions.

Another important result is the influence the size of the species' current environmental envelope has on its vulnerability to climate change. All the species whose environmental envelopes are currently less than 1000 sq km disappear very rapidly (Table 2). The largest species are much more 'resistant' to climate change: no species with a current environmental envelope covering more than 50 000 sq km disappear at +0.5°C and only one of these species disappears at +2°C.

This result is due to two factors: (1) the larger the environmental envelope of a species, the wider the range of climate parameters it can be found under and the less likely climate change will exceed these parameters completely; (2) the larger the species' distribution, the more soil types it is likely to prefer so that its predicted climatic envelope under climate change is going to coincide with at least some of its preferred soil types.

This effect of size is independent of location. Whether from the south or north of the region, species with a very small environmental

Table 2. Impact of three global temperature increases on Dryandra species ranked by area of current environmental envelope.

Current area (sq km)	No. of species at current climate	No. of species which disappear at:		
		+0.5°C	+1°C	+2°C
0 - 1 000	25	25 (100%)	25 (100%)	25 (100%)
1 000 - 5 000	14	1 (7%)	9 (64%)	12 (86%)
5 000 - 10 000	22	0	6 (27%)	15 (68%)
10 000 - 50 000	21	0	3 (14%)	8 (38%)
> 50 000	10	0	0	1 (10%)
Total	92	26	43	61

Table 3. Proportion of Dryandra species whose environmental envelope lies within native vegetation areas over 50 ha, under current climate and three global temperature increases.

Proportion of the species' environmental envelope within native vegetation areas	Proportion of species within native vegetation areas at:			
	Current climate	+0.5°C	+1°C	+2°C
0 - 25%	44%)	43%)	43%)	51%)
25 - 50%	41%) 85%	48%) 91%	47%) 90%	26%) 77%
50 - 75%	5%	6%	4%	6%
75 - 100%	9%	4%	6%	17%
Number of species	92	66	49	31

envelope disappear extremely quickly.

85% of dryandras have less than 50% of their current environmental envelope within large blocks of native vegetation (State Forests, protected areas and remnant vegetation areas of more than 50 ha). Because the species do not move markedly with climate change, this proportion does not change much under climate change (Table 3). What reserve system we have now will need to be greatly upgraded if we want to improve the conservation status of surviving dryandras under climate change.

If we assume that the responses of the distribution of dryandras to climate change are likely to be the same for other endemic plants in the south-west, this study has several implications for the development of conservation strategies aimed at counter-acting climate change in the region. Some of these implications are noted below.

- ◆ Rare or restricted plant species endemic to the south-west will be extremely vulnerable to climate change: they will suffer most and

much earlier than more widely distributed species.

- ◆ The current centres of plant diversity in the south-west (Stirling Ranges and Northern Sandplains) are also very vulnerable because of the high number of restricted species found only there.
- ◆ Ecosystems with a high plant diversity are not going to gain species by migration, but instead are going to lose all their restricted species first.
- ◆ Because most plant species do not move under climate change, expanding the current system of reserves should take precedence over the design of corridors across the region.
- ◆ Because species migration is unlikely, it is not possible to define specific climatic refuges where species may concentrate under climate change. However, our study indicates that the Stirling Range region may act as a climatic refuge for those species currently extending eastwards along the south coast.

# LFWNEWS

## Visit of SA Minister for the Environment.

**I**N January, the South Australian Minister for the Environment, the Hon Dorothy Kotz, visited WA and asked to see *Land for Wildlife*. We took her to visit a large property - Russell and Pat Lord's at Goomalling - and a small one, Jenny and Mike Mackintosh's at Mt Helena, with lunch at Toodyay in between. We intended to show her remnants, reveg, streamlining, rare flora work etc etc, but were beaten by the weather.

It was one of those days when the heavens opened! As we drove up to the Lords' we could see lightening bolts smashing into paddocks alongside the house! Inside, there was no electricity and it rained so hard that we could hardly hear ourselves talk. At Toodyay, Rae Paynter, Dawn Atwill and



At the Lords' - Claire Hall, Russell Lord, Mrs Kotz, Ashley, Pat, Stephen Lord, Bob Huston.

Desrae and Wayne Clarke joined us for lunch. The rain was so heavy the loo flooded and the restaurant's roof leaked! At the Mackintosh's it was gloomy and sodden, though, for a short while, not actively wet.

Nevertheless, I think the Minister was impressed by the energy and

enthusiasm shown. She said she learnt a lot about salinity too! SA are thinking that they may start a *LFW* programme, but it is not a high priority at the moment. Many thanks to everyone for your help.

*Penny Hussey*

*continued from page 9*

◆ This study did not take into account the ecological and physiological adaptability of species. We assumed that the current distribution of dryandras coincide precisely with their rainfall and temperature requirements for reproduction and/or regeneration. However it is well known that plant species can live and reproduce under a wider range of climatic conditions than those under which they are found in the wild. To improve the chances of plant species surviving climate change, some rare species from the northern part of the region could be transplanted south of their current distribution as a safeguard.

Although not a high priority threat at the moment, climate change has the potential to impact on a wide range of conservation issues including revegetation strategies, weed demography and distribution, type and amount of agricultural production (hence native vegetation clearing and management), jarrah dieback, fire patterns, native mammal re-introduction strategies,

reserve location, salinity (through changes in rainfall patterns) etc. Latest climate change models indicate that the reduction in rainfall over the region could be even greater than predicted by the CSIRO 1996 model. Climate change is really a global threat both in its geographical extent and in its likely impacts. Whatever mitigation strategies against greenhouse gases, we should also be thinking of adopting strategies which will help us and our environment adapt to climate change.

*Further reading: 'Dryandras - they are not all prickly shrubs' M. Pieroni, WW 2/4.*

*The research was funded by the Greenhouse Assessment Team, Australian Greenhouse Office, Environment Australia, while Odile was Senior Research Officer at the Institute for Science and Technology Policy, Murdoch University. Odile can be contacted on (08) 9572 3615 and email: oyoung@iinet.net.au*

## BUSH DETECTIVE

Who made this bag?

**DON'T TOUCH!**

It contains irritating small spines which can get under your skin.



**You have been warned!**

*Answer - page 15*

## WEED ALERT

## SIAM WEED – COMING HOME WITH THE TROOPS?

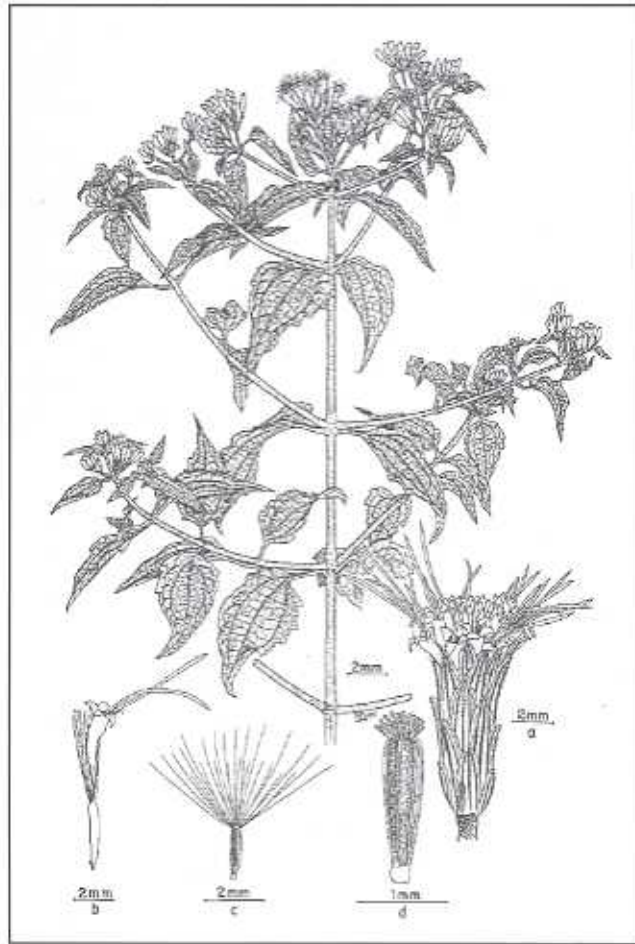
by Barbara Waterhouse

**S**IAM WEED (*Chromolaena odorata*) is one of the most serious tropical weeds one can expect to encounter. Originally from South America, it has been introduced and become aggressively invasive in West Africa, South Africa, the Indian subcontinent, southeast Asia and the Pacific. A small infestation which was noted near Tully in far north Queensland in 1994 is more or less under control – at a cost (so far) of nearly \$1 million.

The plant is a perennial shrub which forms tangled masses to 3m tall in open areas, but can scramble up to 5-10m along forest margins. It produces fluffy pinkish-white flowers between June and September, which result in millions of seeds attached to a parachute that floats them away on the wind. It can form impenetrable thickets and smother ground layer and shrub vegetation. It is a serious weed of riverbanks and disturbed sites, and will smother plantations, tree seedlings regenerating after logging, crops and pastures, as well as natural areas. In sites with wet and dry seasons, such as the Kimberley, it dries off after flowering, burns readily at this stage, then resprouts from the rootstock. It is unpalatable to stock, but toxic if inadvertently eaten – perhaps if included in fodder in feedlots.

## The risk from Timor

Siam weed is widespread across Indonesia, including Timor and Irian Jaya and is spreading rapidly through PNG. The next time you see news footage from East Timor,



pay attention to the roadside weeds and background "greenery" – much of it is Siam weed, which is widespread within Dili as well as in more rural areas.

Siam weed is notorious for spreading in association with military personnel and equipment. It hitched rides across the Pacific on military vehicles during WWII. The Australian Quarantine and Inspection Service (AQIS) realised that it was the biggest risk of the possible threats that could return with the troops from Timor. The detection of Siam weed seeds in the footwell of a UN vehicle brought to Darwin for repairs in October provided convincing evidence that this was not just a "perceived" risk, but the real thing.

A team of AQIS officers worked in Dili, cleaning vehicles before they were shipped back to Australia (this sometimes involved dismantling vehicles and/or engines), while a second team in Darwin checked personnel. In all of this, the Defence Department has been wonderfully helpful and co-operative.

But the probability is that, despite all the care, some seeds will slip through.

## Where you come in

There will be ongoing surveillance near military bases, but it is actually more likely that concealed seed will be "bounced off" during exercises in rough terrain.

Siam weed could grow in coastal regions of Australia from the Kimberley across to the eastern seaboard, possibly down as far as north-eastern Victoria. If you live in the north of WA, or if you go north for your holidays, collect a pressed specimen of any plant you are suspicious of, and check it with a Community Herbarium, or the Weed Science section of AgWEST.

Remember, this latest incursion by Siam weed hasn't happened (quite) yet, but it (probably) will happen, and it is (probably) coming to a site near you!

*Barbara Waterhouse is a botanist with AQIS's Northern Australia Quarantine Strategy based in Mareeba, Qld. For more information, contact the following website: <http://www.agric.wa.gov.au/progserv/plants/weeds/clero/siam.htm>*

## PRACTICALITIES

### Regenerating Woodlands - Similar to Growing a Crop!

by Avril Baxter

SO, you've got a nice patch of woodland on your place, but there doesn't seem to be many young trees or shrubs. If you think back to last season, you will realise that regenerating your patch of woodland is similar to growing a crop.

To get a good crop you kept the sheep out of the paddock, controlled weeds, created a seed bed and planted seeds, manipulated fertility and pest species, you may even have introduced pollinators and finally prayed for perfect winter rains.

Treat yourself for a walk through your bushland. Have a look around and see if any of the following elements are missing. Changing them could be the start of this year's bushland management programme.

◆ **Grazing control**

Fence to exclude stock, control rabbits. Monitor and, if necessary, control kangaroos.

◆ **Weed control**

Prevent weeds and excess nutrients from entering the site. If necessary, control weeds within the site and replace immediately with seedlings or by direct seeding.

◆ **Seed source**

Are there enough parent plants to reseed the area? Hard seeded wattles and peas can remain in the soil for up to 50 years - others have a short life. Has soil erosion on slopes removed most of the soil seed bank? Can the seeds reach the area you want to regenerate eg. do prevailing winds blow them the wrong way? Do the plants need fire to open the fruits and release seeds?

◆ **Seed germination**

Many native plant seeds need a specific trigger to stimulate germination, this may be heat, or smoke. If direct seeding, make

sure the seeds have been treated before you sow.

◆ **Seed bed**

Compacted surface, or niche for seed to fall into? Consider raking, or cultivation. Do not disturb the surface near the edges as this will create a seedbed for weeds blown from the paddock. Do not seed under the canopy of existing trees - it will have little effect.

◆ **Good rains**

Do not treat the whole area at once. Water erosion could occur or there may be inadequate follow-up rains.

◆ **Pollination and pest control**

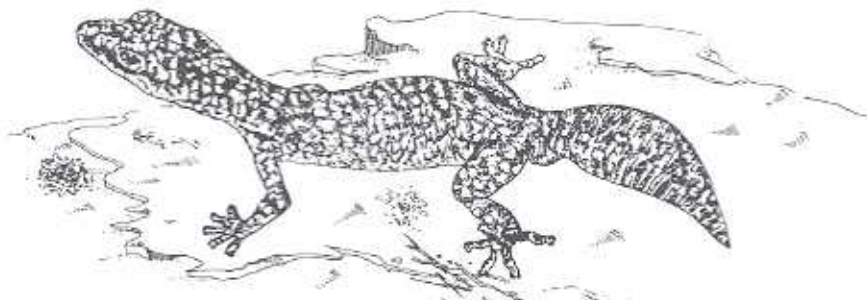
Maximise plant diversity to encourage insect and bird populations. Control foxes.

Finally, give it time. New plants will continue to appear several years after you started the regeneration process.

### Create fauna habitat on rock outcrops using paving slabs

LOOSE rocks have been removed from many granite outcrops, either by the water authority to build walls to channel water, or, around urban centres, by householders for use in landscaping. The crevices under these rocks are a most important fauna habitat. Two researchers in NSW decided to see if they could recreate habitat on degraded sandstone outcrops by putting out concrete paving slabs.

They were interested in the endangered broad-headed snake (*Hoplocephalus bungaroides*) and its major prey, the velvet gecko (*Oedura lesueurii*). The gecko uses rock crevices for shelter, so declines in numbers when the rocks are removed. Then the snake numbers decline also. The researchers put out pavers, propped up to give a variety of crevice widths. Some



Marbled Velvet Gecko, *Oedura marmorata*. Purplish-brown with white or yellow speckles, in cross-bands when young. In WA, mulga region and north.

were in shady areas, some more exposed.

The results showed that the geckos used these crevices. This demonstrates that habitat restoration with appropriate-sized concrete pavers may be a feasible conservation technique for degraded rock outcrops.

They recommend the use of large pavers (30-45 cm wide, 5-10 cm

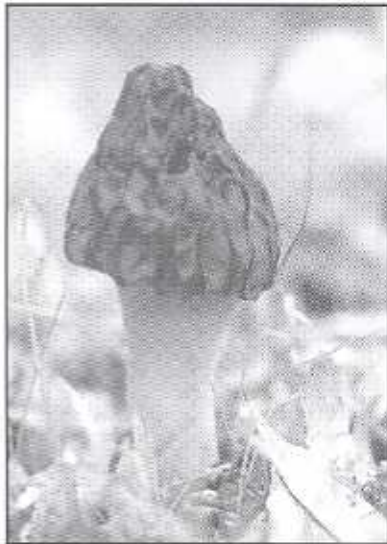
thick) with a variety of crevice sizes up to 10mm, to maximise the diversity of retreat sites.

Has anyone here had success with a similar technique?

Reference: Webb, J.K. & Shine, R. 2000. "Paving the way for habitat restoration: can artificial rocks restore degraded habitats of endangered reptiles?" *Biological Conservation* 92, pp 93-99.

## FUNGI

### Morel



Morel, York. Photo: P. Hussey

The fruiting body of the Morel, *Morelia elata*, has a stout yellowish-white stalk topped by a conical, wrinkled brown cap, overall height 10 - 15 cm. The whole thing is hollow. In WA they occur in forests and woodlands of the south-west.

In Europe and America, Morels are highly regarded as edible fungi, but they are not used much in Australia. There doesn't even seem to be any records of use by Aboriginal people. This lack of interest might be because they are not often noticed, as fruiting bodies seem to be produced in abundance only after bushfires.

After a fire, Morels fruit and release spores which germinate in the soil to form mycelia (feeding threads) and then form sclerotia. Sclerotia are fungal 'resting bodies' up to 5 cm in diameter, composed of large thick-walled cells which enable the fungus to survive adverse conditions. Many south-west fungi form sclerotia, and it has been suggested that it could be a feature that is an adaptation to cope with frequent fires. In spring the sclerotium will either germinate to form a new mycelium or produce a fruiting body. Generally, however, the Morel will not produce a fruiting body until after the next fire.

Morels have a light flavour, and there is nothing much else they could be confused with, if anyone wanted to try them. However, note that some reports from other continents say that, if alcohol is taken at the same meal, severe vomiting and diarrhoea will result!

## FLORA

### Cord Rush

*Ecdeiocolea monostachya*  
ECDEIOCOLEACEAE

Cord rush is a tufted perennial which forms large clumps, with culms (upright stems) up to 1m tall, each with a single cone-shaped inflorescence. The plants are either male or female. The flowers are produced in spring. It grows in sand under heath or woodland, often in association with granite. After fire it resprouts, or may grow from seed. It is common and widespread from Kalbarri throughout the northern and central wheatbelt.



Illustration by Ellen Hickman from "Australian Rushes" - see New Books section.



Distribution of *Ecdeiocolea monostachya*

## FAUNA

### Native Snails

Following the article in "Western Wildlife" a native snail shell was found on the Australian Bush Heritage's block at Kojonup. Mal Graham, of CALM Kojonup, sent it to the Museum, and Dr Slack-Smith was very interested. She replied, in part:

"Prior to receiving your specimen we have had only a single shell of a *Bothriembryon* species from anywhere near Kojonup. It is a mystery as to why there should be so few records of specimens of this group of native snails from the huge area inland of the Escarpment and north of the Stirlings-Esperance road. It is possible that it could be a paucity of collectors, but I don't think that is the only reason. The snails are really sparse.

"In addition, their shells are generally fragile, perhaps because of a low calcium content of the soil and so of the vegetation. As a result, the shells seem to disintegrate soon after the death of the snails, unlike those nearer to the coasts or in other calcium-rich localities. Species with well-calcified shells leave behind plenty of evidence of their existence, even when the populations aren't large.

"An interesting point is that wandoo woodlands seem to be more often inhabited by native snails of various groups than are surrounding jarrah or marri woodlands. Wandoo is often associated with outcrops of dolerite which, I understand, contains more calcium than does granite.

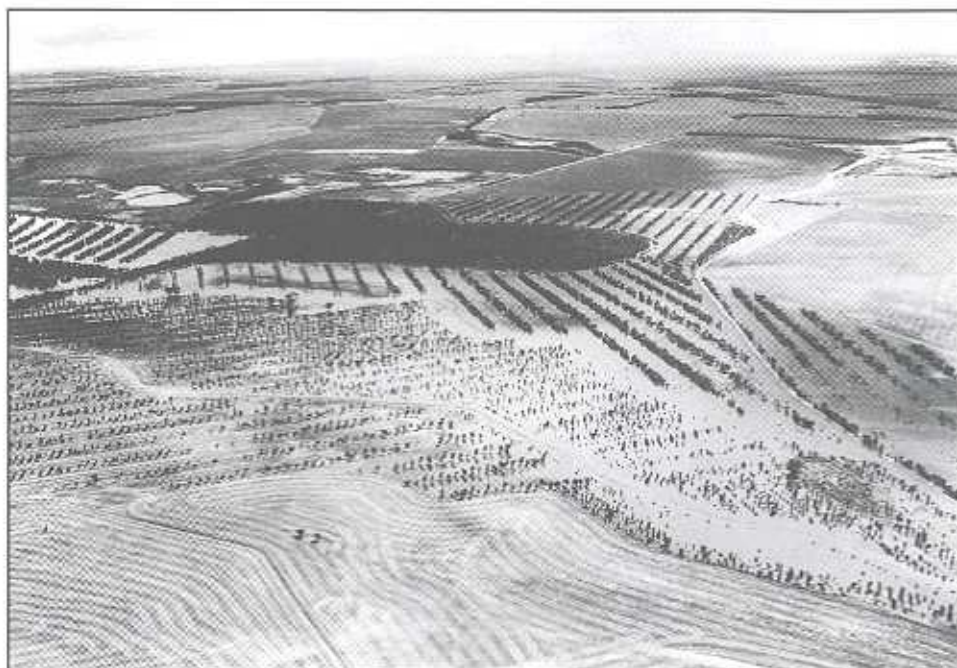
"I would be really keen to receive any information or, better still, any specimens of *Bothriembryon* species from the general area. If the specimens are alive then they could be packed into a dry container with airholes, such as a matchbox, and sent to me. I could have the live animal photographed, and could then narcotise and preserve it in such a way that it would be suitable for anatomical and genetics studies - should we ever have the good fortune to have a researcher willing and able to work on the group."

So how about it, *Land for Wildlifers* in the Great Southern? **Early this winter, have a Great Snail Hunt!** You never know, you might find a new species, and then it might be named after you! (Incidentally, the Kojonup species might be *Bothriembryon bradshawi*, originally found at Tambellup.)

## MEMBERS PAGE

### Should we be farming kelp?!

Kerry and Wayne Smart's revegetation in the South Lake Bryde catchment after 6.5 inches of rain, Jan 2000.  
Photo: Anne Rick.



### Natural Vermin Control

by Monica Strauss

WE are very lucky to have our own Vermin Controller living in our house at Toodyay. It is a small *Varanus tristis*, who moved inside our roof some 10 weeks ago. Our leathery-looking black friend enters via a gap between the external brick fireplace wall and the roof. He appears to have taken up permanent residence, and is doing the most wonderful job exterminating any mice or rats that are wishing to move into the roof space. So much better than having to set traps!

We used to sometimes hear the pitter and patter of tiny feet, now we hear thump, thud and squeak, and on occasions, a little later, see a smug looking black monitor reclining on the outside rafters. He (or she?) also wanders daily about the garden, mostly looking very furtive, the curled tail held high a giveaway. Only once have I seen it with the tail flat on the ground, looking more gloomy and depressed than ever, and that was after it got watered by accident.

*V. tristis* also hunts in our feed shed, which is some 40m away from



the house. I saw it with a freshly-caught rat, which was so big it didn't seem possible that he could eat it, but eat it he did. When next I looked, only the rat's tail was hanging out of his mouth. Some time later he came home, slowly made his way up the brick wall, stomach bulging, and went inside the roof. Vermin control without traps or poison!

The only disturbance that his presence causes is to the people-friendly birds, wren and robin, who are not frequenting our small garden as much as they normally would. His presence does not upset resident bobtails, nor the carpet python that

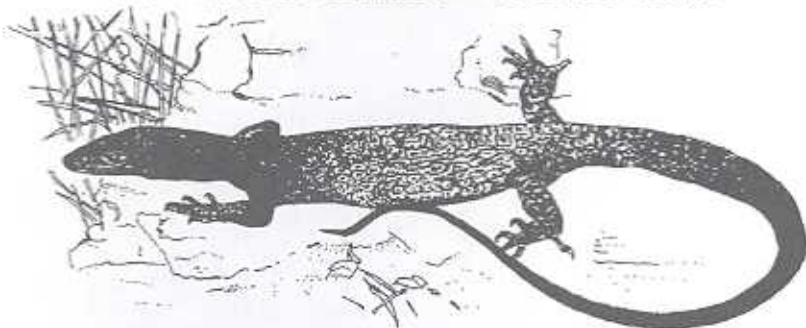


has been spending the last few days in a wandoo next to the house. However, absent is a mulga snake that we have seen around the area for a number of years and I wonder if it is keeping away because of *tristis*.

Another thing perhaps worth mentioning is the fact that this summer is the best for bungarra [*V. gouldii* - Ed.] that we have seen since buying the property in 1990. There are always quite a good number about, but this year there are bungarra, in all sizes, just everywhere. I wonder if others have noticed this also?

## MEMBERS PAGE

### Black Tailed Monitor - *Varanus tristis*



**B**LACK TAILED MONITORS (black goannas) are widespread over most of northern WA, Perth is at the southern limit of their extent. Most southern forms are very dark, although the juveniles are more colourful with yellowish speckles, while inland forms often retain the indistinct yellowish markings into adulthood. They can grow up to 80 cm long.

They are excellent climbers, resting in a hollow or basking on a limb high up. Look for scratch marks on smooth-barked trees such as wandoo (or verandah posts). They specialise in hunting for birds' nests and eggs, but will also take frogs, mice, lizards and various insects. Within a hollow tree, the animals move around to find hotter or cooler places, and so help to regulate their body temperature. Ceiling spaces are ideal on all counts. In winter they sleep near the chimney!

Young animals would have numerous predators, including cats and birds such as kookaburras, but the adults are killed by dogs or carpet snakes. They are often road casualties, as they bask on the tarmac to raise their body temperature. If they are noticed, small birds often mob them, so, when emerging from a den site, the black goanna looks around very carefully before moving

out. Sometimes this nearly gives a heart attack to people when they look out of their window and see a long snaky neck peering at them from the rafters!

If they are disturbed when on the ground, they run up things to escape, usually trees. If you note one running away, try sneaking up on a likely tree, you can catch him sidling around to keep the tree between you and him! There are several stories of the animals running up people, and I once observed the effect on a horse ... I clearly saw the startled goanna hurl itself sideways off the horse's shoulder as Brandis (the horse) tried to go vertical himself. After that, things got a little hectic for a while!

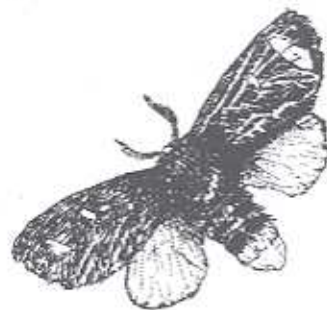
Around human dwellings, black goannas (or chuditch) may take mice or rats that have been poisoned. If the rat-poison is used according to the label instructions it is unlikely that the predators would eat enough of the dead rodents to cause them any problems. Use a bait station, and never overdose, as if you do that the rat may die before the poison has decomposed inside it - that would be fatal to a predator. Better still, of course, is not to use poison at all and try to persuade your neighbours not to do so either. - Ed.

## BUSH DETECTIVE ANSWER

It is made by caterpillars of the bag-shelter moth (*Ochrogaster lunifer*) which construct communal bag-shelters of silk and frass. They are found hanging on branches of Acacia species throughout southern Australia.

The adult moths emerge in November and December and the females lay their eggs on branches of jam wattle (*Acacia acuminata*). There are six larval stages occurring from January to June. The densely-hairy caterpillars emerge in late December or early January and live together in a bag-shelter made out of silk, frass and dried larval skins hanging on tree branches. The bags range in size from about 20mm in January to 225mm in June. The caterpillars feed from January to June and emerge from the bag-shelter at night to feed on the host tree, leaving trails of silk to their foraging sites. This is known as 'central-place foraging'. They move in a single line or procession giving rise to another common name 'processionary caterpillar'. In late May or early June the caterpillars move down to the ground to pupate.

The caterpillars are well protected by their dense hairs which can be irritating to humans and animals. The Aborigines avoided the bag-shelters filled with discarded hairs and wriggling caterpillars as a bag could cause severe irritation if it fell on a sleeping person. Cattle may die from stomach irritation if they ingest a fallen bag of caterpillars while feeding. It is possible that the caterpillars could be predated by several insectivorous bird species common in woodlands, in particular cuckoos, who have a special stomach lining to deal with the hairs. The bag-shelter could be an anti-predation advice and it could reduce water loss when the caterpillars rest inside it during the day.



Bag-shelter moth  
(*Ochrogaster lunifer*)

**Congratulations!**

to Margaret and Colin Tonkin of Collie for winning  
the NHT National Rivercare Award.

Well done!



## NEW BOOKS

### AUSTRALIAN RUSHES: BIOLOGY, IDENTIFICATION AND CONSERVATION OF RESTIONACEAE AND ALLIED FAMILIES.

Ed: Kathy A. Meney & John S. Pate.  
University of Western Australia Press, Perth, 1999.  
\$95.00

Any person who has ever taken part in a bushland survey will be aware of those 'reedy things' that are always present but no-one knows the name of. Like Admiral Nelson, we often turn a blind eye and pretend we didn't see them! But in fact they are an important part of native vegetation communities, and deserve more attention. Now, a new book has thrown light on one family of reedy things, the 'southern rushes' from the family Restionaceae.

Each of the 144 Australian species has a page of description, including photomicrographs of culm (aerial stem), rhizome and root, as well as a page of drawings, done by Ellen Hickman. These are a feature of the book, being both detailed and delicately beautiful. There are also chapters on morphology, anatomy, biology, diseases, propagation and conservation.

This is not a book for the faint-hearted! Even dedicated volunteers at Community Herbaria are likely to still have trouble with exact naming of individual specimens. But it is a beautiful book, full of fascinating detail about this important but little understood/neglected group of plants.

### MANAGING OUR RIVERS: A GUIDE TO THE NATURE AND MANAGEMENT OF THE STREAMS OF SOUTH-WEST WESTERN AUSTRALIA.

Luke J. Pen  
Water and Rivers Commission, Perth, 1999.  
\$19.95 + \$6 p&h.

This book is a must for anyone who loves our south-west rivers. It contains a wealth of detail on how rivers work - landform and topography, vegetation on banks and bed, fauna and human use. How and why rivers degrade is also discussed, followed by chapters on management and the future.

Not just a text but a work of love, this book is easy to read and very informative. It will provide a huge amount of background to assist in the understanding and management of any size and type of stream likely to be encountered. By taking a broad view, the author shows how all the processes interact with one another, so that maintenance of the beauty, fertility and productivity of our south-western rivers is the responsibility of all of land users.

Very reasonably priced, this book should be in the collection of all truly concerned land carers.



### THE LAND IS IN YOUR HANDS: A PRACTICAL GUIDE FOR OWNERS OF SMALL RURAL LANDHOLDINGS IN WESTERN AUSTRALIA.

AgWEST, Perth, 1999.  
Free

This comprehensive guide has been developed to promote good management practices to the State's growing number of small landholders. It contains practical, user-friendly information on a wide range of topics including land management, water supply, stocking levels, chemical use, weed and pest management, property design and many others. It will be a valuable resource regardless of the size of the property.

Obtain your copy by contacting your local AgWEST office.

## FUNDING

### Threatened Species Network Community Grants

Round 3 opens in April, closes June.

If you think you have a small project that would help threatened species, contact Sandra McKenzie for more information ph: 9387 6444 fax: 9387 6180  
email smckenzie@wwf.org.au

## COMING EVENTS

### "Eucalypt Tree Decline in the Great Southern"

Workshop planned for late August. Kojanup area.

Focussing on Wandoo, Flooded Gum, Flat-topped Yate and Marri.

Organised by Land for Wildlife and Bushcare Support.

For more info, or to register interest,

ring Avril Baxter: 9881 9218.

► LFW Officers will be attending the following Shows - put the date in your diary!

Dowerin Field Days - 24-26 August

Dalwallinu Show - 25 August

York Show - 2 September

Newdegate Field Days - 6-7 September

Mingenew Expo - 16-17 September

Moora Show - 22-23 September

Narrogin Show - 7 October

Bindoon Show - 21 October

Gidgegannup Show - 28 October

Busselton Show - 3-4 November

Blackwood Show - 7 November

Margaret River Show - 10 November

Bridgetown Show - 25 November

This Newsletter is a compendium of articles written by many different people. The views expressed are those of the authors, not necessarily those of the Department of Conservation and Land Management.

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