Western Wildlife

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

LAND FOR WILDLIFE

July 2004 Vol. 8, Number 3

NEWSLETTER OF THE *LAND FOR WILDLIFE* SCHEME

REGISTERED BY AUSTRALIA POST PRINT POST: 606811/00007

NO BULL ABOUT *MYRMECIA* ANTS!

Pierre-Ulric Achour

About the genus

Myrmecia ants are Australian entomological icons. They are very distinctive in appearance and are conspicuous elements of our insect fauna. Within the Formicidae (ant family) this subfamily has long been considered to be a monogeneric taxon, only comprised of the genus *Myrmecia*. The genus is well known under the vernacular term 'Bull' ants, for which two forms are colloquially identified: the 'inch' or 'giant bull' ants for their large size, as well as 'jack-jumper' or 'jumping jack' ants, for their ability to hop.

The genus is diverse, comprising 91 described species at present, with 90 of these endemic to Australia. The remaining species occurs in New Caledonia (*M. apicalis*) where it is rarely encountered. One species has accidentally been introduced into New Zealand (*M. brevinoda*). These ants are widespread throughout the continent, and can be found in a wide range of habitats in temperate and arid climatic zones, being particularly abundant in woodlands, coastal heath and open forests. They are not well represented in the northern tropical regions.

Myrmecia has long been considered a taxonomically difficult genus, with many of its species displaying internal variations in size and colour. Nevertheless, morphological and molecular data strongly indicate that nine species-groups exist within the genus, each representing quite distinct morphological types.

Identification and general biology

Myrmecia ants are unlikely to be confused with any other ants. Some *Myrmecia* ants are among the largest of all ant species, ranging from 36 mm in total length to relatively small species of 8 mm in length. They can also be recognised easily by their large protruding eyes, elongate toothed mandibles and the powerful functional sting characterising most of the larger species. Many of the smaller diurnal species display bright or contrasting coloration patterns, in different shades of red or yellow and black, as a warning of their sting to vertebrate predators. Two species commonly found in the South-west of Western Australia

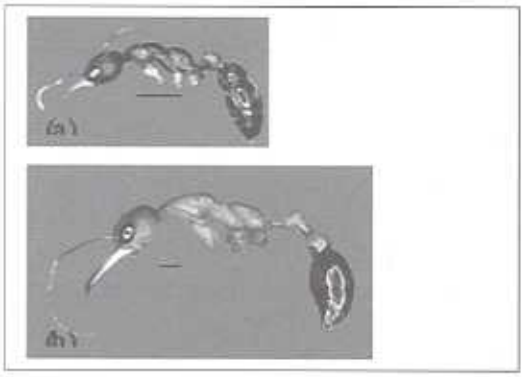

Fig 1. Two species commonly found around the S-W of WA. (a) The small *M. urens* 'Baby Bull ant', is found on vegetation of our coastal heath; and (b) the large *M. vindex* 'Bull ant', is a conspicuous ground dweller found in our woodlands. These two species exemplify well the variations in ecology and morphology found across the genus. Scale = 2mm. (Photos: P-U Achour)

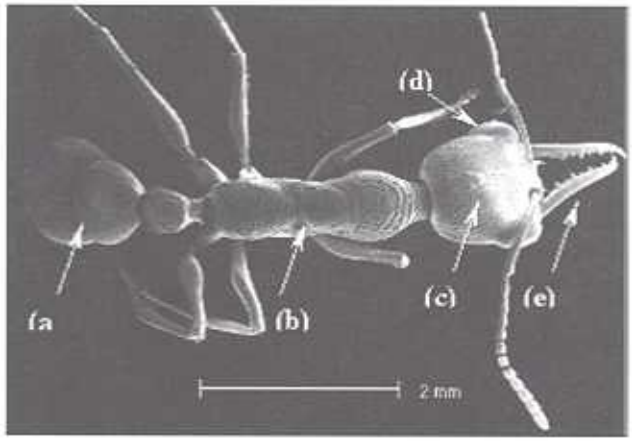

Fig 2. General *Myrmecia* morphology, using *M. urens* in dorsal view. Typical features include: (a) a constricted abdominal segment, (b) a distinctly defined abdomen (mesonotum), (c) a group of ocelli on top of the head, (d) large anterior eyes and (e) long toothed mandibles. Note that the protruding sting is not visible in this illustration. (Photo: P-U Achour)

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EDITORIAL

Greetings all!

Land for Wildlife staff attended a Workshop in March, where we discussed, among other things, how to regenerate Salmon Gum and the most effective way for *LFWers* to seek 'Envirofunding'. Congratulations to all those people whose projects were funded in the last round.

Unfortunately, not everyone thinks that having land for wildlife is a good idea. The photo shows a shot-up sign from the Tone River area. It appears that there may be a conflict between some landholders' desire to conserve bushland and a another section of the community's desire to ... what – clear land, shoot animals? Please everyone, pass on the message of co-existance, if you get the chance.

On another sign issue, we are coming up to sign number 1080. That figure has a particular relevance in WA – is there anyone out there who would particularly like it on their place?

This issue has a number of articles written by Western Wildlife's readers, describing the plants and animals – some of them very small – that they have observed. Fascinating stories which all add to

the knowledge of biodiversity in this State – has anyone got any more?

We are trying something a little different this issue, inside you will find a flyer advertising two properties for sale. One is offered by the "Bush Bank" programme, the other is a long-time *LFW* property adjoining the Stirling Range. *LFW* Victoria regularly offers this service to readers of their newsletter, but my concern is that 'Western Wildlife' comes out so infrequently that the properties may be sold before you get to read about them. Please tell me what you think about the usefulness of this initiative.

It is not only farmers who sighed with relief when the rains finally started in May – on my block on the Darling Scarp we had had nothing more than a few drops since November 2003. Large areas of Scarp bushland have died, but, given a decent set of winter rains, should regenerate. For all of us, on farmland and bushland alike, best wishes for an excellent season.

Penny Hussey

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Land for Wildlife staff:
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Front row: Fiona Falconer, Zara Kivell, Sylvia Leighton

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Myrmecia ants continued from page 1

are depicted in Figure 1. Some diagnostic morphological features of a typical *Myrmecia* worker have been identified in Figure 2.

Following is a point summary providing the central features of myrmeciine biology:

- *Mymecia* colonies range from only a few dozen workers to a few thousand workers, depending on the species. Most species nest in soil, often constructing large mounds with single or multiple nest entrances, which are sometimes decorated with stones or fragments of plant material. A few species nest in rotten logs, while one tropical species (*M. mjobergi*) nests arboreally in epiphytic ferns. Workers of the larger species are considered aggressive and will relentlessly defend their nest, especially if it is well populated. The smaller and more timid species build small, protected nests with inconspicuous entrances and contain fewer individuals.
- The workers are generally noctidiurnal and forage on the ground or on low vegetation. Adult ants are nectarivorous and feed primarily on plant exudates. Animal prey is collected extensively in summer, however, as soon as young larvae have appeared, and is fed to them after being cut up. The foraging workers use stealth, rapid movements, their long mandibles and their potent sting to capture a large variety of arthropods. Vision is well developed among *Myrmecia* ants, and they rely predominantly on that sense for their external activities.
- *Myrmecia* species produce large, fully winged virgin queens, which leave their parental nests with virgin males to mate in a mass nuptial flight. Deviations from this pattern do arise in some species, with the production of queens that are wingless or have reduced wings. They are inseminated on the ground. In addition, a few species of temporary and complete social parasites are known in the genus. These deviations are rare however, and thought to be secondary evolutionary trends.
- Once the female is inseminated, she sheds her wings and excavates a new nest chamber in a suitable location. She does not, however, follow the 'claustral' patterns of colony founding seen in higher ants, when the queen remains in the cell and uses her own metabolized tissues to feed the brood. In contrast, *Myrmecia* founding queens follow a 'partially claustral' pattern, where they emerge from nest and forage for prey to feed larvae, until workers emerge.
- In the larger species, the worker caste may be differentiated in two overlapping size subclasses despite body proportions remaining the same. Some basic division of labor, based on age differentiations has been observed between these subclasses: larger workers partake in foraging, while the smaller ones undertake nest duties and care for the brood.

FAUNA

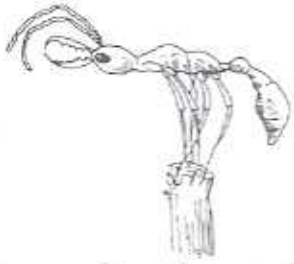
Evolutionary significance

Ants from the *Myrmecia* genus have attracted much scientific interest on the basis that they are considered, along with *Nothomyrmecia* (the famous South-Australian 'fossil ant') and *Amblyopone*, as some of the most primitive examples of living ants. A primitive taxon, in essence, is one that has retained many basal states when compared with other taxa at the same classification level. These states can be purely morphological characters or more complex behavioural and social characters.

Indeed, *Myrmecia* has retained a variety of morphological character states which are taken as primitive within the Formicidae as a whole: their long bodies, distinctly defined abdomen, large anteriorly positioned eyes, ocelli and protruding sting are some of the more obvious. *Myrmecia* ants are morphologically very generalised and show little specialisation to the subterranean environment.

The primitive status of *Myrmecia* species is also reflected in their behaviour and ecological patterns. For example, their brood-care habits and the social interactions occurring between adults are not as elaborate as in other ant taxa. The chemical ecology and exocrine make-up of these ants also appears to be generalised. Particularly, the 'partially claustral' mode of colony founding described earlier is of evolutionary significance, since it is regarded as a remnant of the primitive colony foundation provisioning practiced by the queens of putative wasp-like ancestors.

Fossil records indicate that there is little doubt that *Myrmecia* has originated from a single ancestral stock, having emerged around 75 million years ago. Since *Myrmecia* and *Nothomyrmecia* are presently endemic to the Australian continent, while some related fossil taxa have been identified in other parts of the world (Europe and South America), it implies that myrmeciine ants were previously much more widespread across Gondwana than their actual distribution may have suggested. Myrmeciines are now extinct everywhere in the world, except in Australia and New Caledonia, where they survive as relict taxa.



So remember, the next time a Bull Ant threatens to sting you, that it is a unique part of the Australian fauna!

Pierre-Ulric Achour completed an honors project at the Department of Environmental Biology at Curtin University of Technology. He conducted a study investigating the physiology, biochemistry and functional significance of metapleural glands in M. vindex *and* M. urens. *You may contact Pierre-Ulric Achour to obtain further information concerning this topic at pachour@hotmail.com.*

FAUNA

UNDERSTANDING RING-TAILED POSSUMS

Chris Gunby

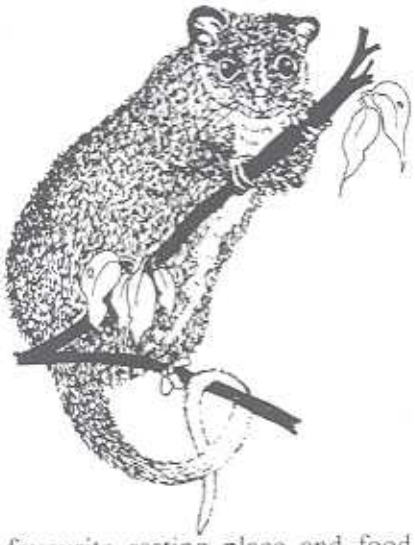
I can't claim to be an expert on ring-tailed possums but after fairly constant observation of their behaviour on our property just near Albany for four years, I have learnt a few things which may be of interest to others.

For starters, our property consists of 11 ha of mixed paddocks, wetland, remnant vegetation and more formal gardens, just 3 kms north of Albany town centre. Most of my observations of the possums, however, were restricted to an area immediately around our house, which includes about 1 ha of mixed Marri, Jarrah and Sheoak remnant vegetation and half a hectare of mixed Australian bushes and trees.

Between April 1999 and a severe winter gale in 2000, sightings within the 1.5 ha varied from 2-6 individuals a night, in groupings of up to three but mainly as individuals or as a mother and young. The maximum number of possums I counted on the same night was 10 - not bad for such a small area. Activity normally started an hour after sunset, with the possums well spaced. Surprisingly, each night about 7pm, two small possums would go to sleep in the fork of a large wattle tree, before restarting activity an hour or so later. Why they needed a catnap so soon after getting up I have no idea!

The possums would come from the remnant vegetation and eat the flowers and leaves of the exotic plantings. Special favourites were oak leaves (especially when young), New Zealand Christmas Tree leaves, Bald Island Marlock flowers and various planted wattle and eucalypt leaves and flowers. Only occasionally did I see possums eating native vegetation, although Jarrah new growth was favoured. I definitely got the feeling sheoak leaves were their least favourite food, and I never saw them eating anything on a Marri tree - despite them being the commonest native vegetation in the area.

In the severe gale of 2000 our property lost 8 large planted trees, including the young possums' favourite resting place and food supply. Food was obviously diminished as since that date I have never seen more than three possums in the area - and often fail to see any.



In these four years I have only once seen a possum travelling on the ground. Favourite food trees with no connecting vegetation never have possums in them, with the possums unwilling to cross open ground of even a few meters. Favourite food trees before the gale have been ignored since, if the connection of even a single twig has been lost.

Another implication of the gale and loss of trees has been the concentrated feeding on one or two exotic trees that still have connected pathways to the remnant vegetation. The oak tree has suffered a hammering, with leaves stripped bare and it is now half dead, although whether from loss of leaves from the possums, or from recent dry summers, I am not certain.

Nocturnal lodgings range from forks of trees without any nests, to nests using twigs or circles of sheoak leaves, very loosely gathered on the side of trees from 1-5 m off the ground. Elsewhere on the property, Sydney Golden Wattle (*Acacia longifolia*) is a favourite nesting tree, with very large nests made of the trees' leaves. Similar nests exist in the wetland vegetation, with teatree being a favourite building material.

Attempts at constructing artificial nesting sites have met with mixed success. Two heavy Jarrah logs that were cut in half and hollowed out by chainsaw, before being lashed together and hoisted in trees, are now occupied by bees. A third attempt simply used an already hollow smaller log, blocking an end. This is now occupied by a possum. It is noticeable that other hollows previously occupied by parrots and maybe by possums are also now occupied by bees. Whether this is related to the decline in possums I do not know.

Management implications

My experience with local possums has taught me the importance of wildlife corridors. Not corridors kilometers wide, or hundreds of meters, but in this case a single tree, branch or even twig. The loss of such connections has fundamentally disrupted the behaviour of possums on our property, depriving them of habitat, nesting places and food supplies. A dramatic drop in the population of possums has ensued with the loss of these connections and has concentrated feeding on a few trees, to their detriment.

If we are going to maintain a healthy population of possums, we need to cater for ease of movement to allow food sources to be utilised. This means careful thought when making firebreaks and access paths. It will take many years before the replanting I have done will replace the trees lost in the gale, but hopefully once these grow and the connections are restored, I will see possum numbers grow again.

Chris Gunby can be contacted on 9842 5760.

[Incidentally, by association with the name used for the leaf nest created by squirrels, a possum's 'nest' is often called a 'drey'. Ed.]

FLORA

WELLSTEAD - ALMOST WATTLED OUT!

Compiled by the Wellstead Heritage Committee

'WATTLE' is an old word in the English language meaning 'rod or stake.' The word was introduced to Australia during the construction of the 'wattle and daub' huts of early settlers, when the flexible acacia saplings were used for the frames. However, the people of Wellstead could almost interpret the word as the 'rod that almost broke the camel's back'!

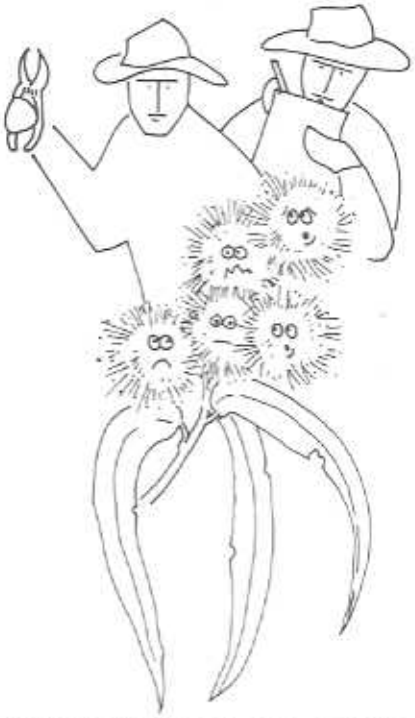
Wellstead is farming country tucked between the Stirling Ranges and the Southern Ocean, approximately 100 kms north-east of Albany. Since 1987 the locals have surveyed the district's population of birds, eucalypts and banksias and published the results in a series of booklets assisted by Gordon Reid Foundation funding. The aim was to record what exists in the bushlands of the region, learn about it and, armed with that knowledge, plan its preservation.

The mammoth task of surveying the district's acacia species is almost completed and ready to be published in their fifth book.

Penny Hussey from *Land For Wildlife* suggested some years ago that the group select 'wattles' as the next survey topic. This sounded easy enough. Estimates indicated there were possibly 20 to 30 species out in the district. An official survey sheet was created with the assistance of the Perth Herbarium and it was arranged that samples of each specimen were to be sent to them for official identification. Latitudes and longitudes were studied and GPS experts lent a hand to pinpoint localities.

Ten locals bravely agreed to participate in the survey. A local artist unsuspectingly took on the task of sketching each plant when in flower and adding the pods later when the collector brought them in. The Albany Herbarium assisted in the research of the meanings behind the scientific names of the species.

Family: *Mimosaceae*
Genus: *Acacia*
Common Name: WATTLE



Who would have dreamt there could be so many different shades of yellow and subtle variations of perfume? Pods were aptly described as long, curly, short etc., seeds were round, oblong, flattened or perhaps curled – the local knowledge of botanical adjectives steadily increased!

Just as the collectors began to develop confidence it was disconcerting to discover that the foliage of most wattles cannot be described as a true leaf. They have flattened, expanded leaf stalks called phyllodes that function like leaves. These can vary from wing-like, angular, boat shaped, spiky, soft to leathery or hairy. It was also discovered that nectar is not produced in the flowers. Ants are attracted to a nectar-producing gland on the axis of the leaf-like phyllode.

Many a time the survey team wished that they had picked a plant family that was easier to classify. Western Australia has 560 species of *Acacia* and this small district has so far identified 59 species! It was confirmed with interest that eight of the species discovered in the survey were rare, threatened or had insufficient data to determine their status.

Acacias are of great value in remnant vegetation and are at the forefront of regeneration in burnt or degraded areas of bush. They are legumes that add nutrients to the soil by coexisting with *Rhizobium* bacteria that take nitrogen from the air and add it to the soil. The seed pods are a food source for birds, insects and many other animals including man. Their pods are easily collected. The seed has a hard water-resistant coating that is broken down by abrasion or hot water. They are easy to propagate and quick growing.

The really hard work is now under way with many local computer experts preparing the vast amount of information at the Wellstead Telecentre. Next stop is the printer, and finally the book launch!

Did you know ...

... that the deadliest animal in Australia (using human fatalities as an indicator) is the horse? An average of 21 people a year die in riding-related accidents. Using the same criterion, the deadliest venomous animal is the honeybee, which causes up to 10 deaths a year.

FUNGI

Perth Urban Bushland Fungi Project

Roz Hart and Neale Bougher

THE Perth Urban Bushland Fungi Project is underway and all those interested in fungi are invited to participate. The project will run for 18 months which will cover 2 fungi seasons. It has been generously funded by Lotterywest to enable the project to employ Dr Neale Bougher as Mycologist, Roz Hart as Community Education Officer and Jac Keelan Wake as Project Support Officer. The aims of the project are to raise awareness of the importance of fungi to bushland health and to increase the level of scientific knowledge of fungi in this state by collecting and preparing specimens for lodging in the Western Australian Herbarium.

During the 2004 fungi season, we are concentrating on the coastal plain area of the Perth metropolitan region. We are working closely with Bush Forever and the Perth Biodiversity Project to gather relevant and useful data on fungi which will satisfy the requirements of all three projects. The initial area is being restricted in the interests of working with a manageable quantity of information. We will be conducting many types of fungi events to cover the various needs of community groups and the project, and aim to survey and collect fungi from a wide range of vegetation and soil types. The season is centered around June and July, depending on the weather and the rainfall.

Initially there will be a 'Train the Trainers' workshop, for training volunteers to assist us by leading small groups in the field for our four teaching workshops and the numerous fungal forays. Most of these people are already involved in the Fungi Study Group of the Western Australian Naturalists' Club. This event will be by invitation but if you are interested in training as a fungal foray leader please contact Roz Hart.

The four teaching workshops are going to be held on a Saturday or Sunday in June and July and will run all day. We are conducting these workshops to educate as many interested people as we can reach. We will teach how to choose what is collected versus what is recorded, information that needs to be captured in the field; important details to be aware of when taking photos, so that they will assist in identification; and, how to assist us in our quest to work out what fungi we have in Perth's urban bushlands and what role they play in the health of this bush. We are setting out to build inventories of fungi for Perth bushlands, in many cases for the first time. Each workshop will cater for a maximum of 40 people so it is essential that you book your place. Workshops will be conducted at Star Swamp bush, Forrestdale Lake bush, Talbot Rd bush and Baldivis Reserve. Contact Roz for details.

In addition to workshops, we will also be conducting a number of forays, both biodiversity surveys in selected bushlands and short walks. During the surveys we will undertake a detailed fungi study of that site for that day. We will be photographing and comprehensively describing the fungi that we find. People who are keen to spot fungi and assist us with this are invited to come along. We all have a lot to learn and can enjoy the learning and working together.

Omphalotus nidiformis to record its habitat and beauty

A good collection of Cortinarius species photographed in a manner to keep as a quality image record for reference

We intend to prepare fungi specimens for permanent lodgement at the WA Herbarium, as a basis for key scientific studies from these events.

Short walks will take the form of an hour or two walk in an area of urban bush to point out the existence of a diverse range of fungi and how to find them, and to raise awareness about the importance of fungi to the environment. These events will cater for everyone from beginners to enthusiasts. At the same time, while visiting these sites, we intend to collect some specimens to lodge in

FUNGIBANK

WESTERN WILDLIFE readers who are interested in revegetation and fungi will also be interested in a new fungi website, Fungibank at www.fungibank.csiro.au

Fungibank has been developed to improve the availability of information about Australia's resource bank of native fungi. It provides information on the benefits of incorporating native fungi into revegetation and advice on sourcing and propagating native fungi. It also contains superb photographs - both of the pics in this article, taken by Neale Bougher, come (with permission) from this website.

the WA Herbarium and register the bush site as a collection area.

The purpose of having different types of forays is, firstly, to extend the range of our collecting and to hold many events that Community groups can attend and, secondly, for accurate scientific determination of what species are present in Perth's urban bushland. We need to collect in as many areas as is physically feasible and all helpers are a real bonus. In addition we are conducting a scientific survey in Bold Park and a UWA Extension Course, to increase knowledge and awareness of fungi and their importance to urban bushlands. We also invite volunteers to help on weekdays in the Fungi Lab at the WA Herbarium, to record detailed information about the fungi and assist us in the huge task of drying and preparing the specimens for permanent vouchering. A single day, half a day a week, a regular commitment or whatever you choose, we would appreciate your assistance and we have many opportunities for you to learn more about this fascinating kingdom of organisms.

Keen photographers are especially invited to participate.

FUNGI

There will be endless opportunities for you, as photographs are the best record of fresh specimens. Digital cameras have opened up a whole new realm while film cameras still have a role to play. It seems to us that here is a great chance to display all our work and artistry with a PUBF Photography Competition once the season finishes. We would really appreciate ideas and assistance with this concept.

Although a number of events will have already taken place by the time you receive this newsletter, you would be very welcome at any of the July events listed below. Looking forward to foraying with you! The most up-to-date information about the forays will be posted on the WA Naturalists' Club website at www.wanats.iinet.net.au.

Contact Roz Hart, the PUBF Community Education Officer on 9334 0500 weekdays.

EVENTS

Workshops:

3 Sunday, 11th July
Talbot Rd Bushland

4 Sunday, 25th July
Baldivis Reserve

Biological Surveys

2 Sunday, 18th July
Bold Park

Walks

5 Saturday, 10th July
Wanneroo, Bushlinks walk

6 Saturday, 10th July
Joondalup, Bushlinks walk

7 Saturday, 17th July
Yellagonga Regional Park

8 Saturday, 24th July
Dianella Bushland

9 Saturday, 31st July
Neerabup National Park

BUSH DETECTIVE

Who built this?

Photo: Heather Adamson

In the central, northern and eastern Wheatbelt you may spot this strange structure built up against the trunk of a shrub or small tree. A silk-lined burrow extends upwards against the trunk and is closed by a hinged lid. A fan of twigs is attached to the rim, and hang down to the ground.

Ideas? Well, the hinged lid is a giveaway, isn't it!

Ans: It's a trap-door spider, in this case the Tree-stem Trapdoor Spider, *Aganippe castellum*.

This is a relatively small spider, 12 mm long. The fan shape of the twigs leads prey up to the burrow entrance, which is built up off the ground to avoid flooding. Like most other trapdoor spiders, the females spend all of their remarkably long lives – 20 years or more – in the same burrow. Males leave their burrows after autumn rains to search for mates and this is when they are most likely to be seen. Not much is known about the survival of the young spiderlings, but it is unlikely they could disperse very far, certainly not across paddocks. The spiders can survive in quite small remnants, but they cannot survive clearing, so now they are listed as Threatened. However, there may be more out there than we realise, as they tend to live in fairly dense broombush and tamma thickets, and might not be noticed – Heather has spotted a few on *LFW* visits. If you have the right sort of bushland, have a look – you might just have this extraordinary and unusual animal. There could be other interesting trap door spiders too!

If you think you have found a Tree-stem Trapdoor Spider, please let your *LFW* Officer know.

FAUNA

RETURNING THE FORGOTTEN ANIMALS – BUGS

Melinda Moir

OFTEN invertebrates (insects, spiders, scorpions) are seen as pests whenever they cross our path. However, only very few species of invertebrates are pests. When revegetating or rehabilitating land, it is important for many invertebrates to return so that they may begin vital ecological processes such as pollination (butterflies, bees, beetles, flies), decomposition (termites, beetles), soil aeration (worms, ants), recycling through herbivory (caterpillars, bugs, beetles) etc. Furthermore, invertebrates provide essential food for larger animals, such as birds, reptiles and mammals. Without the invertebrates, these larger animals can not survive.

On an interesting *Land for Wildlife* Day at Coorow, the participants were able to spend an afternoon investigating the fauna of three different patches of land. The first patch was a bushland remnant, the second revegetated farmland and the third was a salt affected corridor. Armed with large beating sticks we set forth to dislodge any 'true' bugs from the plants. True bugs are of the order Hemiptera, or sucking bugs. Some look similar to beetles. However, unlike beetles, bugs have sucking tube-like mouthparts and relatively soft wings. They include herbivores such as aphids, cicadas, stinkbugs and leafhoppers, and predatory animals such as assassin bugs and bed bugs - fortunately we don't have the latter in Western Australia.

A quick survey of the three sites demonstrated the differences between their bug fauna. Only one species captured was an introduced pest; the Pea Aphid (*Acyrthosiphon pisum*) (Figure 1). This aphid was present in plague proportions on crops in the area and had travelled into the bushland remnant. All the other species captured were very interesting native species. Of the 12 native species, 9 were undescribed (species without a name) (Table 1). To determine this, the animal must be killed (a humane method is freezing) and then mounted on a pin with labels detailing collection information such as the locality, date and collector. The genitalia of male specimens must be dissected and compared with described species. Sometimes this is very difficult as described specimens may be housed in institutions either interstate or overseas. Many Hemiptera (as well as other invertebrates) in WA are new to science and without names. This is particularly disturbing as we don't know if many species are threatened or have already gone extinct. And as this survey at Coorow demonstrated, even animals we find in our own backyards can be undescribed!

Figure 1: Aphid Acyrthosiphon pisum in the wingless form (3-5mm in length)

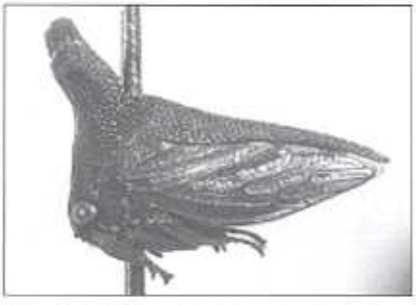


Figure 2: The horned treehopper Eufrenchia falcate *(9-11mm in length)*

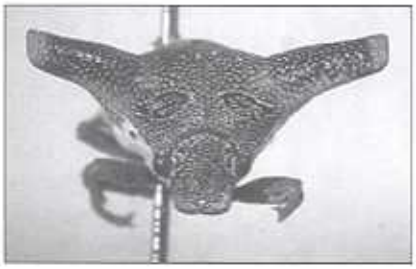


Figure 3: The stinkbug Deroploopsis bidentatus *(10mm in length)*

Figure 4: The plantlice Psyllidae sp.1 (5mm in length)

The most species (8) and the largest number of animals (25) were captured in the bushland remnant. This was expected as more structurally complex and diverse habitats, such as those with many plant species including trees, shrubs and groundcovers, are generally thought to contain more bugs. A surprising result occurred with the revegetated farmland, which only had 4 bug species. In contrast, the salt affected corridor had 5 species. This can be explained by examining the species – those of the salt affected corridor were usually not found elsewhere. This suggests that these bug species were host specific to the plants in the salt affected areas. The plant species were not found in the other areas, and therefore, neither were the bugs. Many bugs will follow particular plants. For example, the horned treehopper (*Eufrenchia falcate*) collected in the bushland remnant was feeding specifically on an *Acacia* species (Figure 2). This *Acacia* species was not found at the other sites, therefore, neither was the horned treehopper. In contrast, some bugs can feed from many different plants. Psyllidae sp. 1 may have been just such a species as it was the only bug present at all sites.

Another interesting bug was the horned stinkbug *Deroploopsis bidentatus*, the patterning on which resembled aboriginal artwork (Figure 3). There are 5 species of this genus and often the males and

FAUNA

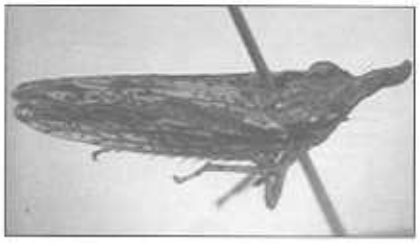


Figure 5: The female leafhopper Tartessoides griseus (8-10mm in length)

Figure 6: Macropsinae sp. 2 leafhopper (3-4mm in length)

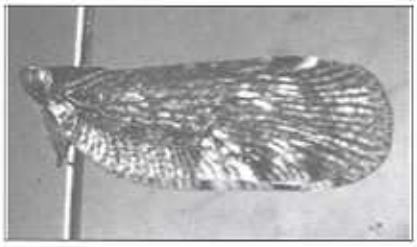


Figure 7: Ricanidae planthoppers looks very similar to moths (10mm in length)

Table 1: Hemipteran species collected in three sites at Coorow

Family	Species	Common name	Bushland Remnant	Revegetated farmland	Salt affected corridor
Psyllidae	sp. 1	Plant lice	15	6	1
Membracidae	*Eufrenchia falcata*	Horned treehopper	4		
Ricanidae	sp. 1	Plant hopper	1		
Cicadellidae	Macropsis sp. 1	Leafhopper	1		
Cicadellidae	Macropsis sp. 2	Leafhopper		2	
Cicadellidae	Macropsinae nymph	Leafhopper	1	7	
Cicadellidae	*Tartessoides griseus* nymph	Leafhopper			2
Lygaeidae	sp. 1	Seed bug	1		
Lygaeidae	sp. 2	Seed bug			1
Aphididae	*Acyrthosiphon pisum*	Pea Aphid	1		
Achilidae	sp. 1	Plant hopper		2	
Miridae	sp. 1	Plant bug			1
Pentatomidae	*Deroploopsis bidentatus*	Horned stink bug	1		
Pentatomidae	nymph	Stink bug			2
Pentatomidae	sp. 1	Stink bug	1		
Total			**26**	**17**	**7**

females have differently shaped horns from one another. However, they are relatively rare, so the record is an interesting one. The Achilidae (planthopper) was also interesting, as many of these are restricted to large forests of higher rainfall zones, such as the jarrah forest of the southwest. The juveniles of this bug family feed on fungus, therefore rotting wood and other likely habitats are required for these bugs to appear.

One afternoon of bug collecting at these three sites just scratched the surface of the biodiversity present. Undoubtedly, if we had sampled all the different plant species in each site, we would have collected many more bug species. In addition, using different methods of collecting such as pitfall traps (cups/containers in the ground) or vacuum sampling (inverting a weed-blower and sucking the invertebrates from plants) would have produced many more species. The types of bugs present will change depending on the time of year, therefore most invertebrate surveys that wish to determine the biodiversity at a site will collect in that area at least once a season.

So what can be done to increase the biodiversity of bugs and other invertebrates in a remnant? Providing many different habitats (including logs, large rocks, leaf litter, large trees and groundcovers) and as many different native plant species as possible will maximise the number of invertebrate species in revegetated land. And if increasing the number of weird and wonderful creepy crawlies isn't enough, the diversity of invertebrates will provide a flow-on effect, in that birds and other larger animals will follow into the remnant.

Melinda Moir is a PhD student Curtin University, Dept of Environmental Biology

FAUNA

BEES IN MY BAMBOO!

Margaret Moir

DURING high summer of this year I was fortunate to be able to observe a fascinating event in the garden, featuring native solitary bees, *Megachile* sp, and a delightful parasitic wasp, *Gasteruption* sp. These wasps lay their eggs in the nests of bees and other wasps, cuckoo fashion. They are known as cleptoparasites.

The little *Megachile* is related to the reasonably familiar and adaptable leaf cutter bees that leaves those sculptural semi-circles in rose and other leaves. She makes use of bamboo stakes and holes in fence posts and pergolas to build her nests which she constructs from masticated leaf fragments and resin from gum trees.

The nests are provided with pollen and nectar [bee-bread] to feed the developing young. On the farm, I have observed them favouring Marri and grevillea leaves for construction, and vertical bamboo stakes. Myrtaceous pollen is favoured, and nest building coincides with Marri flowering, and also *Melaleuca huegelii*. No co-incidence, I don't think. Bamboo stakes are in abundance on the farm, as we use them in groups of 3 or 4 with all the tree guards we provide for our seedlings. One reason for favouring the vertical stakes may become clear as this story unfolds.

The *Megachile* bee in this story is slightly smaller than a feral honeybee, about 15mm, with bright orange hair on the face and tip of the abdomen, and strongly marked in furry white and black. I initially noticed her working away at a grevillea, rasping away fragments of leaf, rather than cutting circles like the related leaf cutters. She flew repeatedly between a bamboo garden stake, the Marri trees for resin and pollen, and the grevillea for leaf matter, climbing right into the bamboo with her booty, but making sure the exit was plugged firmly with her abodomen.

A wise move it appears, as I saw other bees arrive at the nest and appear to be trying to lever her out. They would actually grasp her abdomen and pull with might and main! Without success, I might add.

Then as if that wasn't enough to contend with, a gasteruptid wasp arrived, observing her carefully from a neighbouring banksia. These wasps are amazing-looking creatures with an extremely long ovipositor that looks quite unwieldy. Everytime she would leave on another foray, the wasp would fly to the stake, back up, and try to insert her ovipositor into the nest. The ovipositor is inside a protective sheath when not being used, so the impression is of it splitting in two, with one being held away from the body for balance. All attempts by the wasp failed to get the angle correct, the vertical stake proved just too tricky. Interestingly, no bees used horizontal stakes, which I had provided as well, and maybe this is why, to foil the wasps. I saw the wasps successfully laying eggs in many bee nests elsewhere that were made into horizontal wood holes.

Eventually, after some 4 hours, the nest was finished, and after a few hours it dried glass-hard and waterproof. This nest building has been repeated numerous times all over the farm, but I will be watching that one special nest, so close to my back door, very closely next spring.

Margaret Moir can be contacted at Olive Hill Farm, Margaret River, email: olivehill@wn.com.au

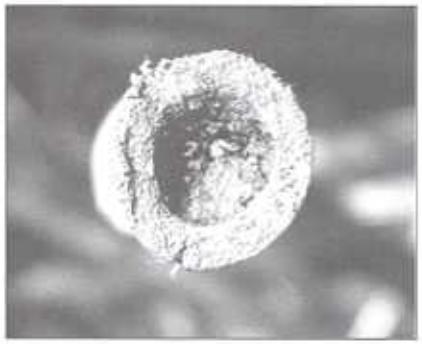
Would you like to learn more about native bees? Visit the Australian Native Bee email study group: http://groups.yahoo.com/group/ANBees/

Megachile bee starting her nest

The wasp is unable to get her ovipositor in

A second bee tries to dislodge the first

A parasitic wasp eyes the action



The finished nest

FAUNA

SPIDERS AND WOODLANDS GO TOGETHER

Rosemany Jasper

THE fauna of healthy Salmon Gum woodlands is dominated (in terms of number of species) by small reptiles and the invertebrates. And once you focus in at this level of the woodland, there is an amazing array of shapes and sizes of ants, termites, spiders, moths, beetles, snails, geckos and skinks, etc.

Look at this photo taken in a good quality patch of bush on private property near Ravensthorpe. It shows an impressive spider burrow, which Barbara York Main identified as probably built by the black wish-bone trapdoor spider *Aname mainae* (Family Nemesiidae).

The 'wish-bone' refers to the fact that these spiders build two entrance tubes, the obvious silk-swathed entrance (as in the photo) and a nearby entrance (near the edge of the silk sheet) which has a collapsed opening and is not visible. This is the emergency escape route. The two tubes join up underground into a single burrow.

Aname mainae is found across southern Australia from near the Flinders Ranges to the west coast of WA. They are generally shiny black though the abdomen may be grey. The males have a single large spur on the first walking legs. Males mature and wander during early to mid-summer. The females remain in their burrows unless dug out or otherwise disturbed.

Burrows like this or the ubiquitous ant holes are indicators that a piece of woodland is in good condition. Grazing by stock will destroy these structures and will compact the soil. Once this occurs, and if the understorey is also eaten out, to restore the woodland to good condition will usually require some active management apart from simply fencing out the stock. It is easier to look after what is in good condition than to resurrect a patch.

These issues and more were covered during a very enjoyable field day held near Ravensthorpe in March. The participants visited two privately owned patches of Salmon Gum woodland and were able to compare the features of each as well as consider actions that could be taken to restore the one that had been grazed in the recent past.

One of the remnants was very interesting because there had been a fire through a section of it 20 years ago which has resulted in a healthy regeneration of understorey species and Salmon Gum. Salmon Gum woodland does not carry fire very readily but fire along with other disturbances (like a wind storm, a flood, or a drought) which cause the deaths of mature trees, are recognised triggers for regeneration. Another example of regeneration, which has apparently occurred after a wind storm cut a swathe through the bush, can be seen on the Lake King Heritage Trail, near the Lake King townsite.

Wishbone Trapdoor Spider burrow

Some participants during the field day

If you have Salmon Gum or other woodlands on your property, it is well worth searching for these smaller creatures, to get a true idea of the biodiversity present. Julianne Waldock of the WA Museum (ph. 9427 2734) may be able to help with the identification if you have clear photos.

Congratulations!

To Clive Malcolm of Denmark, who has been awarded the 'Great Southern Natural Resource Management Medal' for 2004. Clive was a pioneer of saltland agronomy and continues (even in 'retirement'!) to work towards the productive use and rehabilitation of secondary saline land, as well as encouraging many other initiatives in natural resource management. Individuals can make a difference!

FLORA

Assessing Changes in Plant Communities

Bill McArthur

PLANT communities are changing continuously, usually in response to competition between individuals or species, grazing, or the relative longevity of species. There is a need to monitor these changes, and the rates of change, and, whether for commercial, scientific, or aesthetic considerations, the information gained is often applied in management decisions. The method employed is to describe a representative sample of a community on two or more occasions and note the differences over time.

The species present and their abundance, the structure of the community and some measure of size of trees and shrubs, is noted and, on each successive assessment, it is assumed that the same criteria will be applied.

The most rigorous method used is in commercial forestry where an estimate of rate of timber production is required. Individual trees in representative plots are marked and numbered and, at each assessment, the diameters at breast height (DBH) and height are measured and a precise measure of volume of timber is known.

In natural communities, which often consist of many species and several strata from trees to ground cover, the methods used generally involve two stages. Firstly the different communities are identified and possibly mapped at the Association level and then, within each unit, quadrats may be established. The species making up each stratum are identified and the extent of the foliage cover is estimated.

These methods range from relatively simple schemes designed for local community groups with little or no botanical knowledge to those more sophisticated quantitative methods where the data produced are especially designed for computer analysis. In either case trends in growth characteristics can be described. However, there is a degree of subjectivity in most of these methods and so a simple procedure has been devised where direct comparison may be made between sequential measurements regardless of whether the same or different observers are involved.

△ A quadrat laid out

◁ Bill McArthur

The Scheme

On the basis of plant community mapping, quadrats are established on representative sites. The quadrats are 20 x 20 m, aligned north-south, with corners marked by steel pegs. The north-west corner peg is located by GPS. The quadrat is sub-divided into 5 x 5 m squares, using string or rope, and the squares numbered 1- 16 and shown on a plan at a scale of 1:100 (1cm = 1m).

Within each square each tree (>2m high) is numbered and its position plotted on the plan. The height, DBH, and canopy cover of each tree is recorded. The canopy cover is given as the product of the estimated greatest and least dimension. Standing dead trees are included and any fallen trees or logs are plotted. The shrubs in each square are treated in different strata.

Within each stratum the number of individuals of each species present is recorded and the percentage cover for each species estimated. Groundcover in each square, including leaf litter, is recorded with the main species identified, a total percentage cover for all species including leaf litter is estimated. Bare soil is not recorded but can be determined from the data. Other surface features such as termite mounds, ant colonies and trails may be plotted on the plan.

In heath communities, where plants are of uniform height, individuals are identified and shown on the plan by the extent of foliage cover. When several strata are involved, the system already described for tree communities is used.

These data can be gathered quickly and even in the most dense communities, such as mallet forest with about 7500 stems per hectare, a quadrat can be completed in about three hours.

As an example, this method was applied to a pristine jam woodland on a *Land for Wildlife* property in the Narrogin Shire.

Results showed:

- Jam trees (*Acacia acuminata*) were growing at a density of 1350 stems per hectare. Their canopy covered 38% of the site and 68.5% of them were standing dead.
- Shrubs covered less than 2% of the site.
- The native grass, Foxtail Mulga (*Neurachne alopecuroidea*), covered 45% of the site, Pincushions (*Borya sphaerocephala*) 35% and Orange Immortelle (*Waitzia acuminata*) 5%.

Vouchers of the specimens collected and survey data is being stored at the Narrogin Regional Herbarium.

ECONOMIC VALUE OF BIODIVERSITY

NATURE CONSERVATION COVENANTS – FURTHER TAX CONCESSIONS

Anthea Jones

IN a media statement released last month, Dr Judy Edwards, State Environment Minister, said that legislation had been introduced into Parliament to remove the land tax liability for those areas of private land that were protected and managed for nature conservation under eligible conservation covenant programs. This State land tax concession is in addition to the Federal income and capital gains tax concessions that were discussed in the January 2004 edition of *Western Wildlife*. As per the Federal tax concessions, owners of land under conservation covenant with Department of Conservation and Land Management's Nature Conservation Covenant Program or the National Trust of Australia's (WA) Covenant Program will be eligible for the land tax exemption. The lifting of this disincentive was the result of a long campaign by conservation groups, and the implementation of election commitments made by the current Government prior to the last election. It is hoped that the legislation for the land tax exemption will be passed by 30th June, to enable any land tax liability to be removed for this year. For information on the application of these tax concessions please consult your taxation agent or, in the case of the income or capital gains tax concessions, the Australian Tax Office.

Nature Conservation Covenants provide a mechanism for ensuring the long-term protection of the biological diversity of your bushland. They are voluntary, legally binding agreements between the landowner and covenanting organization. The conditions of the covenant are negotiated between the landowner and the Department with the objective of allowing the landowner to be able to enjoy their land, while ensuring the land management will not cause any degradation of its conservation values. Where a landowner is already managing their bushland in an appropriate manner, the landowner's management will probably not be altered by the covenant. The landowner continues to manage their own land and then, when the land changes ownership, they can be reassured that the land will continue to be managed to conserve its biological diversity, as they intended. Other benefits of a Nature Conservation Covenant with CALM include the provision of management advice and the opportunity for financial assistance with management costs (subject to availability). Voluntary Nature Conservation Covenants with the Department are free of charge.

If you would like to know more about conservation covenants, you can contact the Acting Nature Conservation Covenant Program Coordinator, Anthea Jones on (08) 9334 0477 or the National Trust Covenanting Coordinator, on (08) 9321 6088.

IN BRIEF

SMALL IS BOUNTIFUL!

Rosalie and Robert Glynn own a 0.2 ha block on the eastern banks of the King River approximately 12 kilometres north east of Albany townsite. Ever since they purchased the bush block in 1996, they have zealouly guarded the remnant bush. When the builders constructed her house Rosalie excluded them from intruding into the bush area and laid down strict rules about waste disposal on site. On one occasion she collected some of the builders' rubbish which had blown into the bush area and hung it in large, obvious rubbish bags on the boundary rope between the bush and the house site, making sure that the 'no rubbish' message was clearly understood!

Rosalie is a natural 'green thumb' and has quickly revegetated any of the degraded areas on the block. She became intrigued with the vast array of plant species that kept flowering in her garden so began to collect plant specimens in a small home herbarium. Late last year she took her pressed specimens into the Albany herbarium for identification. They recorded over 94 species and one turned out to be a Declared Rare Flora, *Laxmania jamesii*. There are still many small grasses and annual herbs in the garden which haven't been identified, then there are the fungi, the lichens and, of course, the growing number of animals using the garden too.....

Rosalie's garden is smaller than the minimal 2 hectares for full membership with *Land for Wildlife*. However, we have special smaller *Land for Wildlife* signs for these smaller properties where the owners are still managing their bushland to preserve its diversity. These landholders also receive 'Western Wildlife' and are welcome to make contributions with their nature observations.

Sylvia Leighton

WEED ALERT

WATCH OUT FOR DOLICHOS PEA!

DOLICHOS PEA (*Dipogon lignosus*) is a rampant twining perennial which, if it gets out of control, can become seriously weedy in bushland, smothering other plants and dominating an area.

The plant, which is originally from South Africa, has a strong tap root from which arise twining stems bearing leaves with three triangular leaflets. In spring it is very colourful, producing numerous sprays of pink, white or purple flowers. It sets abundant seed which germinates easily. Many seed-eating birds are attracted to the seed, and it is possible that they may be spreading it in their droppings.

Removal is difficult because cut roots resprout and there will be a huge seed bank dormant in the soil. 'Southern Weeds' suggests using herbicides to reduce the infestation to levels that can be controlled by manual removal, though care has to be taken to avoid non-target plants.

Dolichos Pea has, so far, mostly been a problem in coastal areas or disturbed river banks near settlements, but Jennifer Young sent us this photo, taken in the Porungorup National Park, showing just what the plant can do if it gets established, and suggesting that *LFWers* might like to consider removing it from their gardens. There are several natives that could replace it– see "Southern Plants for Southern Gardens" in the 'New Books' section.

(For colour photos see 'Western Weeds' p 150 or 'Southern Weeds' p 130, herbicide detail on p131.)

FALSE YELLOWHEAD (STICKY STINKWORT), *Dittrichia viscosa*

THIS is another plant that is starting to get away along the South Coast. It was first noticed around the port of Albany in the 1970s, presumably having arrived by ship. From there it has spread out along road and rail lines east to Walpole, west to Jerramungup and north to Mt Barker, where it is common.

False Yellowhead is closely related to Stinkwort (*D. graveolens*) and, like it, the leaves and stems exude a sticky, smelly oil that can cause contact dermatitis. It has the potential to be as widespread and troublesome a weed as Stinkwort, though it is a larger, and much prettier, plant. It originates in southern Europe.

It has been placed on the Federal Government's 'Alert List for Environmental Weeds'; a list of 28 species that currently have limited distributions but potentially could cause significant damage. It is targeted for eradication. The CRC for Weed Management has produced a comprehensive leaflet about the plant, to obtain a copy, contact webpage: http://www.weeds.crc.org.au/publicationsfact_sheets.html

If you think you have seen this plant, contact John Moore, Dept of Agriculture, Albany.

(For colour photos see 'Western Weeds' p 97 or 'Southern Weeds' p 144, herbicide detail on p145.)

From a young *Land for Wildlifer*:

Q: What lies on its back one hundred feet in the air?

A: A dead centipede.

NEWS

BOYANUP BOTANICAL NURSERY WORKSHOP

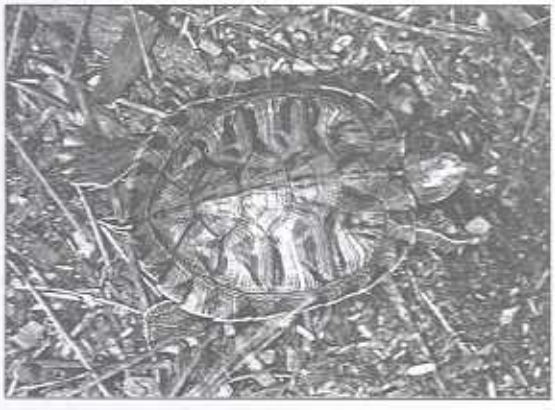
IN January a workshop, attended by about 30-40 people, was held at the Boyanup Botanical Nursery, this was prompted by a great number of the nursery regulars requesting information on how to bring wildlife back to their properties.

Talks were given on how to collect and store native plant seed (including the regulations involved), on how to propagate native plants by seed and cuttings and finally, how you can use them in garden and revegetation projects. An informal cuppa time with more questions and networking followed and many people wandered around the nursery to look at the large range of plants available.

Cherie Kemp

FERAL ALERT

RED-EARED SLIDERS NEAR BRISBANE



AUTHORITIES have been alarmed to discover that an American turtle, the Red-eared Slider, has been discovered in farm dams north of Brisbane. This aggressive killer has the attitude of a mutant ninja turtle and could play havoc with native species if it gets into our waterways. They have the potential to spread into over 80% of Australian waterways, including estuaries and other brackish habitats.

They have strong jaws and a nasty bite and will eat anything including frogs, lizards, snakes and other turtles. Apparantly, if a fish swallows a young Slider, it will bite at the fish's insides until the fish regurgitates the dangerous meal! Queensland's Environmental Protection Authority is attempting to eradicate them, including such extreme measures as filling in and compacting the farm dams concerned.

Red-eared Sliders are classified as one of the world's 100 worst feral invaders and are banned in Australia. It is thought that the colony was started when a collector released illegally traded turtles into the wild.

Congratulations

To 'Riverside Sanctuary', national winners of the Banksia Environmental Foundation category 4: 'Environmental Leadership in the Rural Sector'. Very well done folks!

For more info on the Banksia Awards, visit: http://www.banksiafdn.com/index.php?page=188

SGIO Western Australian Environment Awards 2004

Enter your project in WA's premier environmental awards! 14 different categories!

For further infromation, contact Joey King at the Department of Environment on phone: 9278 0679 or email: awards@environment.wa.gov.au

Did you know...

Quandongs are Cool!

That the leaves of Quandong: *Santalum acuminatum*, will sometimes feel cooler to the touch than those of nearby shrubs? This is because the Quandong will, at certain times, transpire at a higher rate than other shrubs and the additional water vapour evaporating from their leaves makes them feel cooler. This is the case for most 'root hemiparasites' like the Quandong and Sandalwood. In contrast, most Mistletoe always transpire at faster rates than their host and always have cooler leaves.

Next time you see a Quandong or Sandalwood in the bush (or if you can reach Mistletoe) feel the leaves and see if they are cooler than a nearby shrub or tree. Perhaps this possibility of a lower temperature encourages kangaroos to choose Quandong and Sandalwood as daytime rest places?

(Thanks to Rosemary Jasper and Grant Woodall for this fascinating snippett.)

COMING EVENTS

Drummond Symposium

Memorial Hall, Toodyay

27-28th August 2004

To celebrate the work of James Drummond, first Government Botanist in Western Australia. A seminar and a field trip.

For further information contact Carole Elliott, WA Herbarium on 9334 0496, or a member of the Toodyay Naturalists' Club. Fees apply.

Victoria Plains Wildflower Walk

Sunday 12th September 2004

Start 9.30 am with billy tea; botanical walks in the morning; 12 noon BBQ lunch with damper; revegetation/landcare walks in the afternoon.

Cost $ 15

This event is held annually as an opportunity for people from Perth and other areas to experience the lovely profusion of wildflowers that occur in our Wandoo woodlands. As in previous years the walk will be through the Rica Erickson Reserve, located on the corner of the Calingiri West and Old Plains Roads in the Shire of Victoria Plains.

Because we want to provide a rural experience, the morning tea and lunch will be hosted in a farm shed. The farm is opposite the Rica Erickson Reserve and is a safer place for parking etc. There will be school buses to transport visitors to the walk sites. A variety of length of walks will be conducted by botanists and naturalists to cater for all ages and interests.

There will be a selection of stalls selling local produce and crafts set up in the shed. As well, there will be a wood turning demonstration, an old photograph exhibition and machinery quiz and a local band will play during the morning.

After lunch Sarah Mason will be guiding a walk through some revegetation/landcare areas on her farm, for anyone interested. She has been a member of *Land for Wildlife* since 2002 and is involved in the Carnaby Recovery Project with 4 artificial hollows on her land, and also is planting Carnaby food species.

For an alternative route home, there is the Landcare Drive (see WW 7/4) which is a self guided tour of some of the work farmers are doing to look after our natural environment.

For more information please call Sarah Mason 9336 1600

APACE "Introduction to Bush Regeneration" courses

These courses are a mixture of both theory and practice. They focus on bushland areas in the Perth Metropolitan area, and lectures and practicals cover a wide variety of topics needed for managing small areas of bushland. Fees are charged.

This year the courses will be in August and September.

For more information contact APACE on 9336 1262 during business hours

NEW BOOKS

Common Seasonal Pests

Bulletin No. 4587, Department of Agriculture.

Free - order through: info@agric.wa.gov.au

This little booklet is a guide to the spread of animal and plant pests, diseases and weeds. It covers the identification and treatment of a number of organisms that are a problem for gardeners and horticulturalists as well as having useful sections on sending specimens for identification and beneficial fauna. Though most relevant to the metropolitan area, it contains items of interest to all gardeners in the southwest.

Southern Plants for Your Garden

Dorothy Redreau

Green Skills, Denmark, Feb 2004

Book: $9.90 + p&h; CD: $9.90 + p&h; both: $15 + p&h. Order from Green Skills, ph: 9848 1019, fax: 9848 2061.

This lovely new book, full of interesting information and beautiful photographs, will give delight to all wildflower lovers, but is a must for anyone with a garden in the higher-rainfall south-west. It is a practical guide that is aimed at helping people to plant local plants in parks, gardens and landscaping. Plants that are native to any area attract local birds and animals, repair the environment and minimise water and fertiliser use.

There are descriptions, propagation advice and maintenance tips for 68 local plants, along with information about many of the plants' environmental benefits. The introductory chapter gives lots of tips about growing and garden design. Brief details of many other plants are also included - even which nurseries sell them. Whether you are designing a cottage garden, a gravel garden, a bog garden, or just an attractive surround for your house, you will find inspiration and encouragement within this book. *Penny Hussey*

Cape to Cape Landcare Companion

Cape to Cape Catchments Group 2004, Margaret River

Free to landholders in the Cape to Cape Catchment

A magnificent compendium of information, advice and good ideas. It has concise, up-to-date technical information on landcare issues, environmental values and environmental best practice, exemplified by case studies. Weeds are especially well treated.

All landholders in the catchment should have received a letter of notification about this book. Take it to your Shire office to pick up your free copy. If you are not in the Cape to Cape Sub-region of the South West Catchments Council NRM area, then pester the powers that be in your NRM region to get something similar written for you!

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.
Published by the Department of Conservation and Land Management, Perth. All correspondence should be addressed to:
The Editor 'Western Wildlife', Department of Conservation and Land Management, Wildlife Branch,
Locked Bag 104, Bentley Delivery Centre, WA 6983.
Design and Desktop publishing by Louise C. Burch Graphic Designer.