Department of Environment and Conservation

Western Wildlife

REGISTERED BY AUSTRALIA POST
PRINT POST: 606811/00007

NEWSLETTER OF THE LAND FOR WILDLIFE SCHEME

April 2013 | Vol. 17, Number 2

HABITAT FOR THE RED-TAILED PHASCOGALE

Jeff Short

The Red-tailed Phascogale (*Phascogale calura*) is a small squirrel-like marsupial that occurs in remnant woodlands in the southern wheatbelt of Western Australia. It is two to three times the size of a house mouse, with a long bushy tail, brick red at its base. It is a quick-moving insectivore that is equally at home on the ground or in the canopy of mid-storey trees. It nests in tree hollows and can shelter in hollows, under bark, in the skirts of grass trees, in the hollows of fallen timber, and amongst collections of sheoak needles in the forks of trees.

A Red-tailed Phascogale in Rock Sheoak. Photo: Sid Smithies

While once widespread across inland Australia, it now persists only in the southern half of the WA wheatbelt. Its persistence here is somewhat surprising, as much of the original vegetation has been removed to allow farming, cereal cropping and the grazing of sheep, to dominate this landscape. It has long-since disappeared from inland eastern Australia, central Australia, and the deserts of WA. This large-scale historical decline has earned it 'Endangered' status at the national level and 'Likely to become extinct' status at the WA state level.

Farmers and townsfolk in the southern wheatbelt often become aware of this species when a specimen is brought home by their pet cat. However, it will also seek out shelter in farmhouses and outbuildings and is occasionally disturbed in or around buildings or drowned in a pool. While in the past such sightings may have been dismissed as 'just a rat', its profile has increased greatly in recent years and there is increasing recognition of its presence. Some farming communities, such as Wagin/Woodanilling, maintain a register of community sightings to assist conservation actions. Such is its growing recognition in the wheatbelt, both the Wagin Woodanilling Landcare Zone and the Hyden Progress Association have adopted this animal for their logo.

While superficially resembling a squirrel or a large mouse with a long brushy tail, this species is a member of the marsupial Dasyurid family, along with marsupial mice, quolls and Tassie devils. An unusual characteristic, which it shares with some other small dasyurids, is the annual male die-off. Males live for less than a year (11½ months), competing furiously with each other for mates over winter, and then dies, leaving just females in the population. The female gives birth to as many as 13 young in August, with usually eight surviving to attach to her teats. She carries these around for several weeks before depositing them securely in a nest – still naked and vulnerable – to allow her to go out and forage. She will return to the nest several times a night to feed them and to warm them with her body heat. The young gradually develop fur and the ability to maintain their own body temperature, but as the litter grows the demands on the mother for food increases. Towards the end of lactation in November, the combined weight of the young may be up to three times that of the mother.

continued on page 4

Editorial

Greetings everyone!

This issue of *Western Wildlife* contains a wide range of articles covering such diverse topics as our State coat of arms and monitoring fire, and includes some fascinating contributions from members.

In the last issue we read about Brush-tailed Phascogales; in this one, ecological consultant Jeff Short details the natural history and habitat requirements of its smaller cousin, the Red-tailed Phascogale. This delightful little animal is hanging on in the south-western Wheatbelt, and has inspired a lot of interest in biodiversity among the communities where they can still be found.

Another topic that will be of great interest is Paul Barber's discussion of the causes – and possible treatments – of tree decline. Many people with valued trees showing signs of decline might be interested to try the nutrient plugs illustrated; contact the author for more details that can be downloaded as PDF documents.

Allan Wills' review of a new book on galls might persuade many people to learn more about these peculiar growths on plants that are caused by parasitic organisms.

Contacts

After each issue, some *Western Wildlifes* are returned because they are sent to inappropriate addresses. If you change your address, phone number or email, please let *LFW* know. The cover sheet included with the magazine has space for you to do that.

In addition, if you sell the property, please return the *LFW* sign, unless the new owners specifically say they wish to remain registered, and contact *LFW* to say so, in which case a visit to the new owners by the *LFW* Officer would be arranged. There have, alas, been occasions when a *LFW* sign has been left on a gate, behind which illegal vegetation clearing has occurred. This does not send a good message to the community.

Penny Hussey

INDEX

Questionnaire

To those of you that filled in and returned the questionnaire included in the last issue, thank you so much! We received over 300 responses, a large enough sample to be able to get a good idea of your thoughts about how the programme is going for you. The majority of respondents were positive and complimentary, and there were some interesting ideas for improvements, which the *LFW* team will consider at our annual workshop.

I had hoped to have the responses analysed and the results reported to you in this issue of *Western Wildlife*, but they are not ready yet. However, we have done a 'draw' of five names from the responses that were submitted by 28 February and these people will receive a book prize from DEC's WA Naturally publications. The winners are: Rob Barnett, Margaret River; David Dureau, Broome; Ken Loveland, Jurien Bay; Lyn Mathwin, Kojonup and Andrew Williams, Karragullen. Of course, some respondents did not put their name on the form, so could not be included in this process.

Contact details for *Land for Wildlife* Officers

Name	Location	Phone	Email
Heather Adamson	Mandurah	(08) 9303 7738	heather.adamson@dec.wa.gov.au
Avril Baxter	Narrogin	(08) 9881 9240	avril.baxter@dec.wa.gov.au
Fiona Falconer	Coorow	(08) 9952 1074	fiona.falconer@dec.wa.gov.au
Wayne Gill	Esperance	(08) 9083 2118	wayne.gill@dec.wa.gov.au
Claire Hall	Perth	(08) 9334 0427	claire.hall@dec.wa.gov.au
Mal Harper	Merredin	(08) 9041 6004	mal.harper@dec.wa.gov.au
Sheila Howat	Bridgetown	(08) 9761 2405	sheila.howat@dec.wa.gov.au
Penny Hussey	Perth	(08) 9334 0530	penny.hussey@dec.wa.gov.au
Cherie Kemp	Busselton	(08) 9752 5533	cherie.kemp@dec.wa.gov.au
Zara Kivell	Mundaring	(08) 9290 6112	zara.kivell@dec.wa.gov.au
Sylvia Leighton	Albany	(08) 9842 4522	sylvia.leighton@dec.wa.gov.au
Dorothy Redreau	Albany	(08) 9842 4522	dorothy.redreau@dec.wa.gov.au
Phil Worts	Kojonup	(08) 9834 2242	philip.worts@dec.wa.gov.au

www.dec.wa.gov.au/landforwildlife

HOW MUCH CAN YOU EAT?

Avril Baxter

Rabbits are on the increase in the Wheatbelt in recent years and providing a food source for feral and native animals.

When Ned was working in his shed, he heard squeaking outside and witnessed our resident Rosenberg's Monitor flush out and kill three baby rabbits in rapid succession. Was it a killing frenzy or was he going to eat the lot?

The monitor was pretty skinny and obviously hungry and proceeded to squash and gradually swallow the first rabbit. Monitors can move their upper jaw independently of the rest of their skull which helps them gradually swallow their prey. Mobile hyoid apparatus (a group of bones just below the tongue) helps move the prey into their throat and twisting their neck side to side helps push it down even further.

They can also ram the food down their throat, this monitor used bolts on a verandah post stirrup and a low log to help force the rabbit down.

Having swallowed the baby rabbit whole he then rested up against a tree trunk and used gravity to help the rabbit slip down into his stomach.

He looked really full and we thought he would be having a bit of a nap after that, but no, after a rest he proceeded to down the second and then the third rabbit!

By this stage the monitor had a really distended stomach and waddled off tail held right out as a counterbalance to the weight in his stomach.

Maybe now it was time for a long nap?

We asked Dr Peter Mawson, the Director of Animal Health and Research at Perth Zoo, how long such a meal would last. Peter said that the monitor would be unlikely to eat for another few weeks and that the rate of digestion is influenced by temperature; the warmer the weather the faster the food is digested.

Ref: Dennis King and Brian Green *Family Varanidae* in *Fauna of Australia.* Available online.

1 *The skinny monitor begins his meal*

2 *Pushing the rabbit against a log*

3 *Nearly there!*

4 *A rest in between courses*

Photos: Ned Crossley

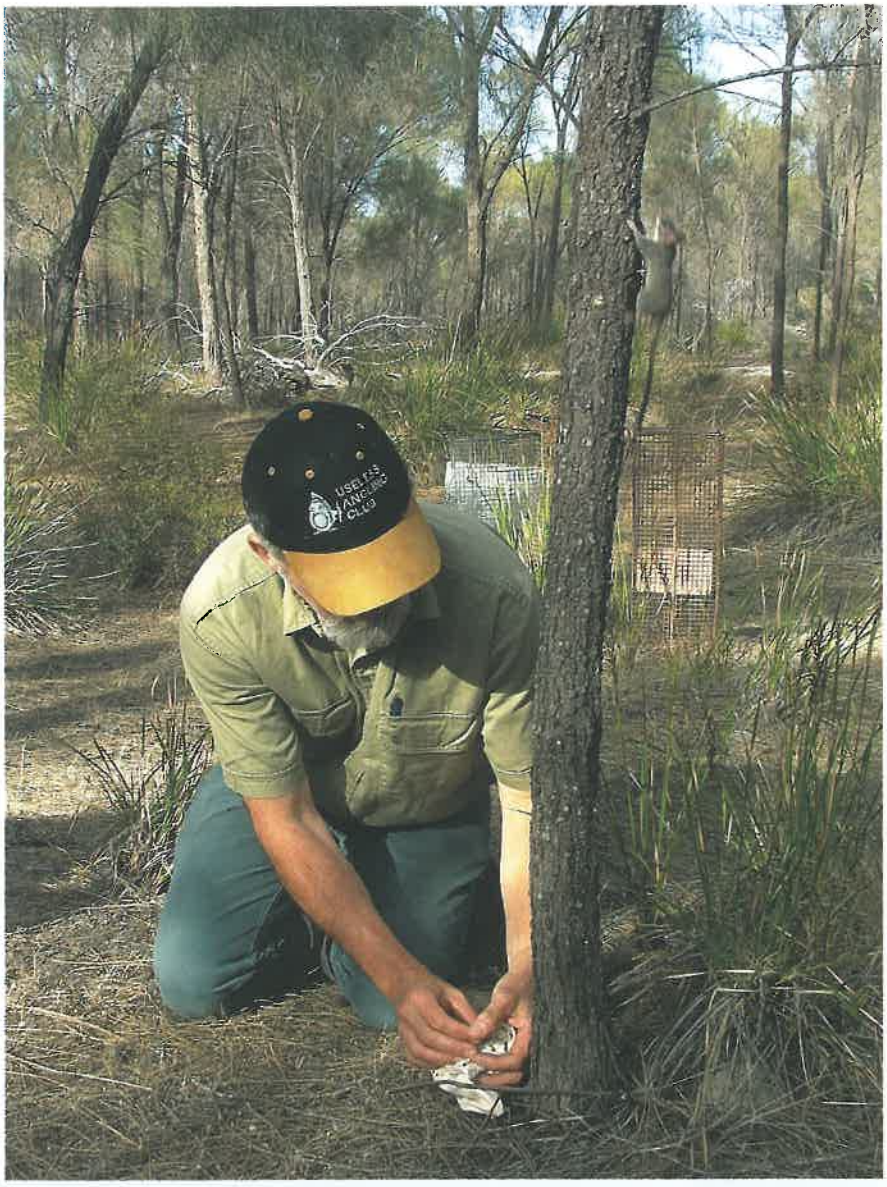
continued from page 1

Red-tailed Phascogales

A likely explanation for the seasonal death of all males is this high demand for food by the female to feed her growing litter. Males would compete for a limited food supply and reduce the chances of the female successfully raising her litter. Hence they have become a transient, albeit recurring, part of the life cycle of the species.

These aspects of the life history of the Red-tailed Phascogale impact on where the phascogale persists and what its requirements for habitat might be.

Chief among its requirements are eucalypts with plenty of hollows. The phascogale is largely a woodland species and this is because of its demanding requirements for hollows for nesting. Its requirements appear very specific. The female needs a large capacity hollow (relative to its body size) to allow her to build a big ball of nesting material of wool, grass, and feathers. This is critically important to allow the young, naked litter to maintain body temperature while the female leaves them each night to go hunting. The female and her litter are resident in the hollow for up to four months so it must also be secure against competitors such as galahs and parrots and predators such as pythons. This means a small entrance which limits the ability of other species to enter. Hollows with such characteristics (a large volume but small entrance) are probably difficult to locate and may be a key limiter to whether the species is present in the local area. Woodland has been preferentially cleared in the past for farming, and even now, old mature paddock trees or road verge trees are frequently removed. Replacing such old trees with new trees, while maintaining the connectivity of the landscape, will not assist nesting for over 100 years. The Red-tailed Phascogale's sister species – the larger Brush-tailed Phascogale – has been observed moving up to 225 m across an open paddock in Victoria to utilise an old hollow-rich paddock tree. Red-tailed Phascogales are similarly mobile and may be expected to seek out suitable trees if in short supply, even if this means crossing open space.



The author releasing a phascogale during a survey at Wagin in 2006. This photo has already been published in WW 10/2, April 2006, as part of a story about a phascogale survey in Wagin. But it looks better in colour! *Photo: Sid Smithies*

The wandoo/rock sheoak belt in the western Wheatbelt (from Brookton to Woodanilling) has been the key region where phascogales have persisted. The often-dense canopy of rock sheoak provides an ideal foraging zone for them and the dense cluttered canopy provides protection from owls while the many stems at ground level allow the phascogales foraging on the ground to escape quickly into the canopy if threatened by a cat or fox. And older wandoo have an abundance of hollows suitable for nesting. While wandoos are an important species for nesting, many other mature eucalypts may also provide suitable nesting hollows.

Further east in the central wheatbelt at Wadderin Sanctuary near Narembeen, phascogales have been reintroduced to a mature woodland of York gum and salmon gum

continued on page 5

continued from page 4

Red-tailed Phascogales

interspersed with rock sheoak fringing granite outcrops. Morrel is another species in which phascogales appear to nest. While sometimes reported in such habitat, it is unclear how useful thin-stemmed eucalypts such as mallee and mallet are for nesting as compared to simply sheltering. The demanding requirements of Red-tailed Phascogales for suitable hollows mean they will readily utilise suitable nest boxes and will often come in to buildings on farms to seek suitable shelter.

With a body size of between 20 and 60 gm, phascogales are well within the preferred prey size for feral and domestic cats. Domestic cats, in particular, often catch phascogales around farm buildings or nearby bushland, often proudly depositing their catch at the farmhouse door. Many community sightings reported in the Wagin/Woodanilling area are from kills made by domestic cats. Cats, both domestic and feral, may be a major factor impacting on phascogales in their remaining range. Ensuring cats remain inside at night, wear a bell or apron to limit the effectiveness of their predation, or simply not replacing the current moggy, may all be strategies that assist the conservation of the phascogale. Local government rubbish tips have been identified as a major source of feral cats in the agricultural landscape and their control at these sites may reduce their overall density across the landscape to the benefit of phascogales.

Another important factor that enables phascogales to survive in farmland is a well-connected landscape, which allows them to move between remnants of native vegetation. Phascogales have been reported in very small remnants, likely too small to meet all their requirements. Hence, it is likely that animals do move across the farming landscape utilising more than one remnant. Roadside vegetation, corridors of vegetation along paddock margins, oil mallee corridors, and paddock trees all play a part in connecting the overall landscape for this species. The gradual attrition of remaining vegetation, in particular mature eucalypts, reduces the overall favourability of the landscape for phascogales. The widening of roads and the consequent loss of road verge trees, the loss of mature paddock trees as farm equipment becomes larger, or the loss of trees in remnants that are not fenced to exclude stock, all play a part in reducing the overall suitability of the landscape.

This lack of connection may be a key factor in the loss of the species from the central Wheatbelt. Here remnants are widely spaced and corridors of native vegetation often absent or degraded. The recent successful reintroduction of phascogale to a 430-hectare remnant at Narembeen has demonstrated that, at least in patches, suitable habitat remains. Here, a core area has been fenced to exclude foxes and cats and existing hollows in York gum have been supplemented with nest boxes. But, as in many areas of the wheatbelt, connections across the landscape have been largely severed and individual remnants are widely separated. This limits the ability of the phascogales to spread beyond the immediate protected area.

Will Red-tailed Phascogales persist in our agricultural landscape? If we can assist with maintaining or creating suitable nesting hollows in old-growth eucalypts or by providing nest boxes, maintaining or creating a well-connected landscape, and controlling or managing domestic and feral cats, then they may stand a chance.

Dr Jeff Short is a research scientist who is currentlystudying phascogale habitat in the central and southern Wheatbelt. He can be contacted on: jeff.short@wildliferesearchmanagement.com.au

PHASCOGALE FRIENDLY COMMUNITIES

Since 2006, the communities of Wagin and Woodanilling have been 'Phascogale friendly', through a varied range of funding and grants to work with research, private landholders, local governments and regional bodies to record sightings and maintain and enhance habitats.

The local landcare officer maintains a register of community sightings, which currently number more than 100. Phascogales are often seen feeding on moths on verandah beams. Volunteers are also involved in building nestboxes, trapping research and monitoring programs. Mens' Sheds, as well as community youth and aged centres, are currently building over 200 nestboxes out of 95% recycled materials. Already installed are 60 nestboxes and more than 30kms of fencing protecting over 1500ha of remnant vegetation that the phascogales use.

How you can help

- **Help build a home**: MAKE YOUR OWN NEST BOX – instructions are available through wwlandcare@westnet.com.au or by calling 9861 2222.
- **Cat tips**: please, if you own a cat, ensure it is kept in at night-time and wears two bells. And consider not replacing it, when your current moggie passes away.
- **Report a sighting**: to your local landcare office or *LFW* officer.

Danielle Perrie, Zone Manager, Wagin Woodanilling Landcare Zone, contact given above.

RED AND GREEN KANGAROO PAW: A FLORAL EMBLEM OF GRACE AND BEAUTY

Claire Hall

Each state and territory in Australia has its own floral emblem and, interestingly, most of them were proclaimed around the same period in the early 1960s, well before the Australian floral emblem the Golden Wattle (*Acacia pycnantha*) was proclaimed in 1988 (see Wattle – Symbol of a Nation in *Western Wildlife* 9/3, July 2005).

The Western Australian floral emblem is the Red and Green Kangaroo Paw (*Anigozanthos manglesii*), proclaimed in November 1960. It was considered that the emblem would heighten tourist interest in the state's wildflowers and was recommended to then Premier David Brand by the WA Tourist Development Authority. Premier Brand said: "...the Kangaroo Paw is so outstanding that it was the logical choice. It has grace and beauty, striking colour and distinctive outline – and it grows naturally only in Western Australia".

The European association with the Kangaroo Paw goes back long before 1960. Botanist Jacques-Julian Houton de Labillardiere was part of a French scientific expedition which visited the south coast of WA near Esperance in 1792 and he was the first European to collect the Kangaroo Paw *Anigozanthos rufus*. De Labillardiere described the genus *Anigozanthos* which means 'irregular flower', in reference to the division of the floral extremities into six unequal parts.

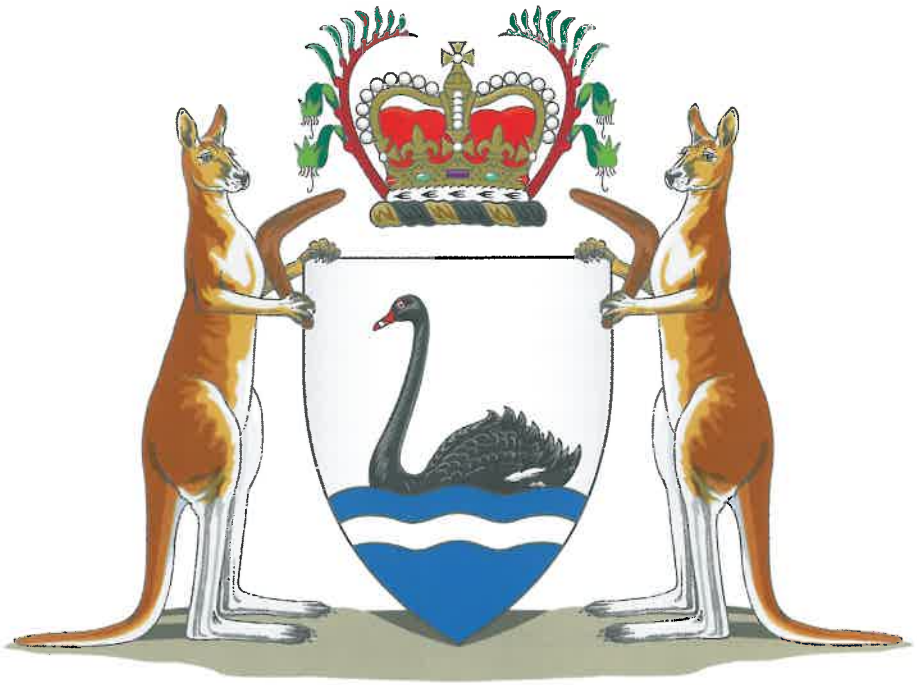


Photo: Claire Hall

In the early days of the Swan River colony, Government naturalist James Drummond encouraged settlers to send seeds and specimens back to England and the Red and Green Kangaroo Paw was introduced into England in 1833. Several members of the Mangles family, including Ellen Stirling (nee Mangles) wife of the colony's first Governor, Captain James Stirling, were plant enthusiasts who promoted the cultivation of Swan River seeds in England. The specific name, *manglesii*, honours Robert Mangles who raised the type specimen from seed in his English garden. In 1839 Robert Mangles wrote a letter to his brother Captain James Mangles RN, an enthusiastic patron of the cultivation of Western Australian plants in English horticulture, describing his experiences in growing *A. manglesii*:

'I have Anigozanthus [sic] Manglesii shewing for flower in the open ground where I put it in April'. In August he noted that 'Anigozanthus [sic] is progressing fast', and three weeks later 'Anigozanthus [sic] is now four feet high but has not yet expanded its flower. I am under some apprehension these frosty nights may destroy it'.

There are 11 species of *Anigozanthos* in the Haemodoraceae family and *A. manglesii* is a rhizomatous perennial herb which grows in the South West Botanical Province from just south of Shark Bay to the south west capes and inland as far as the Warren region. It has flattened fan-like leaves which taper to an acute apex and the flowering stem can grow up to one metre in height, showing a very distinctive outline. Honeyeaters are known to pollinate the flowers and they can be seen clinging to the flowering stems with their beaks plunged into the flower, drinking nectar and receiving a dusting of pollen on their heads.

The stem and bases of the flowers are a striking deep red with the

continued on page 7

continued from page 6

Floral emblem

remainder of the flower being a brilliant green. The stem and flowers are covered with woolly hairs except where the flower opens to reveal a smooth pale green interior. The common name, Kangaroo Paw, is derived from the appearance of the unopened flowers.

The Red and Green Kangaroo Paw grows well in cultivation, especially in sandy soils, and can be propagated by seed or root division. However, it is subject to fungal diseases, especially if watered over summer, and for this reason it is often treated as a biennial. Recent hybrids of *A. manglesii* and *A. flavidus* have shown greater resistance to fungal diseases whilst retaining the spectacular flower colours.

Red and Green Kangaroo Paw and Prickly Moses at Serpentine Cove
Photo: Marion Timms

The iconic status of the Red and Green Kangaroo Paw has resulted in it being depicted in various stamps, coins and the state coat of arms. For example, it was included in the five pence stamp issued in 1962 to commemorate the Seventh British Empire and Commonwealth games held in Perth. The Kangaroo Paw has been featured on $100 and $150 gold coins, a Discover Australia half-ounce platinum coin, and a 20 cent Centenary of Federation coin. In 1969 the state floral emblem was incorporated on either side of the crown in the WA coat of arms.

The Red and Green Kangaroo Paw certainly has all of the attributes of 'grace and beauty, striking colour and distinctive outline' required for a state floral emblem, one we can be proud of and enjoy looking at.

Claire Hall is Technical Officer, LFW, at DEC Kensington. For contacts, see page 2.

DIFFERENT FLOWERING TIMES OF JARRAH AT MORANGUP

We read with interest in the October 2012 issue of *Western Wildlife* the article 'Using the timing of flowering by banksia to monitor climate change'. We would like to comment on the different flowering times of Jarrah (*Eucalyptus marginata*) on our property at Morangup.

Flowering Jarrah

Photo: Penny Hussey

After moving onto this 10-hectare native bush property in August 2011, the Jarrah trees flowered well in May 2012. Then, just eight months later, in December 2012, Jarrah trees again flowered well. We are uncertain as to the reason for the flowering time in late 2012, but it may well be due to warmer temperatures in spring. Also noted were the very hot temperatures from Christmas Day 2012 to early January which resulted in the few Jarrahs that were heavy in bud ceasing to flower.

It is clear from these observations that Jarrah would not be a good choice to use as an indicator to assist in determining climate change.

Allan and Sandy Rose

RESTORING THE CANOPY HEALTH OF DECLINING NATIVE TREES

Paul A. Barber

The rapid decline in health of native trees across the south-west of WA over recent years is causing great concern. Over the past two years we have had many enquiries from landholders about the cause(s) of decline of their trees, and whether there is anything they can do to alleviate this decline. The loss of old, significant trees can be devastating for the landholder, not to mention for the associated flora and fauna reliant upon these iconic and dominant canopy species.

Most of our enquiries concern marri, tuart, jarrah, WA peppermint, flooded gum and banksia. If people see jarrah or banksia declining or dying they often assume *Phytophthora* to be the cause, or if they notice marri declining, they assume it is the marri canker. It is always very dangerous to assume though, as mis-diagnosis is very common indeed and we have observed many examples where sudden death of jarrah or banksia has not been due to *Phytophthora*. The role of the forest pathologist is to consider all the factors that may predispose, incite or contribute to a decline in health of a specimen, and there can be many factors to consider. A change in climate or increasing age can predispose trees to decline, factors such as pathogens, pests, drought or a frost event may incite the decline, and over time, other contributing factors like canker fungi and pests can increase the severity of this decline to a stage where the tree can no longer naturally recover and will eventually die.

The decline in health of trees may not be noticeable by landholders until they have been impacted by these contributing factors, as the landholder sees the tree every day and may not be sensitive to these subtle changes. The actual predisposing or inciting factors can therefore be easily missed or forgotten. This is often the case when there has been a trigger event such as a hail-storm, frost or construction damage. The prevention of the initial inciting factor is usually the best form of management, but if this is not possible, then there are other options that can be tried.

Figure 1: threatment of declining jarrah trees with two different treatments, the tree on the left responding by an improvement in leaf colour and density six months following treatment, when compared to the tree on the right that did not respond to treatment
Photo: Paul Barber

Our recent surveys of many declining trees throughout the Perth metropolitan region has revealed a diverse number of *Phytophthora* species, some of these new to science and yet to be described. We know very little about their potential to cause disease, their biology, or how to manage them. We do suspect however, based on the environment and hosts to which they are associated, and the collection of these species within some nurseries, that the movement of infected seedlings into sites may be one mode of introduction. We also know that trees that have recently died as a result of infection by pathogens such as *Phytophthora* or *Armillaria* (Australian Honey Fungus) have been removed and mulched, and this mulch has been spread throughout the environment. If green mulch is not composted properly, then it can become a source of disease spread.

The management of the health of your native trees on your block therefore begins with avoiding the introduction of green mulch and infected nursery material. This can be achieved by using mulch from your own site, setting up your own composting facility for your green waste, and if introducing soil media or mulch, ensuring it has been properly composted to Australian Standards. To avoid the introduction of new plants you can collect seed from plants on your block and propagate, or strike cuttings. Alternatively, the use of tube-stock minimises the amount of soil media that may be diseased, reduces the chances of purchasing pot-bound seedlings,

continued on page 9

continued from page 8

Canopy health of native trees

Figure 2: treatment of a declining marri tree showing an improvement in foliage colour and density after six months
Photo: Paul Barber

and is more cost-effective.

When considering the health of more mature trees, the ongoing maintenance is important. Pruning should only be carried out where required to improve the form (that is, formative pruning), or to remove limbs that pose an unnecessary risk to life or property. Unfortunately many landholders see big trees near houses or overhanging thoroughfares as an unacceptable risk, and many species are unfairly labeled as 'widowmakers'. The reality is that the chances of being seriously injured or killed by a falling limb or tree in Australia is probably no more than 1 in 10 million, much lower than other risks that we accept every day such as driving a car or crossing the road. The unnecessary pruning of trees is wounding and such wounding can greatly increase the chances of infection by pathogens or pests, leading to more pruning, expense, risk from decayed limbs, and eventual death of your trees. An expert opinion on the risk of your trees may save your trees and many thousands of dollars in future pruning and removals. Pruning of trees should also only be carried out by qualified contractors working to the Australian Standard.

There is also a misconception that it is normal for Australian native trees to have branch dieback, deadwood throughout the crown, or look a bit scrappy. People are often told by the tree loppers that their trees will benefit from a haircut. This may sound a bit silly, however, this is a very common form of management of native trees throughout the south-west of WA. Pruning of trees can induce stress, and result in the tree allocating valuable resources to respond to the pruning that could otherwise be used for defense against pests and diseases. There are alternatives, and these alternatives may not only be of far greater benefit to tree health, but much better for the environment and much more cost-effective.

Over recent years we have encountered many different disorders on native trees in a range of environments. Diagnosis in many cases has been challenging, and the application of effective treatments even more so. However, we have had many successes and we remain optimistic when it comes to the response of trees to treatment. Trees are incredibly resilient and adaptive. Lets take the decline of jarrah, for example. We know that if trees like jarrah are affected by *Phytophthora cinnamomi* they may respond well to treatment with phosphite. But what if trees are declining but the cause is not *P. cinnamomi*? As observed in figure 1, jarrah trees suffering a decline in health from factors other than *P. cinnamomi* were treated with two different treatments and this resulted in two very different outcomes.

Marri canker caused by the fungus *Quambalaria coyrecup* has become an epidemic throughout the south-west of WA. At present, we do not have a treatment that we can apply with confidence that will control the canker. We have, however, treated marri trees suffering from canker and other disorders and observed good recoveries in crown health (see figure 2). Tuart trees can also respond well to some treatments, as can flooded gum and WA peppermint, but the success of the treatments is dependent on the cause of the decline. Isn't it better to try to save your tree rather than slowly watch it die and then eventually remove it?

Treatments can take very different forms, from slow-release systemic implants that are absorbed via the tree's vascular system, to stem injections, foliar sprays, or soil amendments, drenches, granules or tablets. The method of application is determined by a number of factors, including the size of the tree, accessibility to the root system, site characteristics, product composition and availability, and ultimately, the factor(s) causing the decline in health.

continued on page 10

continued from page 9

Canopy health of native trees

Method of application and depth of insertion of the systemic tree implants

Photo: Paul Barber

During the last year we have received many enquiries about systemic nutrient implants and enquiries to *LFW* have initiated the publication of this article.

The systemic nutrient implants were developed in the USA more than 40 years ago. Since that time we have conducted many trials to determine their efficacy for a range of tree health disorders. They are applied around the circumference of the tree at 10 to 15 cm spacings into the sapwood where the gelatin capsule containing the active ingredients is slowly absorbed into the vascular system of the tree. Figure 3 shows the implants inserted into the sapwood just beneath the cambium. The ingredients then stimulate the foliage within the crown and over time, these nutrients are hopefully translocated back down into the root system. We have used these implants on native and non-native trees. They are not designed to eradicate or kill pathogens or pests, but work on the principle of improving the vigour of trees and stimulating their defence and resistance to these agents. Knowledge is still being developed on the correct treatment for various disorders and the optimal time for application. As well, new products are continually being developed. As trees are living organisms and we really know very little about them, in particular their below-ground structure and function, there are no guarantees that the treatments will work. They are not a magic bullet! However, the chances of their success can be greatly enhanced through accurate diagnosis and correct application.

Dr Paul Barber is the Director of ArborCarbon Pty Ltd, an environmental and arboricultural consulting company based in Perth, and is an Adjunct Senior Lecturer at Murdoch University's Centre for Climate Change, Woodland and Forest Health. (A PDF of this article can be obtained from the author by email at p.barber@arborcarbon.com.au)

GARDENING FOR WILDLIFE WORKSHOP

Land for Wildlife's two-part/ all day 'Gardening for Wildlife' workshop with Sabrina Hahn at Tortoiseshell Farm in Bridgetown in November was a great success.

The morning session with Sabrina and *LFW* Officers Sheila Howat and Heather Adamson explored how to turn your garden into a habitat haven for small birds, mammals, frogs and insects who will all work diligently to pollinate your flowers and enrich your soil. The pollinating native bees were seen during the bush walk!

The afternoon session expanded the theme into reaping the benefits of biodiversity to create a sustainable kitchen garden with the aid of native pollinators and pest controllers.

If you missed out this time (it was booked out very soon after the date was announced), Sabrina will be back at Tortoiseshell Farm in November. Details to be advised, or you can register preliminary interest with me at any time.

Sheila Howat

PLANT GALLS: THE DIVERSE ABNORMAL GROWTHS ON PLANTS RESULTING FROM THEIR INTIMATE ASSOCIATIONS WITH PARASITIC ORGANISMS

Allan Wills

A recent Australian publication introducing the biology and ecology of insects that live in plant galls reveals the fascinating life of these organisms. The book *Life in a Gall* by Rosalind Blanche would make a handy addition to the reading list of anyone interested in the Australian bush. Its language and content are highly readable and it is extensively illustrated and informative to a broad range of readers. The book is divided into an introductory chapter and chapters covering the different kinds of gall-inducing insects and their plant hosts; the adaptations that these insects have for living in galls; the various kinds of enemies of these insects and the strategies involved in avoiding being eaten; chapters on the problems caused by galls when they become pests, and the benefits and ecosystem services provided by galls. Lastly is a chapter describing how to collect and study galls.

A casual inspection of just about any piece of bushland will reveal at least several different types of plant gall. This is because about 50% of gall-inducing insect species in Australia are associated with eucalypts and up to 18% of gall-inducing insect species are associated with acacia. These two plant taxa that are so characteristic of much of our vegetation occur extensively across Australia.

Many different organisms that parasitise plants induce alterations in the normal development of cell tissue that result in a fantastic array of different shaped growths on plants. These irregular growths are known as galls and result from either an increase in the size of affected plant cells or an increase in the number of cells. The organisms that induce galls include phytoplasmas, viruses, bacteria, fungi, nematodes and arthropods (e.g. mites, and insects such as thrips, wasps, flies and beetles).

No one really knows how the structure of galls is induced and regulated by the galling organisms, particularly the complex structures induced by insects. The gall itself is produced by the plant.

One simple way of classifying galls is based on their structure and shape:

- Modified or multiplied organs that are still recognisable: e.g. witches brooms and virescences such as Sheoak Witches Broom associated with a phytoplasma pathogen.

Irene Tallentire beside a gigantic Sheoak Witches Broom on Common Sheoak, Allocasuarina fraseriana, Gidgegannup Photo: Penny Hussey

- Irregular, variable growths with mostly undifferentiated tissues such as tumours and cankers: e.g. galls induced by the acacia gall rust fungus *Uromycladium tepperianum*.

Fungal gall on Jam Wattle, York Photo: Zara Kivell

- Complex and organised growth with layers of specialised tissues forming a novel structure on the plant. Within this group are the great variety of galls induced by nematodes, mites and insects.

There are a few problems with considering galls only by structure. Quite different organisms can induce superficially similar galls and closely related parasites can induce galls that are very different in form. The galls induced by particular insect species are usually characteristic of the insect species. In some cases, such as the scale insects of the genus *Apiomorpha*, males induce quite different galls to the female insects. In some other cases, the type of gall formed depends on the stage of the insect's life cycle.

Which organism benefits from galling: insect or plant? An obvious benefit to gall-dwelling insects is that the plant provides a concentrated source of nutrients in the gall, and these are provided to the detriment of the plant. Also, flower bud and seed galling insects may reduce the reproductive potential of their hosts. However, some gall inducing fig wasps play an essential role in pollen transfer to the reproductive benefit of their plant hosts. Thus, galling insects that affect the reproductive potential of their hosts can have an effect on the composition of plant communities, and other organisms, including humans, which depend on plants affected by galls.

What kinds of insects induce galls on plants and what plants are galled? An amazing variety of insects and plant hosts! The insects include bugs (such as psyllids, scale insects and whiteflies), wasps, thrips, flies, beetles and even moths. Generally each species of galling insect has a

continued on page 12

continued from page 11

Plant galls

Believe it or not, these galls are made by the same species, the scale insect Apiomorpha, *growing on Tuart. On the left is the gall made by the female, on a twig, or the right the much smaller gall made by the male, growing on a leaf, Trigg.*
Photo: Allan Wills

narrow range of only one or two plant host species.

While the chapter on the taxonomy of gall inducers and their hosts is a well illustrated synopsis of insect and host taxa, the high level of host specificity of gall inducers means its strength is not as a 'What gall is that?' identification handbook. Rather, it is a prelude to the subsequent chapter that reveals the fascinating adaptations of the insects to their life mode and to overcoming the problems of dispersing and finding the right plant and site for producing a gall, and successfully reproducing. For example, among most galling scale insect species it is the immature insect stage that is the dispersal stage to new gall sites. This nymphal stage is usually limited to crawling, which is a restricted means of dispersal. One group of scale insects has solved this problem through a difference in the rate at which males and females mature. The males mature faster than the females and the immature females hitch a ride on the elongated abdomens of their winged adult brothers to new sites suitable for initiating galls.

The way insects feed within the gall is determined by the kind of insect inducing the gall. The enclosed insects may have mouthparts which allow direct chewing of plant cells (wasp, beetle, moth and some fly larvae), or feeding by sucking the contents of plant cells by piercing mouthparts (psyllid and scale insect nymphs). Feeding by the larvae of the gall midge *Asphondylia floriformis* (tiny flies) involves wounding and chewing of the tissue of the host plant Beaded Glasswort (*Sarcocornia quinqueflora*) to induce gall formation followed by feeding on the layer of fungus that develops on the interior walls of the gall. Newly emerged adult females carry spores of the fungus to new gall sites where the female lays her eggs. In a later chapter, the ecological importance of this and another species of gall midge is revealed. Seeds of the *Sarcocornia* host are a food source for the threatened orange-bellied parrot. These parrots migrate from Tasmania to coastal salt marshes in Victoria where they overwinter and feed on the beaded glasswort. Galling affects seed production and should the amount of galling increase there is potential for this to contribute to a decline in parrot populations.

Two examples of the problems caused by galls are of relevance to Western Australia. In natural stands of the Scarlet Banksia (*Banksia coccinea*) the gall inducing midge *Dasineura banksiae* causes galls on the underside of leaves. While these may be of trivial importance in wild populations, this banksia is cultivated commercially for its prized red inflorescences. The presence of galls renders the flower stems unsuitable for the fresh flower trade. The affected leaves can be removed but the stems are suitable only for the dried flower trade resulting in diminished financial returns.

Geraldton wax (*Chamelaucium uncinatum*) is also grown commercially for the fresh flower trade. The native chalcidoid wasp

continued on page 13

Bud galls, causative organisms unknown. Left: Coastal Daisy (Olearia axillaris). *Photo: Allan Wills*
Right: Jam Wattle (Acacia acuminata), *York Photo: Zara Kivell*

continued from page 12

Plant galls

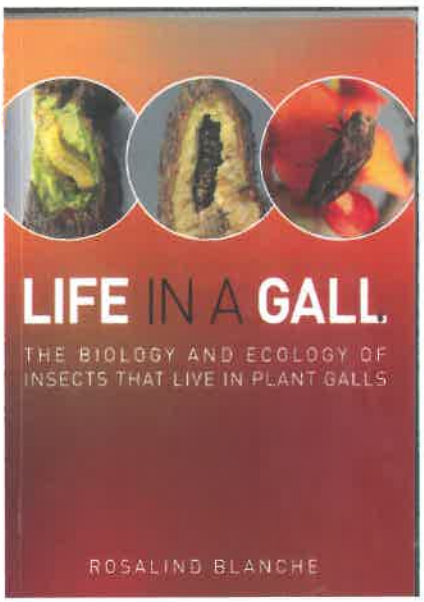
Dasineura banksiae *galls on Scarlet Banksia. Photo: Sylvia Leighton*

Oncastichus goughi induces galls on the new stems and leaves of this plant. The presence of galls results in deformed branching patterns which degrade the suitability of affected plants for the fresh flower and nursery trade. The wasp has spread to Israel and California where it is considered a pest.

Gall enemies range from predation by parrots, tiny wasp parasitoids, inquiline species which cohabit the galls with the gall inducing species, and kleptoparasitic species which steal the gall from the gall-inducing species. Against these enemies, gall-inducing insects employ an equally diverse array of strategies. Perhaps one of the most interesting defences briefly touched on by the author is the antibacterial secretions of gall inducing thrips.

Galls are not all bad news! When species are introduced either deliberately or accidently to new countries outside their endemic range they often proliferate because they have left their enemies behind. Galls have potential for use in biocontrol of invasive plant species. One of the best known examples of this is the use in South Africa of the flower galling chalcidoid wasps *Trichilogaster acaciaelongifoliae* and *T. signiventris* to reduce environmental damage caused by the introduced Australian wattles *Acacia longifolia* and *A. pycnantha*. Of local interest in the book too is a section dealing with the potential of two gall midge species *Dasineura strobilus* and *D. tomentosa* as biocontrol agents of coastal tea tree which is a woody weed species in WA.

After obtaining the required permission appropriate to the area intended for survey for galls, how do we know what kind of insect is present inside the gall we have found? Well, the equipment needed for collecting galls and studying galls, such as secateurs for snipping the galls from vegetation and paper bags for specimens, is quite simple, as detailed in the book, and can be found in most households. Collected specimens can be dissected to extract insects from the galls, or the galls can be kept in ventilated containers such as glass jars with tissue covers to rear specimens to adult stages. Identifying what has been collected usually requires viewing the insect specimens by magnification and reference to a good information source such as the two volumes of *Insects of Australia.* But don't despair if you have no access to these, there are lots of keen entomological groups out there on the internet who can provide help and advice on identification. A local group is the WA Insect Study Society who are contactable via their website: museum.wa.gov.au/waiss/



Life in a Gall
Rosalind Blanche
Pub: CSIRO

Allan Wills is a Technical Officer in Science Division, DEC, Kensington.

A CUCKOO BEE

Shown here is a Waroona Cuckoo Bee (*Thyreus waroonensis*) visiting *Boronia dichotoma*, a spring-flowering perennial often seen on winter-wet flats on the Swan Coastal Plain.

The female cuckoo bee requires a 'host' and uses the nest of another native bee, the Blue-banded Bee (*Amegilla chlorocyanea*) to lay her eggs. The cuckoo bee larvae hatch first, then destroy their host's brood and take over the food supply inside the chamber. To sleep at night, male cuckoo bees attach themselves to a stem or leaf by their jaws only.

The bee is found throughout Australa and it will visit a variety of flowers, including eucalypts and grasses.

Heather Adamson

MONITORING FIRE AND NATURE ON YOUR PROPERTY

Steve Platt

LFW Victoria has been encouraging its members to undertake fire-related monitoring on their properties. A senior staffer explains how this can help.

The association between fire and Australia's flora and fauna is one that stretches back over 60 million years. In that time, fire has been an important agent of change, advantaging species able to cope with fire over those without. Fires of different frequencies, intensities, seasons and extent (called 'fire regimes') have influenced which species occur in different regions. For example, *Eucalyptus*, a genus that may have once been a rare sight (found near volcanic activity) has expanded its range to occupy many regions of Australia, at the expense of Gondwanan rainforests, via its adaptations to more drought and fire-prone environments.

Take a careful look at the life history of different species and you will see the signs of fire adaptation such as resprouting from the base and branches, woody (serotinous) fruits that store seed protectively and release it post-fire, and long-lived, often hard-coated seeds that germinate in response to heat or smoke effects. Such species may lie dormant in the soil seed bank for decades between fire events. The characteristic 'mallee' habit of some eucalypts is due to fire – the multi-stemmed shape being comprised of shoots arising from a mass of buds (the lignotuber or 'mallee root') that survives fire and resprouts. Look in the ashen post-fire landscape and you will often see fire-adapted fungi fruiting as they take advantage of the opportunities for new infections created by a fire. Our fauna has also had to persist in the face of fire. Many species survive fire either by fleeing, or sheltering in unburnt refuges and underground. Thus, a burrowing wombat has a distinct fire advantage over its tree climbing relative, the koala.

These adaptations to fire are widespread in our flora and fauna due to a long association with fire. Of course, not all species are fire adapted. They can persist in refuges, such as steep-sided gullies, dune crests, wetlands and rocky outcrops.

The life history of species can indicate their preferences and tolerances for different fire regimes. The term 'tolerable fire interval' has been used to indicate the upper and lower limits of fire frequency that a particular vegetation type can tolerate and maintain all species within it. These intervals have been estimated for many vegetation types using the most sensitive species as indicators (called 'key fire response species'). Those species that take the longest to reach reproductive maturity after a fire set the theoretical lower limits of fire frequency. Those that senesce first set the upper limit.

Understanding the full effects of fire is complex and usually needs to be practiced at large spatial scales comparing many sites with differing fire histories. However, there is a range of monitoring techniques that are suitable for use at the scale of a *Land for Wildlife* property.

1. Fire history records

Keeping accurate records of fire history is crucial to interpreting the response of plants and animals. The extent of the burn should be mapped soon after the fire event. In addition, more detailed burn severity mapping, ideally using a standard method, is very useful. Historical records can also assist with understanding the natural size and pattern of fire in your area.

2. Key fire response species – vegetation survey

Observing what is happening to the distribution and abundance of key fire response species can tell you about the need for fire in your bush. You will need to ask for advice about which species these are (they typically are obligate seed regenerators with long intervals to set first seed). Simple counts or cover estimates would be useful at six months, one, two and five years post-fire. Make sure you consider the various vegetation types on your property, and focus on the highest priorities based on your assessment of the vulnerability and exposure to disturbance by fire.

You will probably find that some flora species are much more abundant soon after fire whilst they may be a minor component, or apparently absent, in the years ahead (but still present underground). These will become evident if you monitor all plant species.

3. Fauna habitat monitoring

Fire has direct and indirect effects on fauna species. Whilst some individuals die in the fire, it is the effect on their habitat that has an enduring effect – be it loss of leaf litter, logs, hollows or even spawning sites for fish that can be covered by sediments eroded post-fire. Monitoring these habitat elements can provide insights into why fauna species persist or not. To avoid bias, it is best to use a standard technique, such as setting out random line transect(s) and measuring the number of hollows, extent of log touching your tape measure etc.

4. Photography

Photography is a simple way to record changes in visible habitat over

continued on page 15

continued from page 14

Monitoring fire and nature

Pre and post fire photopoint monitoring in the Victorian Mallee
Photo: Natasha Schedvin

time. It is best done by establishing fixed 'photopoints' and following a standard protocol. Include areas that have not yet been subject to fire, starting immediately after the fire area is safe to enter – one month, six months, one, two and five years. If doing many sites, it is advisable to place a data board with the site details in front of the camera. A precise GPS location should be recorded. Fancy versions of this method take advantage of new technology allowing panoramic images or even aerial drones! You will record information that helps estimate the fire intensity and what species return following fire. As the years roll by, the frequency of monitoring can usually be reduced (the frequency will depend on the subject of your monitoring and its likely rate of change). This is a long-term commitment but one that will be rewarding in building your understanding of how the bush changes with time.

5. Remote cameras

Recent improvements in digital cameras have allowed some fauna, especially terrestrial mammals, to be monitored without the need for intrusive trapping. The cameras are attached to a tree or stake facing a lure suitable for attracting the species of interest (such as peanut butter, rolled oats, honey and pistachio essence) secured in a metal tea strainer or cage. [Note: in WA the use of 'lures' is a form of 'taking' fauna and may require a licence. Contact your DEC office if you propose to do this. - Ed.] Camera type and settings are adjusted to take photos over a suitable time period. Images indicate the species that visited the lure but, because the same animal may be photographed repeatedly, are generally not suitable for estimating abundance.

6. Bird survey

Birds are conspicuous and easily monitored, and respond to fire regimes. Some species like the open areas soon after a fire, others favour the dense regrowth that follows and some favour long-unburnt habitats where they take advantage of the increased bark, deep litter layers and hollows. If you know your birds by their call, a standard 20-minute bird survey can be used to monitor activity. It involves observers walking around a two hectare (100m by 200m) site counting birds by species heard or seen 'on site' or 'off site'. This can be an excellent way of getting to know the bird populations on particular habitats on your property: for example you might choose to do surveys in patches of remnant forest, and in parts of a more extensive woodland area with different fire histories. By following standard protocols your data may also contribute to BirdLife Australia's Atlas records.

Trials of automated sound recorders, now widely available, are proving that they too have a role in collecting data, allowing birds on many sites to be recorded simultaneously and cost effectively at the best time of day.

There are many other techniques that can be used for different species and habitats.

What to do with all this information?

If you collect data you will need to think about its curation, storage, sharing and archival requirements. Computers and the internet are a great help. Make sure you share what you collect with others who have an interest in the fire ecology of your region.

You may like to visit the Victorian Department of Sustainability and Environment website (www.dse.vic.gov.au) where a number of items may be of interest.

Stephen Platt is Manager, Biodiversity and Fire Policy and Programmes in the DSE, Victoria.

A VERY WARM NIGHT, A PAVED PATIO AND THREE FROG SPECIES

At our property in Bullsbrook on the 15 Jan. 2013 we went outside to take the dog for his nightly toilet trip and we were surprised to see three different frog species all within one metre of each other on the back patio.

The Spotted Burrowing Frog (*Heleioporus albopunctatus*), Yellow-flanked Burrowing Frog (*Heleioporus barycragus*) and the Western Banjo Frog or Pobblebonk (*Limnodynastes dorsalis*) provided us and the dog with a very unexpected piece of entertainment. It also led us to wonder what is really living out there that we do not often get the chance to observe.

Although we have seen all of the three species at different times it was the first time we had witnessed all three together. Kim quickly grabbed my camera and we recorded the event. The daytime temperature had been 43°C and when we took the pictures it was still 29°C at 11.20pm. We have often noticed burrows dug into the bank near the carport and wondered what was doing the excavation and now we have the answer.

1. Spotted Burrowing Frog

2. Yellow-flanked Burrowing Frog

3. Pobblebonk

4. A burrow

Jim and Kim Maher, Bullsbrook

CORAL LICHENS – OCEAN OR OUTCROP?

On a recent trip to Esperance, I observed an unusual cluster of what appeared to be coral in the undergrowth of a thicket of One-sided Bottlebrush (*Calothamnus quadrifidus*) on a granite outcrop. I had seen this species before but had never taken the time to learn more about it. Upon my return to the office I discovered the species I had seen was a lichen, *Cladia ferdinandii*.

Some further investigations revealed that this species is generally found in clumps in sheltered areas on granite outcrops usually in association with mosses. The lichen is pale, yellow or cream in colour, can grow up to 15cm tall and its tubular tissues are covered with tiny perforations. These perforations give the lichen a similar appearance to marine coral giving rise to its common name Coralline or Coral Lichen.

There are six lichen species known in WA from the Cladoniaceae family,

which all occur south of Geraldton, including *Cladia aggregata*, *C. corallaizon*, *C. inflata*, *C. schizopora* and *C. sullivanii*.The growth form of the *Cladia* genus is fruticose, meaning the thallus or body of the lichen is erect or pendulous and 'shrub-like', a small section of it attaching the lichen to the substrate on which it grows. The lichens produce hollow, branched soft tissue in the winter which becomes rigid and brittle when dry in the summer months.

Next time you're exploring around a granite outcrop in the Wheatbelt, South West or South Coast keep your eye out for these amazing lichens and take a moment to appreciate their unique form. *Kimberley Page*

Kimberley Page is Covenant Technical Officer at DEC Kensington. She can be contacted on: kimberley.oswald@dec.wa.gov.au.

CHASING RAINBOWS

Heather Adamson

Rainbow Bee-eaters (*Merops ornatus*) are stunningly beautiful birds, but their arrival in the south-west is noisy. They come in October, migrating from the north to the south of Australia to set up their territories and begin to dig out their nesting tunnels. They favour an open area near trees with relatively soft soil on flat ground or a sandy bank, and maybe near water.

Although there are 24 species of bee-eater, only this one is found in Australia. They are beautiful brightly colored little birds 23 to 28 cms long, including tail points. The bill is black, finely curved, and the eyes are red with a blue-edged black eyeline. The underside of the wings is orange with black outline, while the topside is mainly green and blue, with black and orange throat markings. Males have longer tail points (which may be damaged during burrow construction).

They excavate a breeding tunnel 50 to 120cms long, usually facing eastward. It has a chamber at the end lined with soft grasses. They dig together, loosening the soil with their bills and then use their legs to kick out loose dirt, while balancing on their wings and bill. Both feed the young and may have auxiliaries (other family members) present to help. The male presents a 'gift', normally a honeybee, to his female before mating, although she usually demands more than one bee, so he is frantically catching bees one after the other. On observing this I thought he may not have the energy left to perform the necessary task! There are usually four to five white, rounded eggs.

They are elegant flyers with broad pointed wings, swooping, gliding, turning - all prey is caught on the wing and returned to a vantage point to 'bash' (remove sting in the bees) before eating. They are often seen doing this on power lines or fences, before gliding down to their burrow. Bee-eaters also catch dragonflies, wasps, beetles, damselflies, cicadas, flies, moths and flying termites – several hundred may be taken in a day. When WA Christmas trees (*Nuytsia floribunda*) are in flower, they are ideal locations to see the birds, as they attract the pollinators Rainbow Bee-eaters love to eat. After breeding, groups congregate together in large flocks to fly back north.

These most delightful, special little birds are threatened each year by foxes and goannas (digging up their burrows), birds of prey, snakes, cats (feral and domestic), as well as ground disturbance by four-wheel-drive vehicles and trail bikes. Each year I see burrows destroyed by motorised recreation vehicles. For their future management and protection please assist by reporting their date of arrival, how many birds and nesting sites are on or near your property, so that a database of numbers and where they occur can be built up. This is critical as we know their habitat is declining rapidly in some areas. If nesting burrows are on your property, please try to make sure that they are not walked or driven on.

Heather Adamson is LFWO at Mandurah. Contacts on page 2.

Watching for prey

Approaching the burrow

Burrow entrance

[NOTE: ON THIS AND THE PRECEEDING PAGE THERE ARE PHOTOS OF BURROW ENTRANCES. IF YOU ARE TAKING THESE FOR RECORD PURPOSES, IT IS A GOOD IDEA TO PUT SOMETHING NEXT TO THE OPENING SO THAT A SCALE CAN BE RECORDED. A PEN, OR A COIN, WOULD DO. - ED]

This is an ideal site to look for Rainbow Bee-eaters - flowering WA Christmas trees over a sandy paddock. There is a bird sitting on the power line in the top right corner.

All photos: Heather Adamson.

Members' page

DE BAIT DEBATE

I regularly set meat fox baits on my bush block at Margaret River but after a two year layoff, I found that the bait formulation has changed.

The 'new' baits containing cereal were disappearing like hot cakes during spring this year – bewdy, lots of dead foxyloxies! I found the new baits very convenient to nail to logs hopefully out of reach of the neighbours' dogs which visit regularly! However, my suspicions were aroused when several baits were being nibbled rather than eaten whole as one would expect of foxes. When 10 baits disappeared in quick succession, I contacted Cherie Kemp who proposed setting up a 'Feralcam' on a bait site. Possums and 'roos were 'caught' showing interest in the baits while Black Skinks in particular devoured the baits at several sites! Penny Hussey assured me that the skinks were unlikely to be harmed by the baits but queried how much they could cope with as the baits were disappearing at an alarming rate. Altogether 30 baits were dispensed in a six week period and even then I saw a fox wander past in broad daylight!

Could the cereal content in the baits be attracting non-target species such as phascogales, mardos, possums, etc as well? Finally, 10 sausage baits were set and skinks were 'caught' eating these too! In the past I used the 'old' dried meat baits and found they disappeared at a slower rate and were always eaten whole, usually a total of 20 baits were dispensed over a period of two months – foxes? Are baited eggs more effective? They're certainly more difficult to handle. In 20 years of baiting, I have only found a couple of dead foxes in the vicinity of baits, is this usual? Apart from the consequences of non-target species consuming large quantities of

A Kings Skink nibbles at the bait

the new baits, how much do native animals reduce bait availability to target species?

I confess to being too slack to check the literature, assuming the effectiveness of baiting to be well researched. However as an avid 'protector' of native wildlife, I'm beginning to question the effectiveness of my baiting efforts?

Paul Downes, Margaret River

[Have readers anything they can add to this debate? – Ed.]

OUR SCALY FRIEND

Guests at the Stirling Range Retreat, Borden, snapped this carpet python sun bathing on Wandoo about four metres above the ground within 30 metres of the Retreat's office. The image was taken by Sigrid and Lutz Kinder, world-class nature lovers from Germany, who wrote the note below to accompany the photo.

Sunbathing Carpet Python
Photo: Lutz Kinder

"My wife and I are tourists from Germany travelling through the beautiful Southwest of Western Australia. In Esperance we were told by fellow campers that there is a lovely caravan park in the Stirling Range National Park. As we are hobby ornithologists we were also told that we will have there the perfect occasion for bird watching. We arrived at noon at the Stirling Range Retreat and I immediately took my binoculars and scanned the trees around to maybe find some birds I've never seen before. And then I really saw something I've never seen before: I thought it must be a very big lizard or goanna. As I watched it closely I realized it was a Carpet Python lying there on a dead trunk of an old tree. It had an estimated length of about two metres and was moving very, very slowly, disappearing from time to time in the trunk of the tree, but always coming back to sun itself for about two hours. As I didn't watch it for about ten minutes it disappeared and wasn't to be seen for the next hours and days."

Four days later, at 8am when investigating shrieking birds four metres from the office, Tony discovered 'OUR' well camouflaged python again on a Wandoo. Setting up a telescope nearby, our scaly friend held guests fascinated until nightfall. The Lutz's also took some stunning images of other fauna at the Retreat. **This makes us ask, how many other hidden treasures do our guests discover on our *Land for Wildlife*?**

Ayleen and Tony Sands

ARE THE SUBSTANCES ADDED TO HERBICIDES TOXIC TO HUMANS?

Glyphosate is the active ingredient of the major herbicide used in the world. It is supposed to be specific to plant metabolism. But most products using glyphosate also have additives including adjuvants, chemicals that increase the uptake of the toxin into living cells. In some recent laboratory research, glyphosate with and without its major adjuvants was tested for toxicity on human cells *. The researchers demonstrated that all formulations with adjuvants were more toxic than glyphosate alone. Thus, anyone using glyphosate should be aware that the guidance values given for intake of the product will be based on long-term test of glyphosate alone, whereas the commercial product they are using could be more toxic than this. Take-home message – check the label and always be extremely cautious when handling these chemicals. Always wear recommended protective clothing.

[* For ref. contact Ed.]

FAUNA MOVES HIGHER UP MOUNTAINS TO KEEP COOL

As the climate warms up, theoretical ecologists predict that animals will move to keep within their preferred temperature range – if conditions, such as the availability of suitable habitat, allow them to. On mountains, this means going higher. This is demonstrated by moths on Mount Kinabalu in Borneo, that have moved upwards 67 metres in the last 30 years. (Kinabalu is a protected area, so human disturbance is not a barrier to fauna movement, as it may well be elsewhere.)

Chris Thomas, University of York, UK.

HORSES HELPING THE CONSERVATION CAUSE

Rangelands Restoration is a conservation program that is restoring native mammals and ecosystem health on Lorna Glen, a 245,000 ha ex-pastoral lease in the arid zone of central WA that is jointly managed by DEC and the local Wiluna Martu people. Key restoration activities include controlling introduced predators (feral cats, wild dogs and foxes) and herbivores (cattle and camels), boundary fencing, managing fire and reintroducing a suite of native mammals that once occurred in the region, but which have become locally extinct.

Captive bred bilbies were reintroduced to Lorna Glen in 2007 and were initially monitored by radio tracking and trapping. However, over time, the bilbies dispersed and because of their great mobility, mostly solitary behaviour and the nature of the terrain, it has been virtually impossible to continue to monitor them using trapping, searching on foot or using machines such as ATVs. This is where horses come in. In March 2011, a trial was carried out using observers on stock horses who rode transects through the bush in search of signs of bilbies such as burrows, digs and scats. The trial was a great success. Horses were able to traverse country not readily accessible to ATVs, were less damaging to soil and vegetation than machines, had greater endurance and speed than people on foot, and were an elevated platform from which to observe bilby tracks, digs and burrows. In May 2012, six volunteer riders participated in the 'great bilby muster', surveying some 36,000 ha over four days, with each rider covering about 20 km each day. A total of 247 observations of bilby burrows, tracks and diggings were recorded, providing valuable information about bilby density and distribution on Lorna Glen.

The intention is to repeat the survey every two years to see whether the bilby population is increasing, decreasing or stable. To this end, we are seeking volunteer riders and horses to help out in May 2014. If you are interested, please contact Dr Neil Burrows at neil.burrows@dec.wa.gov.au

Neil Burrows

Did you know ?

... that the species richness (number of different species) of aquatic invertebrates in gnammas (rock pools) on outcrops in the WA Wheatbelt is 45 to 60 species per rock outcrop? This is very much richer that that recorded from rock pools in the eastern states or from other parts of the world (around 20 species per outcrop). Not only is there great diversity but many of the species are local endemics. It is thought that these pools were important refugia during past periods of climate change and that they became particularly ideal locations for speciation.

Brian Timms, University of NSW

HOW DOES RISING TEMPERATURE AFFECT ANTS?

Most people will be familiar with meat ants, especially those huge interconnected colonies built by the Common Meat Ant (*Iridomyrmex purpureus*) that are widespread throughout southern Australia. They are often constructed in the hard ground along driveways, and the inhabitants boil out in their hundreds to attack anything that disturbs the nest. Researchers from the University of New England in Armidale have studied how rising temperature would affect their activity *.

These ants forage during the day, when the sun keeps them at an appropriate body temperature, but when it gets too hot, they have to go back into their insulated nest to cool off. They cope easily with an air temperature up to 42°C, but anything higher than that slows activity. Things are made worse for the ants as the ground temperature is often higher than the air temperature and when that ground temperature reaches 50°C they reduce activity and when it reaches 63°C, they cannot go outside at all. What does this mean for the colony as a whole?

Rising daytime temperatures could force the meat ants to forage earlier or later in the day, when they are less efficient, and possibly more prone to predation. Longer recovery time between foraging trips could mean less work accomplished, and perhaps also a shorter lifespan. Could this mean that they would not bring back enough food to keep the colony going? What would this mean to the ecosystem in which the ants form a fundamental part?

[*For ref, contact Ed.]

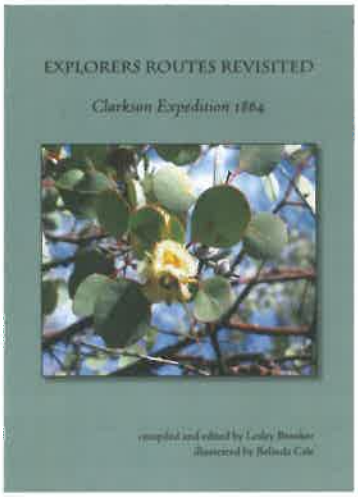
AREAS OF SECONDARY SALINITY ALSO CAUSE INCREASED ACIDITY IN GROUNDWATER DISCHARGE.

Regional acidification of surface waters is occurring in south west WA, and it is linked to dryland salinity and acidity carried by rising groundwater, Deptepartment of Water researchers have found *. At least 350 km of major waterways and tributaries in the Swan-Avon Basin were found to have base-flow acidity (pH<4.5) along with low-level waters in a number of lakes. Acidity is linked with saline groundwater discharge that also contains high concentrations of aluminium, iron and manganese and a range of trace elements (eg: lead, copper, nickel, zinc). The researchers show that this acidification has been occurring for at least 30 years, along with increased diffuse discharge of saline groundwater in the salinising landscape. However, in some sub-catchments, it can be attributed to point discharge from agricultural drains installed to mitigate the salinisation of land. Management to limit surface water acidification should focus on minimising downstream transport of acidity in low flows from areas with diffuse acidic groundwater discharge, and on containing and treating drain discharge.

[* For ref. contact Ed.]

Did you know ?

... that covering a dead animal with vegetation can lead to a 24-hour delay in it being discovered by insects? It is thought that this is possibly due to the insect-repellant properties of compounds in wattle and eucalypt leaves. *Ian Dadour, UWA*



Explorers routes revisited: Clarkson Expedition 1864

Lesley Brooker

Pub: Hesperion Press, Perth

This is another of Lesley Brooker's books that carefully follow explorers' journals, locating their camp sites and flora and fauna seen by them, as they appear today. If you are interested in the early history of settlement in WA, you will really enjoy this. In addition, many of the sites the Clarkson expedition visited would make interesting weekend camp site destinations.

For costs, and information on how to obtain a copy of the book, contact the author on: LesMikeBrooker@bigpond.com

Australia's Poisonous Plants, Fungi and Cyanobacteria: a guide to species of medical and veterinary importance

Ross McKenzie

CSIRO. 2012 $195.00

email: publishing.sales@csiro.au

This large book describes and illustrates most of the plants, both native and introduced, that have been proven to cause poisoning in humans and domestic animals in Australia. It is written for non-professionals to help them recognise the main poisonous plants, fungi and cyanobacteria that occur here, and, armed with this knowledge, prevent the pain and suffering caused by plant poisoning, and sometimes to cure it.

This is a very comprehensive compendium of information, which would probably be of most use to anyone involved professionally with veterinary medicine or human toxicology. *Penny Hussey*

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 Environment and Conservation.

Published by the Department of Environment and Conservation, Perth.

All correspondence should be addressed to: The Editor 'Western Wildlife', Department of Environment and Conservation, Species and Communities Branch, Locked Bag 104, Bentley Delivery Centre, WA 6983.