Western Wildlife
LAND FOR WILDLIFE NEWSLETTER

Department of Parks and Wildlife

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WILDFIRES IN THE ESPERANCE AREA

Sarah Comer & Alan Clarke

The 2015 spring saw a number of bushfires in the Esperance District, and several of these had significant impact on the habitat of the critically endangered western ground parrot (*Pezoporus flaviventris*) and the endangered Australasian bittern (*Botaurus poiciloptilus*).

In mid-October lightning strikes started three separate bushfires in Cape Arid National Park. Two of these burnt more than 15,000 hectares of the park, and impacted significantly on the known western ground parrot habitat. Habitat burnt included one of the core areas that the Parks and Wildlife team had been hoping to target while seeking birds to supplement the captive population at Perth Zoo. Despite this setback the project team, assisted by volunteers, were able to locate enough birds in listening sessions to proceed with the capture of two young birds for the Zoo. Capture efforts had to be called off when lightning strikes again resulted in fires throughout the district in mid-November. Another two fires in Cape Arid National Park burnt through 150,000 hectares; these in combination with the October fires resulted in the loss of an estimated 90% of the known ground parrot habitat, leaving only two areas of known habitat unburnt.

Above: Western ground parrot. *Photo: Brent Barrett*

Below: Clear views into the distance at Cape Arid National Park post-fire. *Photo: Sarah Comer*

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EDITORIAL

Greetings everyone!

It is a great pleasure to present this issue of *Western Wildlife*. It is fortuitous that this issue coincides with an exciting development for the *Land for Wildlife* (*LFW)* program in WA. The Department of Parks and Wildlife is very pleased to be joining with WA's Natural Resource Management Program (NRM WA) in a collaborative approach to delivering the *Land for Wildlife* program. The department and NRM WA have recently signed a partnership agreement to provide support to registrants at a local scale. NRM organisations are key members of local communities and are well aware of local issues that affect *LFW* registrants. We intend to work together to seek additional resources to expand *LFW* presence in the regions in the future.

We are looking forward to developing this partnership and continuing to support members in managing their bush for wildlife.

LFW has welcomed the owners of five new properties into the program over the past year. I have developed and trialled an evaluation method for *LFW* registration based on landholder-provided information and other available data. The landholders and I then identify management options that will support wildlife on the property. Please continue to encourage landholders to consider joining the program.

This issue of *Western Wildlife* contains several different articles about fire, a dynamic element in our landscapes. Spring fires have had a significant impact on threatened fauna of the South Coast, with urgent protection underway to prevent extinctions. A CSIRO and Ngadju team looks in detail at traditional burning knowledge from the Great Western Woodland area, with the ultimate intention of meshing this knowledge with 'western' practices and developing best practice fire management in that part of the State. We also look at banksia woodland recovery after fire, and the ways different plant species regenerate over time.

Fauna surveys of a bush remnant near Kulin provide a very interesting insight into the area's ecology, and indicate that in high quality habitat, small animals are able able to persist even with the presence of introduced predators.

I welcome contributions from *LFW*ers about their successes and trials, so learnings can be shared with other members. Please let me know if you have reached a milestone – perhaps birds nesting in your revegetation, a new animal or interesting behaviour on the remote camera, phascogales moving into the nestbox you put up, or getting somewhere at last with weed control.

I also welcome your feedback about *Western Wildlife*, including suggestions for feature articles.

All the best,
Gillian Stack
Land for Wildlife Coordinator

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Left: A (scarcely there) spiny-tailed gecko.

Photo: Mark Dickinson

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Over summer the Parks and Wildlife team retrieved some of the automated recording units (ARUs) that were deployed after the October fires and conducted surveys of the two unburnt pockets in Cape Arid and Nuytsland Nature Reserve. A small number of birds were heard in an unburnt patch between the fires in early February, which is encouraging, and also in Nuytsland. The challenge now is to continue with management of introduced predators under *Western Shield*, as the parrots (and other animals) are more vulnerable without cover.

Parks and Wildlife conducted an emergency delivery of the feral cat bait *Eradicat*® in Cape Arid in December, and the Integrated Fauna Recovery Project team trapped for feral cats around the unburnt pockets of ground parrot habitat. Seven feral cats were removed in November, and 10 in January. Minimising pressure from introduced predators is a key recovery action and a priority for the future.

Australasian bittern habitat was also impacted by significant fires in the Merivale area, east of Esperance. Big Boom Swamp has been a hotspot of activity for this species in recent years. This area and surrounding wetlands to the north of Cape Le Grand National Park were burnt during the November fires. Water and bittern monitoring equipment situated in the wetlands was lost in these fires, but ARUs have been reinstalled to monitor bittern activity at this site along with re-establishment of the depth and rainfall logging equipment.

Surveys to investigate the impact of fire found that approximately 80% of the wetland was affected, including sedges in standing water. A narrow section of reeds in fairly shallow water provided some remnant habitat at this important site. Three Australasian bitterns were flushed out by surveyors, but no others were seen or heard calling. One predator-killed bittern was also found, highlighting the vulnerability of the birds in this thinner cover, closer to shore than would be preferred.

In the months since the fire the major sedge present (jointed twig rush; *Baumea articulata*) has regenerated across the burnt area to a height of 80cm. It is unlikely to be suitable for breeding this spring, but there is a good chance it will be next year. With time, Big Boom Swamp will recover and thankfully for the bitterns, there are viable options a short flight away for their ongoing requirements.

The nearby Cape Le Grand National Park has a large number of wetlands with varying depths and habitat types and was not impacted by this fire. Some of these wetlands have habitat and water levels that would have been good enough to provide temporary refuge for the bitterns during the fire events and importantly, provide alternative breeding and feeding habitat across fluctuating yearly winter rainfall.

Australasian bittern seem to have very specific breeding habitat requirements in WA and only a few wetlands are regularly used for breeding. With the degradation of bittern-friendly wetlands in the Muir-Unicup area, the greater Le Grand area is now unique in its ability to provide a suite of suitable, freshwater wetlands that are not dependant on consistent rainfall and because of the large area, are relatively safe from the impacts of any one fire.

[For more information on Australasian bitterns see Western Wildlife *16/1, and for western ground parrots see* WW *13/3 and 12/1. See the publications page of the website for the last two. Editor]*.

Sarah Comer is South Coast Regional Ecologist and Alan Clarke works in the Ecosystem Science Program at Parks and Wildlife.

Above: Australasian bittern. ***Photo: Alan Clarke***

MEMBERS

FAMILY VISION PROTECTS BUSH REMNANT

Andrew Chapman

This story began for me in the 1970s when I worked as a biologist for the Western Australian Museum and worked on fauna of WA wheatbelt nature reserves. Queries in letters about fauna on her patch of bush came across my desk from time to time from a Mrs Giles of Kulin who obviously had some considerable knowledge of local flora and fauna. Some 35 years later I met her son, Keven, and we made the connection to his mother. Keven told me that the patch of bush which so delighted his mother was still on the farm and he often wondered what lives in there. From here one thing led to another and in April 2010 we commenced a fauna survey.

The isolated remnant occupies 200 hectares approximately 19km SSE of Kulin on the farm 'Kanandah'. It is located on a high lateritic ridge which slopes away to the east and west into gimlet and salmon gum woodlands as well as mallee and sheoak shrublands and includes some granite outcropping. At Mrs Rhoda Giles' insistence it was never cleared when the farm was developed in the 1950s and 60s. It has always been fenced, never grazed, hasn't been burnt for at least 70 years and accordingly is in almost pristine condition.

The April 2010 survey employed the usual techniques of pit traps, Elliott traps, cage traps, opportunistic searching as well as nightstalking. In addition, Avril Baxter (then *LFW* Officer in Narrogin) arranged for remote camera video to supplement the trapping results. The survey ran for seven consecutive days. The first survey followed a run of three rainfall-deficient years, which undoubtedly influenced the result. However, there were some pleasant surprises. Red-tailed phascogales were abundant with 15 recorded from five sites, and one malleefowl observed feeding in a paddock adjacent to the remnant. The remote camera video recorded phascogales feeding in flowering round-fruit banksia (*Banksia sphaerocarpa*), suggesting that they were in fact feeding on nectar or pollen rather than insects - either way they almost certainly have a role in the pollination of these flowers. This has been written up in the journal '*The Western Australian Naturalist'.*

A follow-up survey was undertaken in October 2015. It also ran for seven consecutive days, and came on the heels of three rainfall-deficient years. Keven said to me after we looked at his rainfall figures, 'it's a wonder we manage to grow anything out here!' In spite of this the results were, once again, encouraging. We recorded honey possums, little long-tailed and fat-tailed dunnarts as well as an additional frog, five reptiles and seven bird species. Two recently used malleefowl nests were located.

Above: a recently used malleefowl nest mound found on Kanandah. ***Photo: Andrew Chapman***

Right: A red-tailed phascogale. ***Photo: Rob McMillan***

Both surveys included a community component with local farmers and townsfolk invited to attend trap inspections and walks. Each survey concluded with a social barbecue at which results, photos, videos and maps were available to interested participants.

At the conclusion of both surveys the total fauna for the remnant amounted to 47 bird, six mammal, four frog and nine reptile species. These figures fit in very well with previous work on wheatbelt reserves which looked at the relationship between size of reserve and number of species present.

There is a small suite of resident singing birds in this remnant, including red-capped robin, western yellow robin, golden whistler, grey shrike-thrush, white-browed babbler, weebill, broad-tailed thornbill and blue-breasted wren. They have no connection to others of the same species outside this remnant as they can't move across the cleared farmland that surrounds it. They persist in this landscape only because there is a big enough area of vegetation to support viable populations within it.

Interestingly, no phascogales were recorded in 2015. This does not mean that they are no longer present; rather it is consistent with what is known of their reproductive biology. Males only live for 11-12 months and die after mating in May-July, so few if any males would be present in October. Females would be raising young then and not moving far from home, so would be unlikely to be trapped.

What is really worth recording about the total result is that the present fauna has survived on an isolated remnant for 40-50 years in spite of the presence of introduced predators (foxes and feral cats). This attests to the quality of the habitats present. Because they are not degraded they still provide the resources for fauna (especially smaller animals) to survive in spite of predation.

In conclusion, the surveys show that the foresightedness of Mrs Rhoda Giles and Mrs Lesley Giles in retaining this bush was well and truly justified. Keven Giles has honoured his mother's wish and embarked on a management program for the remnant including taking out a conservation covenant through Parks and Wildlife as well as a Land for Wildlife agreement, and initiated fox and rabbit control.

Andrew Chapman is an experienced zoologist.

Right: Gimlet woodland shining in the sun. *Photo: Andrew Chapman*

Below left: A juvenile fat-tailed dunnart. These small marsupials feed on insects and share a communal shelter under a log or rock. They store fat in their short tail to use when food is scarce. *Photo: Andrew Chapman*

Below right: Community checking pit traps for fauna during a survey. *Photo: Rob McMillan*

NGADJU KALA: ABORIGINAL FIRE KNOWLEDGE IN THE GREAT WESTERN WOODLANDS

Suzanne Prober, Emma Yuen, Michael O'Connor & Les Schultz

Fire regimes in south-western Australia have changed significantly since European settlement. In the Western Australian wheatbelt, fire has typically become uncommon due to fire suppression and fragmentation of native vegetation. To the east in the Great Western Woodlands by contrast, there are concerns that an increase in the frequency of large, intense wildfires is eliminating old-growth woodlands too rapidly.

Despite popular texts arguing that frequent burning by Aboriginal people prevailed across much of Australia before European settlement, we don't have sufficient knowledge of the characteristics of Aboriginal fire regimes to inform improved fire management in these regions. Understanding and documenting Aboriginal fire regimes can potentially contribute to the use of fire to conserve biodiversity, as well as empowering Aboriginal people to regain land management roles.

We collaborated with more than 40 people from the Ngadju nation to document their knowledge of fire (**kala**) in the five million hectare Ngadju native title area centred around Norseman in the Great Western Woodlands. This region contains relatively intact, semi-arid landscapes with mosaics of eucalypt woodland, shrubland, mallee and salt lake systems, including many similar ecological communities to the Western Australian wheatbelt.

Ngadju kala

Consistent with the well-established importance of Aboriginal fire in Australia, Ngadju told us that planned fires play a significant role in Ngadju daily life and land management: '*Fire is culture: water is number one; fire is second only to water'.*

From a land management perspective, Ngadju explained that fire in the right place keeps the country healthy and open for access, encourages greenpick to bring animals to the hunting grounds, can be used to smoke animals out of the scrub, and stimulates plant growth, flowering and germination. In the wrong place however, Ngadju emphasised that the bush can take centuries to recover and important assets such as big trees, logs, fruit trees, medicine bushes, nests, and 'water trees', can be lost.

The red on the map shows the area known as the 'Great Western Woodlands'. A large part of the Great Western Woodlands is in the Ngadju Native Title Claim Area, as indicated by the yellow line. ***Map: Ngadju Conservation***

A Ngadju Kala workshop. ***Photo: Suzanne Prober***

Therefore, Ngadju use of fire for land management is characterised by its selectivity, in contrast to other parts of Australia such as the tropical savannas and spinifex landscapes that are burnt frequently. Ngadju identified three main types of fire regime applied in the Great Western Woodlands:

- minimal planned fire in expansive, relatively fire-resistant vegetation;
- frequent planned fire in intensively-used landscape elements (e.g. rockholes); and
- selective planned fire in wildfire-prone vegetation.

Across these three broad regimes, the type of landscape fire applied was typically described as '*cool and smoky*' or '*cool and trickly*', and could be done in suitable cool weather conditions anytime outside the hot season (about November to February). In conducting a fire, Ngadju emphasised the importance of ensuring fire-sensitive assets are protected: '*Do a quick walk through. Check that you're not going to burn something that's important for the land like mallee hens' nests'*. Protecting these involved lightly burning around them, or scraping or sweeping away litter using broombushes such as emu bush or tea tree.

Fire resistant vegetation managed minimally with planned fire

Ngadju emphasised that large areas of vegetation in their country, such as extensive old growth salmon gum and gimlet woodlands, saltbush and bluebush plains, succulents around the lakes, and stony country, are fairly resistant to fire. They recognised these don't easily burn in wildfires, and can provide natural firebreaks. However, Ngadju described that if they do burn, they are slow to recover. Most Ngadju felt that the dense regrowth woodland is good for nothing: '*It gets that thick, a kangaroo can't get through it. We just go elsewhere*'.

Ngadju told us they only applied fire in these areas in small patches, to clear around campsites or special assets. Instead, the best way to help prevent woodland fires is to burn a buffer around the edges of the tree line. '*We'd burn back from the woodland, back this way. Rather than burning to the woodland, burn away from it.*

Places requiring frequent planned burning

By contrast, frequent planned burning is considered important in specific landscape elements that are important for camping or hunting. These include intensively-used areas around rockholes (granite outcrops with important water supplies), spinifex grasslands (including those with mallees), spear grass grasslands found near salt lakes, and the coastal scrubs where Ngadju country meets the coast.

Ngadju indicated that fires in these areas need to be frequent, every 3-10 years in any one place around rockholes and in coastal scrub, to keep them open and accessible and to encourage greenpick for animals: '*The bush is now all scrubby again. It has always been kept down in the past; even we did that around the rockholes. The family would go back every few years and do it again...'.* Ngadju indicated that only a small area needs to be burnt at any one time – perhaps the size of a football field or two.

It is the grasslands that Ngadju felt needed burning the most often - every year if there is rain, to attract the kangaroos. It was still considered important to leave some unburnt patches though; for example, this allows the emus to lay their eggs in the spinifex: '*When the emu lays egg, he lays egg in that* [unburnt spinifex]'.

Wildfire-prone vegetation managed selectively through burning

Ngadju accepted wildfire as a natural part of the fire regime in 'bushfire' country such as the shrublands and mallee scrubs of the expansive sandplains. They considered these areas can be left to look after themselves, and that it is best to

Salmon gum – gimlet woodlands are considered relatively fire-resistant. ***Photo: Suzanne Prober***

Frequent cool fires & firewood collecting kept the bush clear around rockholes – '*you should be able to see right through the wattles*'. ***Photo: Suzanne Prober***

stay away from them in summer. However, Ngadju did apply fire for specific reasons on the sandplains, particularly for access across extensive travel routes e.g. from Norseman or Coolgardie to Southern Cross; to protect sacred sites; or to provide a quick meal: '*If we burn out a patch of that* [sandplain] *there – we know we've got a feed. That's our Woolworths, Coles*'. They also recognized that fire on the sandplains is good for some plants and animals but not others, for example: '*Fire is the worst thing going for the malleefowl. They get nothing to eat; all the seeds are gone. They fly away.'*

Ngadju felt that today, one might try to break up the large sandplain fires using fire breaks.

A landscape view

While it is clear that Ngadju lit many small, purposeful fires across their country, it is more difficult to estimate how these fires collectively influenced the landscape. Ngadju emphasised that decisions to light fires tended to be made locally according to need, but nevertheless recognised that at the broader landscape scale, the various fire management activities across Ngadju country could augment the natural vegetation mosaics to help break up extensive wildfires: '*The reason why there's so many* [woodland] *wildfires right now is because we're not burning regularly using little patches'*.

Conclusions

Ngadju fire knowledge helps to fill an important gap in understanding Aboriginal fire regimes in wooded landscapes of southern Australia, and highlights a novel balance between frequent and constrained use of fire. The intersection of the natural vegetation mosaic with the varied Ngadju applications of fire emphasises a very fine-grained scale of land management applied across large tracts of country.

Importantly, in looking to the future, Ngadju felt that their re-engagement in fire management could contribute to increased visitation to country and to livelihoods in land management roles. They emphasised a desire to '*combine the best of old and new ways*', drawing on traditional knowledge for looking after country but progressing the application of new technologies in fire management.

Acknowledgements

This study worked with people of the Ngadju nation. We emphasise that the knowledge documented is the intellectual property of the Ngadju nation. Senior author Les Schultz is a custodian of Ngadju fire knowledge through his Uncle. He facilitated the project in collaboration with Goldfields Land and Sea Council, CSIRO, The Wilderness Society and GondwanaLink. It was funded by the Department of Parks and Wildlife through its Great Western Woodlands Strategy, with support from the Australian Government through the Great Western Woodlands TERN Supersite. Darren Forster and Linden Brownely (Goldfields Land and Sea Council) facilitated the project by organising and contributing to workshops, field trips and steering committee meetings. Lachie McCaw, Ryan Butler and Aminya Ennis (Parks and Wildlife) contributed to the project steering committee, and Fiona Walsh and Jocelyn Davies (CSIRO) provided advice on project design and logistics.

Prober SM, Yuen E, O'Connor M, Schultz L (in press) Ngadju kala: Australian Aboriginal fire knowledge in the Great Western Woodlands. Austral Ecology.

[Contact the Editor for assistance accessing related papers.]

Suzanne Prober, Emma Yuen and Michael O'Connor worked on this project through CSIRO Land and Water, and Les Schultz through Ngadju Conservation.

Below: Fires are common in sandplain shrublands.
Photo: Lachie McCaw

Above: Trickling fire in the Great Western Woodlands.
Photo: Ryan Butler

NEW BIODIVERSITY LEGISLATION FOR WESTERN AUSTRALIA

Sophie Moller – adapted from Bushland News *Autumn 2016*

After many years of development, Western Australia is now one step closer to having new conservation legislation, with the introduction of the Biodiversity Conservation Bill 2015 to Parliament on 25 November last year.

The Bill will replace two pieces of out-dated legislation – the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929*. It introduces a new approach that encourages conservation and supports people doing the right thing, with higher penalties to act as a deterrent to those contemplating actions that have serious impacts on wildlife conservation. It brings a modern approach to the listing of species with listing in internationally recognised threat categories, used by the International Union for the Conservation of Nature (IUCN). Additionally, the Bill provides for the recognition and listing of threatened ecological communities to help ensure their conservation.

The Bill features new opportunities for landholders and managers to enter into biodiversity conservation agreements and covenants. These are designed primarily to recognise, encourage and facilitate private biodiversity conservation efforts.

The Bill also introduces significant new penalties, with offences for harming critically endangered species and ecological communities attracting a maximum penalty for an individual of $500,000. This is a significant improvement on the $10,000 penalty in the Wildlife Conservation Act and the lack of recognition of threatened ecological communities in that Act.

The Bill also introduces a new concept of Critical Habitat, which is a subset of the habitat of a threatened species or threatened ecological community that is determined to be the most vital and essential for that species or community to survive. Recognising such habitats provides a new mechanism for cooperative conservation management and raises awareness of the most special habitat areas.

Significantly, the Bill will repeal the Sandalwood Act, and provides new measures for the control and management of this naturally occurring wild resource. In recent years unauthorised harvests of wild sandalwood have had major impacts on the conservation status of the species. With wild sandalwood valued at more than $10,000 per tonne, the new maximum penalty of $200,000 for an individual and $1 million for a corporation (compared to the maximum Sandalwood Act penalty of $200) will help reduce unlawful harvesting. The new provisions in the Bill also include the means to regulate the transport, storage and sale of wild sandalwood ensuring only legitimately obtained sandalwood is traded.

The Bill provides for recognition and protection of Threatened Ecological Communities. *Photo: Val English*

The Bill also recognises other State approval mechanisms, such as approvals under the *Environment Protection Act 1986*, to avoid duplication. It has been drafted to provide for the possibility of exemptions from approvals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* for matters that are adequately dealt with under a State Biodiversity Conservation Act, which will considerably streamline decision making processes.

The Bill is an election commitment and it is anticipated that the Bill will be passed by Parliament during this year. A copy of the Bill and its explanatory memorandum, which explains provisions clause by clause, is available from State Parliament's website (www.parliament.wa.gov.au).

Sophie Moller is a Principal Policy Officer with Parks and Wildlife

RECOVERY OF BANKSIA WOODLAND AFTER FIRE

Mark Brundrett & Vanda Longman

Banksia woodland plant communities in WA are highly flammable and the frequency of fires in urban areas is increasing substantially. Although many Australian plants have adaptations that help them recover or recruit after fire, it can take years for banksia woodland plants to recover fully and the composition and structure of the vegetation may change after fire. Despite the increasing frequency of fire, little is known about mortality rates and recovery times for banksia trees after fires in Perth.

In 2013, the Banksia Woodland Restoration Project run by Parks and Wildlife established quadrats in banksia woodland in Jandakot and Beeliar Regional Parks to evaluate management of perennial veldt grass (*Ehrharta calycina*), a serious environmental weed. In February 2014, seven quadrats in Shirley Balla Swamp were burnt in a fire lit by an arsonist. This provided an opportunity to study the effects of a hot summer bushfire on plant diversity, density and cover, using data from before and after the fire. We also documented the timing and method of recovery after fire for each plant species.

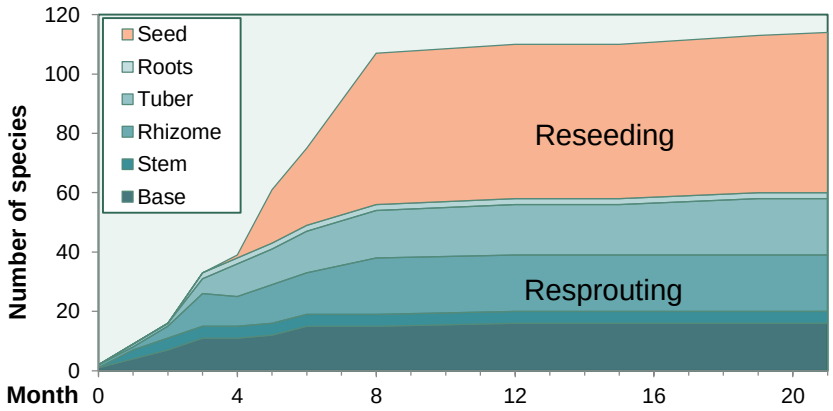
Within the first month after fire we observed resprouting of grasstrees (*Xanthorrhoea* sp.), zamias (*Macrozamia fraseri*), pineapple bush (*Dasypogon bromeliifolius*), bloodroot (*Haemodorum spicatum*) and *Lyginia* species. Geophytes such as bloodroot, orchids, milkmaids (*Burchardia congesta*) and the weedy pink gladiolus (*Gladiolus caryophyllaceus*) started to re-emerge in autumn. Other species resprouted more slowly, such as yellow buttercups (*Hibbertia hypericoides*), first observed in June. Shrubs such as white myrtle (*Hypocalymma angustifolium)* and *Melaleuca thymoides* were observed to resprout several times if initial attempts failed. Many species regenerated both by resprouting and reseeding. These included *Amphipogon turbinatus,* prickly conostylis (*Conostylis aculeata*), *Melaleuca thymoides, Phlebocarya ciliata* and *Lomandra* species. Even prickly moses (*Acacia pulchella*) and common brown pea (*Bossiaea eriocarpa*), which are primarily reseeders, resprouted in some cases. Resprouting occurred from roots, tubers, rhizomes, stems or bases.

Resprouting plants dominated initially, but those which recruited from seed became almost as diverse during the first winter after the fire (months 4-7). Native understorey plant cover has continued to steadily increase, reaching 40-70% of the pre-fire native cover 19 months after the fire.

Annual native plants became very common after the fire, especially the native grass *Austrostipa compressa*, which formed extensive grasslands in spring. Seedlings of perennial native plants were also very common, with up to 86 *Hibbertia subvaginata* seedlings being recorded in just one square metre.

Unfortunately, many weed species were growing vigorously by the end of the first winter after the fire. Most weeds grew from seed, some prolifically. For example, we counted 71 veldt grass seedlings in one square metre. Perennial veldt grass also started resprouting after two months. Due to this rapid response, it is likely to benefit more than most native plant species from the increased available soil nutrients after fire.

Fortunately, this site was sprayed with grass-specific herbicide in 2013 so veldt grass dominance was initially greatly reduced. Pig face (*Carpobrotus edulis*) seedlings were frequently seen germinating from rabbit and kangaroo droppings, indicating they are major vectors for this weed.

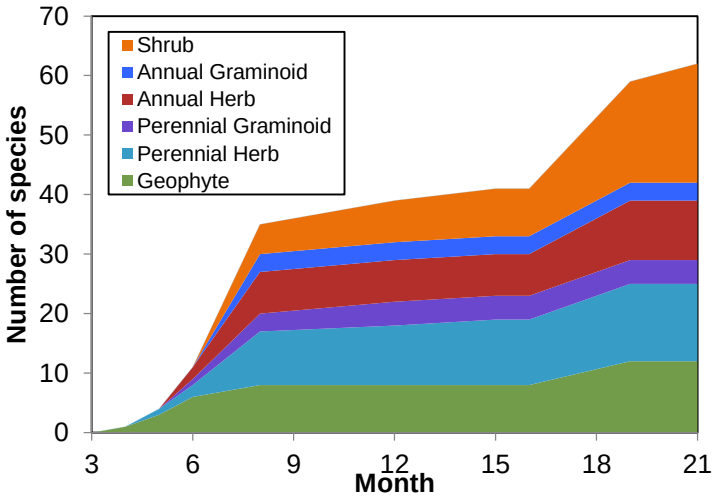


Changes in the relative importance of different native plant regeneration strategies after the fire. This graph shows the species richness of plants which germinated from seeds or resprouted from roots, tubers, rhizomes, stems or bases.

The diversity of native plants also changed due to fire, with eight species present only before the fire and 16 species present only after fire. The latter included short-lived fire-responsive species such as scarlet runner (*Kennedia prostrata*), grey stinkwood (*Jacksonia furcellata*), *Macarthuria apetala* and catspaw (*Anigozanthos humilis*). However, the biggest change was in weed diversity, with 27 new species recorded in plots, including Paterson's curse (*Echium plantagineum*), prickly lettuce (*Lactuca serriola*), bushy starwort (*Symphyotrichum squamatum*), red ink plant (*Phytolacca octandra*), false hawkbit (*Urospermum picroides*) and several eucalypts from eastern Australia. The fire resulted in new outbreaks of major weeds that require management.

The first plant to flower after the fire was the red ink sundew (*Drosera erythrorhiza*) in early June. By 21 months after the fire, 62 native species out of 121 had flowered in the quadrats and 32 species had produced seed. Plants that flowered and seeded particularly well after the fire included grasstrees and Christmas trees (*Nuytsia floribunda*). Several orchids that only flower after fire were also discovered – red beaks (*Pyrorchis nigricans*) and the bronze leek orchid (*Prasophyllum giganteum*). Bloodroot was rarely seen before the fire, but it flowered and seeded prolifically after the fire, with some plants growing to well over head height.

There was spectacular banksia seed germination post-fire, with over 13,000 banksia seedlings per hectare in burnt areas, compared to about 600 per ha before the fire. About 20% of the new germinants survived the summer of 2014-15, by which time banksia germination rates had returned to pre-fire levels.



The cumulative species richness of flowering native plants grouped by life and growth forms, over 21 months post- fire. This graph uses data from seven 100m^2 quadrats, where there were 121 native species in total.

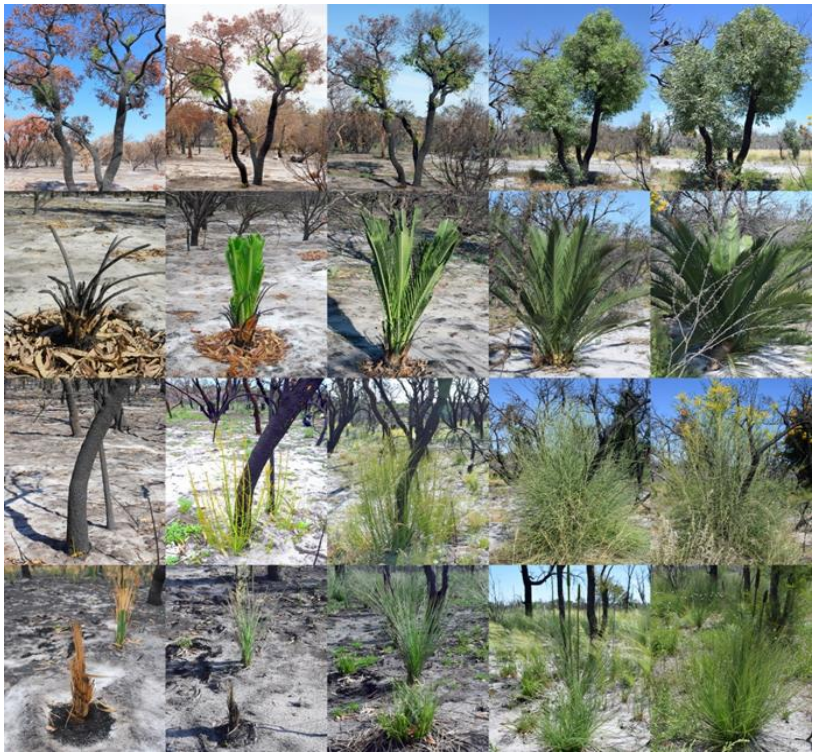
Note: Graminoids are grass-like plants, including grasses, sedges and rushes. Geophytes are plants with an underground storage organ, like orchids.

Christmas trees recovered vigorously after the fire, resprouting from the canopy or base or roots. They also grew from seed, with 51 seedlings in one 100m^2 quadrat. Impressive growth also occurred in resprouting pricklybark (*Eucalyptus todtiana*) trees, as well as grasstrees and cycads, as shown in the photos overleaf.

Three banksia species occur on the site: candle banksia (*Banksia attenuata*), firewood banksia (*B. menziesii*) and holly-leaf banksia (*B. ilicifolia*). All three banksias had started resprouting from the base, stem and/or canopy by 44 days post-fire.

From left to right: candle banksia, holly-leaf banksia & firewood banksia (this one flowering three years after fire).

Photos: M. Brundrett



Time series photographs illustrate the recovery of common banksia woodland plants in the first 2 years after fire at Shirley Balla Swamp (Feb 2014 to Nov 2015).

Row 1 - *Eucalyptus todtiana*, a tree resprouting mainly from the canopy.
Row 2 - *Macrozamia fraserii*, a cycad which resprouts vigorously and rapidly from the base.
Row 3 - *Nuytsia floribunda*, the WA Christmas tree, resprouting from the base. This tree can also resprout vigorously from the trunk and from roots. This specimen flowered in the second spring after the fire.
Row 4 - *Xanthorrhoea* sp., a grasstree which resprouts from the base. The foreground plant was very severely impacted but still eventually recovered. The background *Xanthorrhoea* specimen flowered in the first spring after the fire.

Photos: M. Brundrett

Unfortunately, 39% of all banksias had died by the second winter after the fire, most being killed outright, but some after failed attempts at resprouting. Smaller trees, with stem diameter less than 20cm, were more likely to die than larger trees, which were more likely to resprout vigorously in the canopy. Thus, frequent fires may decrease tree cover in banksia woodland, due to the higher susceptibility of smaller trees to fire.

This research also provided valuable information about fire impacts on smaller plants, identifying some species that were absent after fire and others that substantially benefited from fire. These results support the idea that a mosaic of different fire ages should help to maintain high species richness in banksia woodland. However, fire-responsive plants that grow from seed stored in topsoil require sufficient time between fires to set seeds to replenish soil seed reserves. Plants that resprout after fire also require time to rebuild their canopy and replenish depleted reserves. More research is required to understand how long it takes individual species to recover after a fire. In particular, banksia trees seem to require several decades of growth before they are large enough to become resilient to fire.

Mark Brundrett is a Senior Ecologist and Vanda Longman is a Conservation Officer with Parks and Wildlife.

AUSTRALIAN PLANTS AS WEEDS IN SOUTH AFRICA

Greg Keighery

The recent South African Plant Invaders Atlas newsletter noted that WA's showy banksia (*Banksia speciosa*) has invaded Agulhas National Park and three eastern states banksias (*B. ericifolia*, *B. integrifolia* & *B. serrata*) are also spreading into bushland. Also invading South Africa are garden plants tall kangaroo paw (*Anigozanthos flavidus*), hillock bush (*Melaleuca hypericifolia*) and bottlebrush (*Callistemon*) hybrids. The banksias were originally imported and grown for cut flowers and have spread after fire from abandoned plantings. Is this a portent for the future? Many South African Proteaceae (eg proteas and *Leucospermum*) are grown in WA for cut flowers. *Protea repens* has already established two feral populations in Perth Hills.

***Banksia speciosa*, often called showy banksia.**
Photo: Mike Clark **(Under Creative Commons license)**

BLUE WRENS

After a week of fires, road closures and general upheaval, ash deposits, high temperatures, high winds and brown skies, out of the blue come the blue wrens, AKA the poppets.

We haven't seen them for four months and had assumed that our new resident sparrowhawk had eaten them. We always hoped they had just moved away for safety. Perhaps the sparrowhawk has moved on now too, because back they all came, a family of ten - three males and seven females. "Here we all are, where are the worms, meet the children, where are the worms?" I suspect that they have found another house in our general area to feed them as the baby poppets had no issue sitting on my shoulder, head and hands.

They have been given a refresher course in pest management which has gone quite well. Mr Bluey was shown a caterpillar on a tomato leaf, he shouted to the rest and they were all in the veggie patch hunting. There were a couple of mishaps - two babies couldn't work out the way in or out for a while but all OK now. No wonder the veggie patch was inundated with caterpillars this year - it was due to their absence. Anyway, they are on probation this week to see if they can get the pests under control and then, only then, will they get a treat.

Nice to have them back as we have missed them as much as our garden has.

Julie Williamson

Splendid blue wrens refreshing themselves. ***Photo: Julie Williamson***

PHASCOGALE BOX

LFWers David and Denni Garnett were familiar with many of the birds that come and go, but set up some remote cameras to see what they could discover about other residents on the property. One happy discovery was that they had pygmy possums in several areas.

They built and installed a nest box, put some chook feathers and some sheep wool off the fence into the box, and wondered if a pygmy possum might move in. Later they observed some soft dry grasses had been added to the collection.

When they looked at footage from the camera they had set in that location however, it was a very fleet-footed phascogale that they had captured on film. They are pleased to be able to observe the animals behaving naturally.

Gillian Stack

Western pygmy possum. ***Photo: Wayne Gill***

Phascogale making the most of the facilities. Video shows her moving in and out of the nesting box. ***Photo: David and Denni Garnett***

FAUNA

SOUTHERN BOOBOOK RESEARCH

Mike Lohr

Southern boobook. ***Photo: Matthew Swan***

The southern boobook (*Ninox novaeseelandiae*) is widespread throughout Australia, and is more common than any other Australian owl.

However, BirdLife Australia has identified the southern boobook as a species that has suffered range-wide decreases in numbers across Australia since 1999, and the factors that are driving this consistent decline are not clear. I am investigating the impacts of habitat fragmentation and other threats on boobooks in Perth and surrounding areas.

- **Inbreeding** The fragmentation of boobooks' woodland habitats by urban development and agriculture may be making it difficult for birds to find new territories. This can lead to inbreeding, which can decrease survival and fertility. I plan to examine the genetics of urban, agricultural, and woodland populations to see if inbreeding is a problem.
- **Nest hollow loss** Boobooks need tree hollows for nesting. Small remnant woodlands lose trees with hollows faster than larger woodlands. Introduced bird species like long-billed corellas and overabundant species like galahs may be competing with boobooks and other hollow-nesting birds for scarce nesting sites. I will test whether providing artificial nest boxes increases boobook numbers in areas where they are not present and examine what other species use these boxes and might be competing with boobooks.
- **Anticoagulant rodenticides (rat poison)** Some types of rat poison that use blood thinners to kill rodents, can travel up the food chain when poisoned rodents are eaten by predators. I will investigate whether traces of these substances are present in boobooks and whether the type of habitat they are using affects the amount and type of rat poison they are exposed to.
- **Toxoplasmosis** Toxoplasmosis is a disease that affects both humans and wildlife. It is caused by a microorganism and is primarily spread by feral cats. Toxoplasmosis infection changes the brain chemistry of its hosts and can cause slight behavioural changes in both humans and animals. In humans it has been linked to higher risks of mental illnesses, risky behaviours, slowed reaction time and car accidents. I want to find out how common this infection is in boobooks, whether it may increase their risk of getting hit by cars, and whether it is more common in boobooks living in habitats with more free-roaming cats.

Understanding the threats facing boobooks and where these threats are most severe will help explain the ongoing decline in boobook populations and inform plans to reverse it.

Can you help?

If you come across a dead boobook or boobook feathers, please let me know! If it's reasonably fresh, place it in a plastic bag and keep it cool. Refrigerators are best but freezers are OK too. Give me a call and I will come pick it up as soon as I can! Even if the carcass is not in good condition, it will still be important to the genetics

portion of my study. (Collection is under Regulation 17 License SF010519).

I am also very interested in reports of boobooks seen during the day, especially in the Perth hills or the wheatbelt. Day-roosting birds are often more relaxed when being handled. If you report one, I'll come out to the location right away!

What will I do with them?
In road-killed boobooks, I'll test livers, heart and muscle tissue. Livers will be analysed for seven different kinds of rat poison. Heart and muscle tissue will be used to test for the disease toxoplasmosis. I'll also use small tissue samples to test whether genetic diversity has been affected by habitat fragmentation.

If live boobooks are seen during the day, I'll capture them, take a small blood sample to test for toxoplasmosis and genetic analysis, take a few measurements and return them to their roost.

Contact: by phone (0407 147 901) or email (m.lohr@ecu.edu.au).

Mike Lohr is a PhD student at Edith Cowan University's Centre for Ecosystem Management.

Mike Lohr studying a boobook before returning it to its roost. *Photo: Margaret Owen*

CORALIE

A juvenile western ringtail possum, seen on a Land for Wildlife property near Yallingup. *Photo: John Miller*

Coralie is the name given to a young western ringtail possum who visited John Miller recently. She and her generously built mother like to rest under the deck at his place during the day, but during a very hot period Mum evicted Coralie from the pouch, perhaps tired of an uncomfortable youngster in a confined space (happens to the best of us).

Coralie seemed a little disoriented but otherwise unharmed. John tucked her in his shirt pocket (where she slept contentedly regardless of what else was going on), and sought care advice from specialists.

On a cool evening a few days later she was vocalising, and her mother came looking for her, climbing on the door screen. They were reintroduced, and after a brief smelling session, Coralie squeezed back into the now very tight pouch, and they waddled off into the night together.

Western ringtail possums are endangered, and this sighting has been passed on to Parks and Wildlife. Thank you for sharing your experience with us John, and I look forward to more news!

Gillian Stack

WEEDS

WEEDS TO WATCH

Greg Keighery

Wonga wonga vine or inland wonga vine

Wonga wonga vine (*Pandorea pandorana*) is a widespread vine with white trumpet shaped flowers that grows in eastern Australia, extending to Papua New Guinea, Solomon Islands, New Caledonia and Vanuatu. There are disjunct populations of this species in the Central Australian Ranges, the Bungle Bungles and the Pilbara. The species is a naturalised weed in New Zealand. Reports of this species spreading into bushland in Bramley National Park, near Margaret River and the Perth Hills are being received. Peter Day of Kalamunda has noted that of the numerous cultivars of this species only the white flowered form is seeding. It appears to have passed the initial build up phase and is now entering the invasion stage.

Wonga wonga vine. ***Photo: Greg Keighery***

Another star-of-Bethlehem

Not quite Christmas - John Moore from Department of Agriculture and Food WA is working to control a naturalised population of garden star-of-Bethlehem (*Ornithogalum umbellatum*) near Ravensthorpe. This species is a summer host for barley rust (*Puccinea hordei*), and allows sexual reproduction to occur, potentially producing new strains able to infect resistant plants. Garden star-of-Bethlehem is well established in South Australia. We have three other species of star-of-Bethlehem already naturalised and weedy in WA.

Garden star-of-Bethlehem could boost the threat of barley rust. ***Photo: Rhonda Surman*** **(Under Creative Commons license)**

Another Galium

Western Australia has six members of the genus *Galium* (bedstraws, cleavers or goosegrasses), of which five are weeds. Another to add now is marsh bedstraw (*Galium palustre*). This very delicate white flowered annual vine was obviously imported as a garden plant and has been recently recorded growing rampantly in creeks around Northcliffe and towards Pemberton. Large scale fires in this area have opened up many of the creeklines and may help spread of this potentially serious wetland weed. This species is well established in eastern Australia and other areas.

Marsh bedstraw is a particular threat to wetland areas. ***Photo: Greg Keighery***

Eastern Australian bottlebrushes

Introduced bottlebrushes are spreading rapidly in lakes and creeks around Perth south to Bunbury. There are several species involved, including crimson bottlebrush (*Callistemon citrinus*) and weeping bottlebrush (*C. viminalis*), as well as various selections and hybrids. The species and selections readily cross, and many can set seed without fertilisation giving rise to pure true breeding forms. Currently most are found outside the range of our two native bottlebrushes, but recently hybrids were found with local Albany bottlebrush (*Callistemon glaucus*) near Lake Powell, between Albany and Denmark.

Greg Keighery is a botanist and research scientist with Parks and Wildlife.

Introduced bottlebrush.

Photo: Greg Keighery

AUSTRALIA GIVES BACK TO THE MEDITERRANEAN

Greg Keighery

J-M Dufour-Dror (2012) Alien Invasive Plants in Israel Middle East Nature Promotion Association, Jerusalem.

Not surprisingly given the similarity in climate, nearly all the weeds listed in this book are recorded in Western Australia. However, one major exception is camphor weed (*Heterotheca subaxillaris*), a daisy from U.S. and Mexico. This species transforms coastal dunes, filling in open areas and creating a monoculture. Already a weed in Argentina, it is not a species we need.

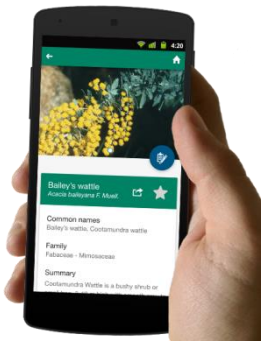
However, to show that WA gives as well as receives, we have contributed to Israel's weed flora with four invasive species: bramble wattle (*Acacia victoriae*; introduced for afforestation), orange wattle (*A. saligna*; afforestation, soil stabilisation & landscaping), coastal wattle (*A. cyclops*; soil stabilisation) and pop saltbush (*Atriplex holocarpa*; forage).

The book lists another seven WA natives as spreading: limestone wattle (*Acacia sclerosperma*), Mueller's saltbush (*Atriplex muelleri*; a conservation-listed species in WA - Priority 1), berry saltbush (*A. semibaccata*; already weedy in U.S.), sprawling saltbush (*A. suberecta*), nodding saltbush (*Einadia nutans*), ruby saltbush (*Enchylaena tomentosa*) and small-leaf saltbush (*Maireana brevifolia*). Mostly these have been brought in for forage and not known as weeds elsewhere in the world. Again this shows that species introduced to new areas for forage or soil stabilisation rarely stay where they are wanted.

Orange wattle (*Acacia saligna*) in its natural setting.
Photo: Bruce Maslin

RESOURCES

BIOSECURITY APPS



Just launched, **MyWeedWatcher** is a free application that can help to identify weeds from characteristics such as flower colour and plant type. Even better, it allows you to map weeds and add related information such as plant density or notes of control activities done. This information pools with that reported by others and can be used by biosecurity groups to plan coordinated control. It is available for both Apple and Android devices.

FeralScan is a similar free app that helps to map sightings of pest animals, record the damage they cause, and document or plan control activities in a local area, also available for both Apple and Android devices.

FROGWATCH

With the coming of the wetter weather comes frog-watching season. A wealth of great information is available at the Frogwatch website, including profiles, pictures, calls, and details of which frogs to watch out for in different regions.

http://museum.wa.gov.au/explore/frogwatch

FUNGI GUIDEBOOKS

Also out at this time of year are the fruiting bodies of fungi (mushrooms etc). It is perhaps surprising, given the vital roles that fungi fill in our ecosystems, that there is so much still to be learned about the fungi species of WA and their distribution.

One great resource is *Fungi of the Perth Region and Beyond – a self-managed field book**. This

A quacking frog (*Crinia georgiana*) and unidentified fungi enjoying the damp together. *Photo: Wayne Gill*

offers so much useful information including pictures and species profiles that it has use well beyond the Perth Region. It is available as a free download from the WA Naturalists Club.

Another great resource for fungi in the south west is *A Guide to Macrofungi in the Shire of Denmark, Mt Hallowell and Wilson Inlet Foreshore Reserves**. It is available as a free download from the Shire of Denmark.

[**For direct weblinks, contact Editor*].

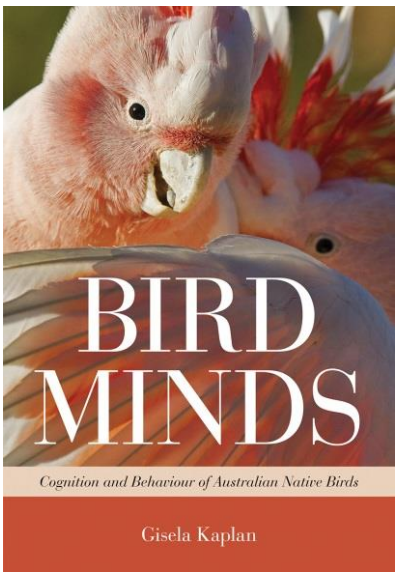
FLORABASE

Florabase is a wonderful resource year-round for learning more about the native plants in your area. If there is a plant you'd like to identify, it is possible to search for, say, shrubs with a pink flower in your shire (I include neighbouring shires as insurance). Once a list is returned you can look through the photos to see if any look likely, and look for additional photos and information through a search engine.

https://florabase.dpaw.wa.gov.au

Florabase's Plant of May – sea urchin hakea (*Hakea petiolaris* subsp. *trichophylla*). *Photo: Rob Davis*

Bird minds – cognition and behaviour of Australian native birds

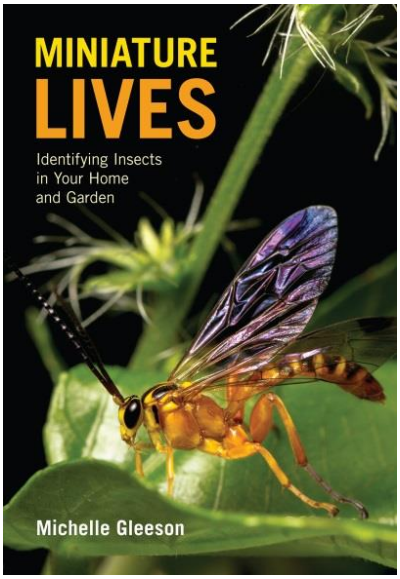


Gisela Kaplan (CSIRO Publishing)

This book considers a range of different indicators of intelligence, including innovation, tool use, play, learning and emotion, and gives many fascinating examples of how these are exhibited by a range of Australian and other birds. I enjoyed reading about a game the Auckland zoo devised for their kea (an alpine parrot), in which a kea stands on a see saw and shifts bodyweight from side to side to move a grape or nut through a maze, and about complex behaviours including grieving, deception and problem solving.

Bird Minds *is written in a science-lite style, by which I mean that the language is understandable and interesting, but citation of published research occurs frequently through the text, rather than a more flowing story with endnotes listed in a separate section. Current knowledge and current knowledge gaps are identified regarding animal intelligence generally and bird intellegence in particular. Arguably the best part of the book is that the information provided about thinking processes makes future observations of bird behaviour take on a whole new perspective!*

Miniature Lives – identifying insects in your home and garden



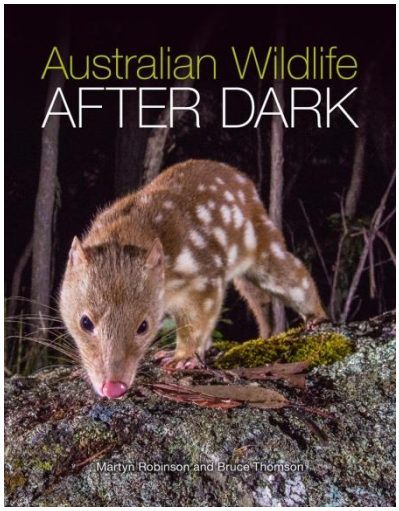
Michelle Gleeson (CSIRO Publishing)

There is such a lot of diversity in the insect world that getting to know the insects that share our living space can be daunting. Some are beautiful and intriguing, and some not so much, but insects are a vital component of ecosystems, acting as pollinators, decomposers, predators and prey.

The book is helpful in allowing for different types of information you may have available for your detective work – what an insect looks like, where it was seen, or traces of it passing through (such as an empty casing).

Beyond identifying a particular insect, Miniature Lives *offers an insight into the way they live and why. There is a glossary, a pronunciation guide and suggestions for further reading – plenty of support for learning more about these fascinating creatures. Great for a wide range of readers, including children.*

Australian Wildlife After Dark



Martyn Robinson & Bruce Thompson (CSIRO Publishing)

This book brings the nocturnal world of some of Australia's wildlife into focus for people who are generally day-active. It is accessible and informative, with chapters organised by the various senses that animals use for night-time navigation, in place of our heavy reliance on light and colour vision.

It includes remarkable photography, interesting facts and practical tips on how to find nocturnal wildlife in your backyard and out in other environments.

All reviews by Gillian Stack

IN BRIEF

FACEBOOK

I hope that many of you have seen the Land for Wildlife Western Australia Facebook page. I encourage those of you who have not to have a look. As a Facebook newcomer myself I don't assume that everyone is using it, but it is a great avenue for timely information about events (eg talks, courses or surveys), pest alerts and funding opportunities, as well as interest pieces, photos and videos about our wildlife.

https://www.facebook.com/LandForWildlife

Facebook is useful for sharing photos you'd like more information about. For example, these diggings were made by a burrowing crayfish (*Engaewa* species).

Photo: Heather Adamson

WESTERN SHIELD – CAMERA WATCH

Would you like to see the animals of the jarrah forest without them knowing you're watching? *Western Shield* is Parks and Wildlife's flagship animal conservation program, running integrated fox and feral cat control. As part of monitoring the program's success, remote cameras have been set up in a number of locations, generating thousands of images. A new website enables a partnership between citizen scientists and the department to help process all that information.

You don't have to be a fauna expert already, but it is a great way to get to know the jarrah forest fauna if you're not already familiar. There is useful comparison information for similar animals, highlighting distinguishing features most easily seen. Multiple observers will look at each image – if a wide variety of answers are received, the image is flagged for expert review. You might be lucky enough to see animals rarely seen in the wild, such as a chuditch.

https://www.zooniverse.org/projects/birgus2/western-shield-camera-watch

Western Wildlife
LAND FOR WILDLIFE NEWSLETTER

Land for Wildlife

Gillian Stack
Land for Wildlife Coordinator
Phone: (08) 9219 9527
Email: lfw@dpaw.wa.gov.au

Land for Wildlife
Department of Parks and Wildlife
Locked Bag 104
Bentley Delivery Centre WA 6983

Western Wildlife contributions may be directed to above contact points.

Website: www.dpaw.wa.gov.au/landforwildlife

A range of LFW publications are available for download from the website.

Facebook: www.facebook.com/LandForWildlife