ACT NOW FOR THE FUTURE
Department of Environment and Conservation
Our environment, our future

LAND FOR WILDLIFE
VOLUNTARY NATURE CONSERVATION

Western Wildlife

April 2008
Vol. 12, Number 2

NEWSLETTER OF THE LAND FOR WILDLIFE SCHEME

REGISTERED BY AUSTRALIA POST PRINT POST: 606811/00007

WESTERN AUSTRALIAN ORCHIDS - THE MASTERS OF DECEIT (PART 2)

Andrew Brown

The attraction of male insects to flowers under sexually false pretences, often termed pseudocopulation, is used by several south-western orchid groups in which the flowers share certain characteristics with the female insect. Their colours, for instance, are usually dull shades of green, yellow and maroon and they are usually, but not always, odourless to humans. However, all produce powerful chemical lures that are irresistible to male pollinating insects. These 'sex pheromones' appear to be especially active on still, warm days, particularly from mid morning to early-afternoon. The dragon orchid (*Caladenia barbarossa*) is a superb example with its insectiform lip closely matching the size, shape and texture of a female flower wasp.

The hammer orchid Drakea livida *is pollinated by flower wasps*

Like *Caladenia barbarossa*, hammer orchid (*Drakaea*) species are masters of sexual deception. Their inconspicuous odourless flowers are living examples of extreme specialisation. These flowers are invariably solitary on top of a thin wiry stem and are reduced to mere remnants of their colourful counterparts seen in genera such as the spider orchids (*Caladenia*). The biggest and most conspicuous part of a hammer orchid flower is its lip, which resembles to a remarkable degree a female flower wasp. Pollination is achieved by sexual deception of the male wasp, which is flung over and upside down against the column when it attempts to fly off with the female decoy. Each species of *Drakaea* is thought to be pollinated by a different species of wasp and illustrates one of the most specialised relationships between pollinator and plant known to occur in Australia, and indeed the world.

Yet another group of orchids that use sexual deception are species of duck orchid (*Paracaleana*). These have a sensitive lip that is similar to that of triggerplants (*Stylidium*) in being capable of movement on mechanical contact. The female decoy is formed by the lip and is attached to the inverted winged column by an elongated springy claw. On contact with the female decoy, both the male wasp and lip are swung down into the pouch formed by the column wings. It takes considerable exertion by the wasp to back-peddle out of the trap and in doing so it removes or deposits pollinia. The flower resets itself to the firing position over a period of several minutes.

The flying duck orchid Paracaleana gracilicordata

continued on page 4

Greetings all!

It is a pleasure to announce two new *LFW* Officers, Sheila Howat and Philip Worts, who will each be working for two days a week.

Sheila has taken over the Middle Blackwood position, previously held by Julia Boniface. This services the Shires of Boyup Brook, Bridgetown-Greenbushes, Donnybrook-Balingup, Manjimup and Nannup. To make it more convenient for her, the office location has moved from Nannup back to Bridgetown, where she will be sharing an office with other landcare and environmental groups. Sheila is a landholder and ecotourism

INDEX

EDITORIAL

operator to the east of Bridgetown and is very knowledgeable about whole of landscape planning.

The Great Southern position has also moved, from Katanning to Kojonup, to make it easier for Philip Worts, who has taken over from

Kathleen O'Brien. This position services the Shires of Lake Grace, Dumbleyung, Kent, Woodanilling, Katanning, Broomehill, Tambellup, Cranbrook and Kojonup. Phil, a geologist and mining engineer in a previous life, now farms west of Kojonup. He is very knowledgeable about remnant management and revegetation integrated with sustainable agriculture. The Shire of Kojonup has made an office available in the Memorial Hall, which will be shared with the landcare officer.

Contacts for Sheila and Phil are given below. If you are in one of these areas, why not ring up and say hello, or call in at the office for a chat? Remember, if it has been a while since a *LFWO* visited you, and you would like someone to come out again to see how well everything is going, or perhaps to seek advice on a new problem that has arisen, then ring up to arrange a 'revisit'.

You may also like to welcome back Sylvia Leighton, returning to the office after a year of maternity leave. I am hopeful that both Sylvia and Dorothy will continue to work with us in the Albany area.

WA's weather continues to be capricious, although it is encouraging that the northern areas have had some good summer falls of rain that will have built up some subsoil moisture prior to the start of cropping. Ray Froend's article on the water relations of banksias shows just how important this soil water is to the survival of natural ecosystems.

Best wishes for the coming year, everyone.

Penny Hussey

Contact details for *Land for Wildlife* Officers

Name	Location	Phone	Email
Heather Adamson	Mandurah	(08) 9582 9333	heather.adamson@dec.wa.gov.au
Avril Baxter	Narrogin	(08) 9881 9218	avril.baxter@dec.wa.gov.au
Fiona Falconer	Coorow	(08) 9952 1074	fiona.falconer@dec.wa.gov.au
Wayne Gill	Esperance	(08) 9083 2100	wayne.gill@dec.wa.gov.au
Claire Hall	Perth	(08) 9334 0427	claire.hall@dec.wa.gov.au
Mal Harper	Merredin	(08) 9041 2488	malcolm.harper@dec.wa.gov.au
Sheila Howat	Bridgetown	(08) 9761 2405	sheila.howatt@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) 9295 9112	zara.kivell@dec.wa.gov.au
Sylvia Leighton	Albany	(08) 9842 4500	sylvia.leighton@dec.wa.gov.au
Dorothy Redreau	Albany	(08) 9842 4500	dorothy.redreau@dec.wa.gov.au
Philip Worts	Kojonup	(08) 9831 0832	philip.worts@dec.wa.gov.au
Irene Vo	Perth	(08) 9334 0404	irene.vo@dec.wa.gov.au

YOUR *LFW* SITE ON ELECTRONIC MAPS FOR NRM PLANNING

All planning and prioritising for land management is now being done electronically via Geographic Information Systems (GIS). Whether it be for mining, agricultural production, revegetation, subdivision, drainage or other on-ground works, planners and project managers are using computerised maps to outline their 'areas of interest' and determine what features within those areas are relevant to their project.

It is important that these persons know where the *LFW* sites are, because:

- they contain valuable native vegetation;
- the landholder is managing them for biodiversity conservation; and
- most *LFW* landholders want to know and to be consulted about planning that may affect their land.

Therefore these sites and their managers are a vital part of local natural resource management (NRM). Unless the sites are on a GIS database accessible by the planner, they will not be taken into account. and landholders could find that their precious bushland is earmarked for a communications tower or a gravel pit – or that they are missing out on the opportunity to benefit from a new funding source.

Thus it is important that *LFW* provides the location of LFW sites to planners, on a project by project basis. No detail – not even your name – just where there is a *LFW* site. If the planners want more detail, they would contact the *LFWO* who would ask for your permission to provide it.

When *LFW* first started, GIS technology was in its infancy, so it was not discussed during the *LFW* visit. But if you have joined us since 2003, you will see at the end of the report that we ask a standard question: "Has the landholder any concerns about the '*LFW* site' being recorded on a GIS mapping system for Natural Resource Management planning?" Most people are happy for their site to be recorded, but 0.04% stated they did not want their site location to be made available to planners on GIS, and this preference is scrupulously observed.

In WW 8/1 Jan 2004, we asked you to contact your *LFWO* if you were concerned about this process or wanted more information – especially if you do not want your site recorded. Only two people followed this up, so we concluded that all the rest had no objections.

Requests for data are being received at an increasing rate. All the projects we are consulted about are aimed at building up a long-term picture of sustainability. **If you do not want your *LFW* site/s to be recorded on these GIS databases, it is vital to let us know.**

Please contact Avril Baxter on 9881 9240 or Penny Hussey on 9334 0530 for more information.

IF YOU DO NOT WANT YOUR *LFW* SITES TO BE RECORDED ON THESE GIS DATABASES, IT IS VITAL TO LET US KNOW!

THE WAY WE WERE - SWANS ON THE SWAN

An early quote from Charles Fraser, Colonial Botanist, a member of Captain James Stirling's expedition to explore the Swan River on 8th – 16th March 1827, to determine if it would be a suitable site for a settlement:

"The river abounds in fish and Black Swans, Ducks, teal, pelicans and Shags are seen in myriads – so much so that our party while on the river lived on roast Swans – but

from the shyness of those birds, I doubt not that at no distant period should the country be settled, there will not be a Swan to be seen, when no doubt the original discoverers will be laughed at for so apparently preposterous a name."

It seems Fraser was right! Although there have been, over the years, many schemes proposed 'to bring the swans back to the Swan', none has been very successful. It is not easy to reverse a change in ecology.

FLORA

continued from page 1

WA orchids

A male flower wasp is attracted to the insect-like lip of an elbow orchid, Spiculaea ciliata*, then, as it tries to fly away, it is swung up against the pollen*

The tiny elbow orchid (*Spiculaea ciliata)* is bizarre even by orchid standards. Although emerging in autumn it does not begin to flower until the moss swards, where it grows, dry out prior to the long hot summer. Under these rather harsh conditions the orchid dies at its base but is able to support the flowers and developing seed pods with water and nutrients stored in its thickened fleshy stem. Each plant has up to seven flowers with a hinged insect-like lip and curiously shaped column wings. When small male flower wasps, attracted to the female decoy, attempt to fly away with it they are momentarily trapped by the column wings, thus depositing or removing pollen.

Pollination by ants is an extremely rare occurrence anywhere in the world. A few species of mignonette orchid (*Microtis*) are known to be pollinated by ants, but pollination by sexual deceit of male flying ants is unique to the hare orchid (*Leporella fimbriata*) The orchid is unusual in that it flowers in autumn. However, this makes sense when you consider that it is this time of year when most flying ants swarm. These primitive ants (*Myrmecia urens*) are in search of a queen with which to mate and start a new colony. On nearing the flower of a hare orchid they act in a similar way to male flower wasps on other species of orchid by being initially attracted by a chemical lure (sex pheromone). However, unlike the male flower wasps, they first land on the plant's stem rather than the flower, then climb upwards, align themselves sideways across the lip for a few minutes, and squirm their way out, picking up pollinia as they do.

The large, colourful scoliid wasps (*Campsomeris*) appear to be attracted to the wonderfully ornamented lip of

Mignonette orchid, Microtis media *subsp.* media

Beard orchid, Calochilus stamenicola

A greenhood, Pterostylis hamiltonii

FLORA

continued from page 4

WA orchids

beard orchid (*Calochilus*) species. It is believed that they are lured by pheromones emitted by the flower and in their attempt to mate, inadvertently pollinate the orchid. Interestingly, these orchids are also capable of self-pollination should the insects not be active.

The slipper orchid, Cryptostylis ovata

But perhaps the most well documented case of an orchid using pseudocopulation as a method of achieving pollination is in species of slipper orchid (*Cryptostylis*). So convincing is their attraction to male ichneumon wasps (*Lissopimpla excelsa*) that copulation is attempted and sperm packets are ejaculated into the orchid. The lip of the orchid is highly modified and held upside down so that male wasps alight upside down and in their attempt to copulate pollinia are picked up or deposited.

The greenhoods (*Pterostylis*) are a large genus of Australian orchids. All species have their petals and sepals fused into a hood which encloses the column. As with species of duck orchid (*Paracaleana*), the often protruding lip found in most greenhood species is sensitive to the touch, springing upwards to trap inside the flower any insect which alights on it. The most common visitors to the flowers are tiny midges or mosquitoes that, for reasons currently unknown, are attracted to the flower. They can escape only by crawling upwards, first past the stigma on which they deposit any pollen that has already adhered to them, then past the anther from which they remove a new load of pollen. They finally emerge from the flower by passing out though the cavity at the top of the bloom or when the lip resets.

Some Western Australian orchids have foregone the use of insects to transfer pollen and instead achieve self-pollination (autogamy) by a process involving the anther collapsing onto the stigma. Some self pollinating orchids such as common sun orchid (*Thelymitra vulgaris*) rarely open. However, most species that self-pollinate are also visited by insects and only resort to self-pollination when insects are not active. Self-pollination is especially common in beard orchids (*Calochilus*) and sun orchids (*Thelymitra*), but also occurs in many other orchid genera.

As you can see our Western Australian orchids use a remarkable number of contrivances to attract pollinators, some simple and some intricate. However, I think you would agree all are interesting and make a fascinating subject of study.

Watch out for the new book "Orchids of Western Australia" by Andrew Brown, Pat Dundas, Kingsley Dixon and Steve Hopper to be published soon by UWA Press. It will contain text and illustrations of all the known orchid species in WA. This book should be superb - if you have seen Pat's beautiful paintings in "The Bushland Plants of Kings Park" you know to expect a high standard.

Andrew Brown is Coordinator, Threatened Flora, at DEC Kensington. He can be contacted by email : andrew.brown@dec.wa.gov.au

Did you know ... ?

that plant transpiration cools the air? A well-grown broadleaved tree in a house garden can produce a cooling effect equivalent to that of 10 air conditioners running 20 hours a day.

The conundrum in WA's climate is that growing the plants requires additional summer application of scarce water, while generating electricity to power the air conditioners adds CO2 to the atmosphere and so increases the Greenhouse warming effect .....

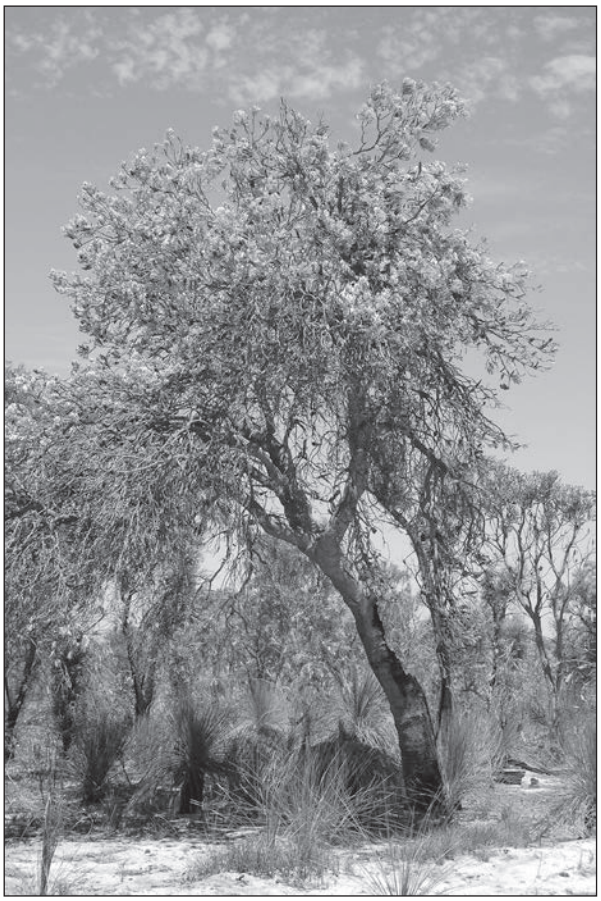
FLORA

IMPACT OF GROUNDWATER USE AND DECREASED RAINFALL ON BANKSIA

Ray Froend

Throughout Australia the future of groundwater resources is being assessed due to increasing pressure from consumptive uses (pumping) for agriculture, mining and urban developments as well as climate change. The role groundwater plays in influencing the health of major ecosystems across Australia is also being increasingly recognised. Groundwater-dependent ecosystems can be defined as a complex community of organisms where groundwater is a key resource required for consumptive use, biophysical processes or as a habitat. To ensure the continued health of groundwater-dependent ecosystems, their water requirements need to be identified and formally recognised by environmental management agencies so that sufficient water can be allocated to meet those requirements. However, the groundwater requirements of different ecosystems are poorly understood. If environmental policy, planning and management agencies are to consider the groundwater needs of ecosystems, sufficient quantitative information is required to determine how much water can be taken from the environment before significant impacts occur.

One example of a groundwater-dependent ecosystem is the banksia woodland of the Swan Coastal Plain. This ecosystem consists of communities that have constant, seasonal or episodic dependence on groundwater to sustain transpiration,



A recently-dead banksia on the Swan Coastal Plain, all leaves brown
Photo: R. Froend

growth and seedling establishment and therefore can be classified as phreatophytic (meaning groundwater-using vegetation). The water requirements and in particular the groundwater requirements of phreatophytic banksia species has received considerable research interest over recent years. Of particular importance is whether there is a seasonal difference in banksia dependence on groundwater. Seasons of high groundwater use by banksia, such as during the dry summer months, when shallow soil moisture is depleted, are times when these plants are most susceptible to groundwater drawdown (lowering of the watertable).

Through assessment of the natural abundance of the stable isotope of hydrogen within the available water sources and trees, recent research at Edith Cowan University has identified seasonal variability in the relative importance of groundwater as a water source to banksia species. During winter and spring (wetting phase of the year; see diagram), unsaturated soil horizons contain sufficient moisture to provide up to 80% of the total water use of a banksia tree. Only 20% of the water used by the tree is derived from the capillary fringe (groundwater rising 50 cm above the watertable due to capillary action). During the drying phase of the year (summer and early autumn), when rainfall recharge of the unsaturated zone ceases and soil moisture is depleted through evaporation and transpiration, the relative importance of groundwater as a water source increases significantly to 70%. This highlights the vulnerability of banksia to groundwater drawdown during the summer and early autumn months. Lowering of the watertable beyond the reach of the sinker roots removes the primary summer source of water to the trees. Moisture reserves remaining in the unsaturated zone then become the sole water source during summer but may be insufficient to meet tree

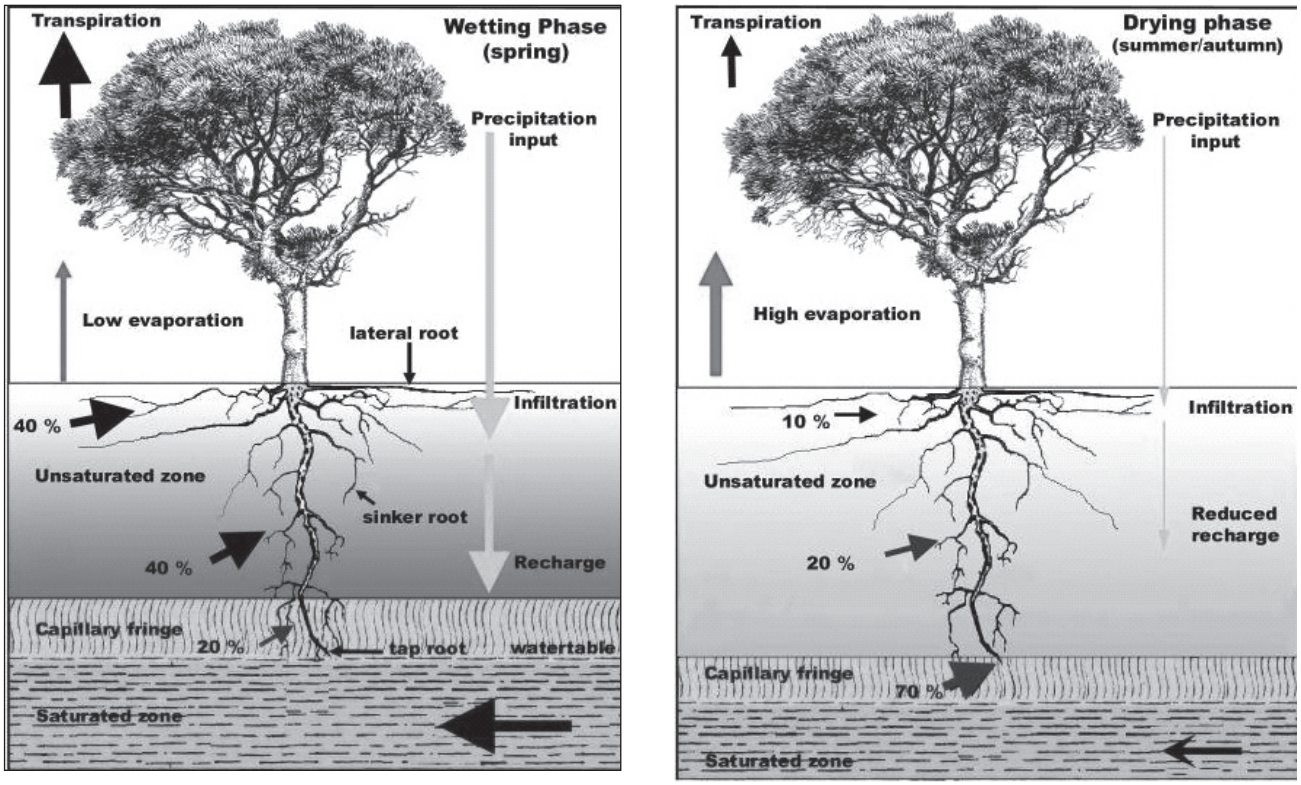
continued on page 7

continued from page 6

Banksias and water

FLORA

Banksia water use in winter vs summer



water requirements for a long period of time (1-2 months). However, by this time, autumn rainfall usually recharges the unsaturated zone and by late winter, groundwater is also recharged and the watertable rises again, resetting the plant water sources for another seasonal cycle. If insufficient recharge occurs due to reduced rainfall, or groundwater abstraction increases, watertables may not rise again, leaving the unsaturated zone as the only water source. In this case, the banksia trees will experience significant drought stress by the end of the following summer and may die as a result.

Recent increases in banksia death throughout the Swan Coastal Plain is predominately a reflection of record minimum winter (2006) rainfall recharge of soil moisture and groundwater levels. The most severe cases of banksia mortality have occurred where summer groundwater abstraction or land use changes have exacerbated poor winter recharge. Evidence of tree decline is typically seen in the first summer after a poor rainfall season. Further mortality is sometimes seen even during the second summer after a poor recharge year, therefore the full extend of banksia decline as a consequence of the poor 2006 rainfall (and cumulative influence of groundwater abstraction) did not become evident until the summer of 2007/08.

By identifying the seasonal variability in water source use by banksia, groundwater users are able to plan for abstraction to occur during times of the year when threats to the groundwater-dependent vegetation are minimal, and maintain abstraction rates at a level which ensures groundwater access by banksias during spring and early summer. However, even with improved groundwater use management, rainfall reduction due to climate change will continue to have a profound influence on the vegetation of the southwest, and in particular, the phreatophytic banksia of the Swan Coastal Plain.

Associate Professor Ray Froend is from the Centre for Ecosystem Management at Edith Cowan University. He is particularly interested in the interactions between water, landform and vegetation and can be contacted by email: r.froend@ecu.edu.au

FERALS

ON THE LOOK-OUT FOR LORIKEETS

Marion Massam and Lisa Wright

Rainbow lorikeets have been established in the Perth metropolitan area since the 1960s and it is estimated that more than 15,000 birds currently live in the area.

In late 2001, rainbow lorikeets were declared pests in Western Australia in all areas south of the Kimberley excluding the Perth metropolitan area, under legislation administered by the Department of Agriculture and Food (DAFWA). Due in part to reports of significant damage to table grapes in the Swan Valley in the summer of 2006/2007, the declaration was changed in 2006 to include the Perth metropolitan area.

The declaration means that private, municipal and State Government landholders are responsible for the control of lorikeets on their land. It is extremely important that when birds are found and identified outside the main infested area in Perth, they are removed immediately so further populations of this bird pest do not establish in other areas.

Lorikeets are considered serious agricultural and horticultural pests. They cause severe damage to fruit crops, foul vehicles and outdoor living areas, are extremely noisy, and compete with other species for food. Rainbow lorikeets can be identified by their noisy, continuous screeching when flying and at a food source. They have a swift direct flight with rapid whirring wing beats, and display flashes of dark green and bright red.

What has been happening with rainbow lorikeets recently?

In February 2004, the Rainbow Lorikeet Working Group WA was established in response to concern from community conservation groups and the general public. The working group consists of representatives from a range of government and non-government organisations.

The working group has prepared a Rainbow Lorikeet Management Strategy, which details the long-term aims of the group, short-term targets and progress over the past few years. The strategy indicates that if 4,000 to 5,000 lorikeets were removed from the Perth population each year for the next five to seven years, with follow-up maintenance of 500 - 1,000 birds per annum after this period, the population could be kept at a low level of less than 1,000 birds.

The Agriculture Protection Board has recently approved this strategy and it will shortly be available on DAFWA's website. Additional funding sources have been identified and representations are being made.

In addition to supporting the efforts of landholders (see below), DAFWA and DEC are working to reduce bird numbers in parts of the Perth area where private landholders cannot. This work includes conducting regular night shoots at one of the big lorikeet roosts in the city, Perth Domestic Airport.

The Swan Valley Declared Species Group (DSG) is an action group that has been formed by the Table Grape Growers Association, the Swan Valley Winemakers and the City of Swan with matching funds coming from the Agriculture Protection Board. The group has been assisting valley grape growers in planning bird management activities after severe damage was reported last year. At least 1,500 lorikeets have been removed so far this grape season. In addition, damage estimates are being made along with counts of birds, to gauge the effect of control so the information can be used to support a case for further funding.

Reports from the Perth Hills area indicate that perhaps more than 2,000 birds have been destroyed over the past two to three months by horticulture growers.

To manage the spread of lorikeets outside the Perth area, an incident management plan has been developed. During the coming months, the plan is to remove rainbow lorikeets roosting in the towns of Northam, Toodyay and York (if they are shown to be present in all three towns). The local communities have been kept fully informed of the actions that will be undertaken by the department and their help has been enlisted to look out for lorikeets and inform them of the methods used to remove them.

Further information is available from DAFWA's website (search for Management of Rainbow Lorikeets page): www.agric.wa.gov.au

Any sightings of rainbow lorikeets should be reported to the DAFWA's Pest and Disease Information Service on freecall 1800 084 881 or by completing the on-line reporting form.

Marion Massam is a Development Officer and Lisa Wright the Communications Officer for the Invasive Species Program with DAFWA.

IN BRIEF

SPACE INVADERS!

Claire Hall

It all happened so quickly! They flew in out of the blue taking up residence at DEC Kensington and the speed at which they worked was quite astounding. The invaders were feral European honey bees. They almost filled our compost bin with honeycomb in a few short days. Where did they come from and what could we do about it?

The story starts in 1846 when the European honey bee (*Apis mellifera*) was introduced into Western Australia from England to pollinate food crops. Unfortunately, swarming bees escaped from managed hives and spread into native bushland. The availability of suitable habitat and plenty of food (both native and exotic) enabled feral honey bee numbers to increase significantly.

Feral honey bees are very aggressive and tend to swarm. They have many negative impacts including competition with native birds, mammals and invertebrates for nectar, pollen and nest hollows. They are recognised as being a factor influencing the distribution and abundance of the forest red-tailed black cockatoo, Carnaby's cockatoo and Baudin's cockatoo. Feral honey bees cause physical damage to flowers, adversely affecting pollination and seed setting of native species, and they aid the spread of weeds. Water sources can become polluted when bees drown in tanks and troughs.

Feral bees have little value for commercial honey production or for pollination of crops and pose a disease risk to the commercial apiary industry. DEC is working together with the Water Corporation to develop a Feral Bee Control Strategy which could be utilised to control feral bees in Western Australia without affecting the beekeeping industry.

Feral bees are a major problem in urban bushland. A feral bee control program which began in the Canning River Regional Park in 2006 identified and controlled 323 feral bee colonies.

Back to our bees in the bin, we needed to control them not only because of the risk of people being stung, but to prevent the bees spreading to other areas. A pest controller was called in to remove the bees.

If you have a problem with feral bees there is a list of apiarists prepared to remove feral swarms on www.naturebase.net/content/view/910/913/1/2 or contact a licensed pest controller.

GOT WRITER'S BLOCK? - LET A SHEOAK WHISPER TO YOU!

Have you ever been asked to write an article or give a talk and you can't seem to work out how you want to get your message across? Go and sit quietly under a sheoak, clear your mind of all but the talk, and just listen. The sheoak will murmur and whisper to you, and gradually everything will clarify.

The Noongyar people believe that sitting underneath a sheoak is the place for contemplation and serious thought. Try it! Even if you haven't got any problems to nut out, you will still find the sheoak's gentle murmurs very relaxing.

Trevor Walley

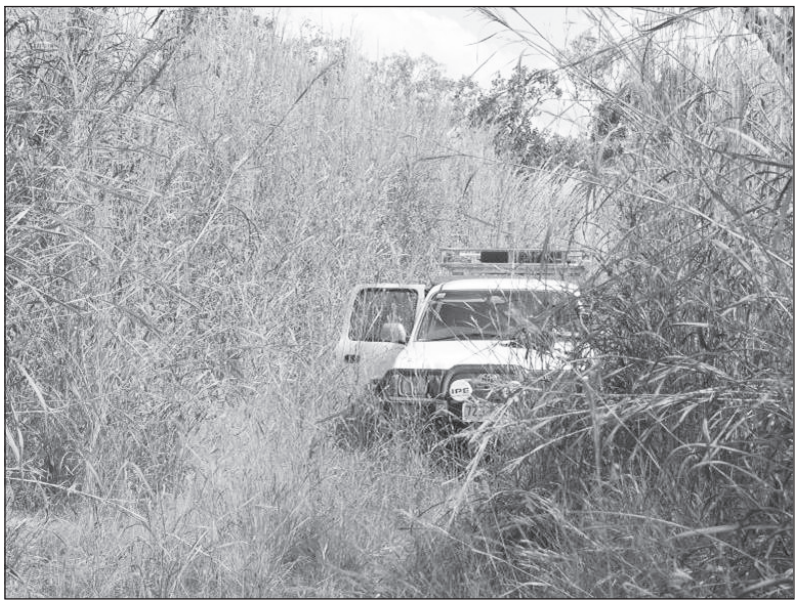
Illustration by Margaret Pieroni from "Leaf and Branch".

WEEDS

SAY NO TO GAMBA GRASS!

Penny Hussey

Kimberley residents and everyone concerned about the ecology of the northern part of Australia will be pleased to hear that In January 2008, gamba grass (*Andropogon gayanus*) was added to the declared plant list in WA. It can no longer be brought into the State and all known plants must be eradicated. At last! The scientific evidence is definitely in*, this grass is having a major detrimental impact on the ecology of northern savanna woodlands.



Gamba grass in the dry season. Note height.

Since Europeans colonised Australia, there has been a deliberate government policy to introduce plants in order to transform the Australian landscape to increase land productivity and therefore the density of human settlement, including in the tropical and arid zones. This supported the 'populate or perish' philosophy of governments. In northern Australia, it often meant introducing forage plants into rangeland grazing systems to increase stock carrying capacity, and over 2,200 grass and 2,200 legume species have been brought into Australia for trial. Some – a few – have become useful, but many have invaded away from the point of introduction, altering landscape processes, threatening biodiversity and reducing both the productivity and amenity values of landscapes. Such a one is gamba grass.

There was a gamba grass story on the ABC TV programme 'Catalyst' a year or so ago. It is a powerful depiction of the problems caused by this plant and is available on DVD.

Gamba grass is a tall (to four metres) perennial African grass brought to Australia in 1931 as a pasture plant. It is now well established in the Northern Territory and Queensland, and was established (partly by seeding from aircraft) on a few stations in the Kimberley in 1991. For the last ten years, the plant has been studied by researchers from the Cooperative Research Centre for Tropical Savanna Management (CRC-TSM), who have found that it has significant environmental impacts. Briefly, what it does is:

change the fire regime

Gamba grass forms annual fuel loads of 11-15 tonnes/ha (may be as high as 30 tonnes/ha) compared with native grass fuel loads of two to four tonnes/ha. This means the grass will support early dry season fires that are about eight times more intense than natural ones. Later in the dry season, when the grass has fully cured, fire intensities are almost 25 times as high as those recorded in adjacent native grass savannas.

reduce tree cover

This change in fire intensity has led to a 50% reduction in tree canopy around Darwin over the last 12 years. The treed savanna is being converted to (exotic) grassland.

alter hydrology

Gamba grass uses more water, over a longer period into the dry season, and from a deeper soil horizon than native grasses. This is putting greater stress on the woody components of the savanna.

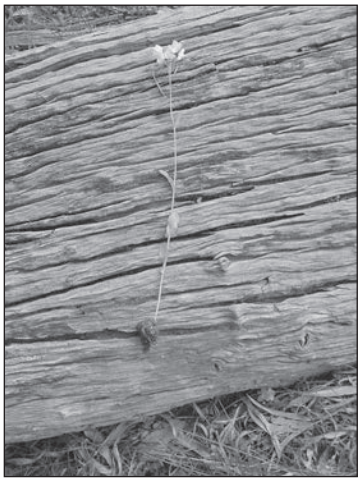
alter nitrogen cycling

Gamba grass prefers ammonium as its nitrogen source, and in its native Africa it is known to inhibit the process of nitrification in the soil, and so give itself a competitive advantage over other grasses. It seems it is also doing that here, increasing soil ammonium and decreasing soil nitrate, each by a factor of three. The nitrogen actually stored in the grass is seven times higher than in native grasses. This stored nitrogen, of course,

continued on page 11

IN BRIEF

ROOS DISPERSE CANOLA SEEDS



When walking in the magnificent Wandoo woodland in Mokine Nature Reserve, York, last August, I spotted a single small plant of canola in full flower. It was well into the reserve, at least 400 metres from any edge. Naturally, I pulled it up, to be disposed of before it seeded. To my surprise, it came up attached to a lump – it was growing from within a pellet of grey kangaroo dung.

That raised several questions – for a start, I had not realised that roos grazed mature canola. Secondly, it has been stated, sometimes during the 'Genetically Modified Crops debate', that canola will not become a weed, as it is not dispersed far from the source paddock. Well, here is proof that kangaroos can spread it at least 400 metres and that it will grow in undisturbed bushland, but will it persist? This plant was removed from the site, so for the moment that question remains unanswered. Has anyone any more observations on this potential problem?

Penny Hussey

IS CONTINUAL ECONOMIC GROWTH THE IDEAL TO AIM FOR?

It is often argued that conservation and sustainability of resources are impediments to economic development. But it is worth remembering that some of the pioneers of the theory of economic growth to which most current national governments subscibe, contemplated its ultimate stabilisation. Below is a quote from John Stuart Mill, a radical thinker and very influential in the development of modern economic and social theory, writing in his book *Principles of Political Economy* in 1848 (Book 4 Chapter 6).

"I confess I am not charmed with the ideal of life held out by those who think that the normal state of human beings is that of struggling to get on; that the trampling, crushing, elbowing and treading on each other's heels, which form the existing type of social life, are the most desirable lot of human kind, or anything but the disagreeable symptoms of one of the phases of industrial progress .....

"If the earth must lose that great portion of its pleasantness which it owes to things that the unlimited increase of wealth and population would extirpate from it, for the mere purpose of enabling it to support a larger, but not a better or a happier population, I sincerely hope, for the sake of posterity, that they will be content to be stationary, long before necessity compels them to it .....

"It is scarcely necessary to remark that a stationary condition of capital and population implies no stationary state of human improvement. There would be as much scope as ever for all kinds of mental culture, and moral and social progress, as much room for improving the Art of Living and much more likelihood of its being improved, when minds cease to be engrossed by the Art of Getting On."

continued from page 11

Gamba grass

goes up in smoke during a fire, which will eventually reduce the levels of soil nitrogen.

can establish in intact ecosystems

Gamba grass spreads rapidly along disturbed areas such as roadsides, but it has been shown that it can establish under trees and in undisturbed soil. All in all, gamba grass is changing the northern savanna ecosystem, especially by causing the loss of trees, meaning that the fauna that depend on the woody vegetation will also be lost from large areas. Another stress the environment doesn't need!

Landholders are now responsible for eradicating gamba grass from their properties. The Dept. of Agriculture and Food has carried out preliminary surveys of infestations in the Kimberley and some control work is already under way. Residents and visitors, please keep an eye out for this grass and call DAFWA's Pest and Disease Information Service on freecall 1800 084 881 for more information or to report any suspect finds.

** There are numerous papers relating to this. If you would like a list, please contact the Editor. This article is adapted from one in Savanna Links, the magazine of the CRC-TSM.*

Photo: courtesy Charles Darwin University, Darwin.

RESEARCH

BLACK COCKATOO RESEARCH AT THE WILDLIFE GENETICS LAB

Nicole White

An endangered species that needs your help

White-tailed black-cockatoos are unique to the south-west of Western Australia - not being found anywhere else in the world. There are two different species of white-tails, the Carnaby's (*Calyptorhynchus latirostris*) and the Baudin's (*C. baudinii*) black-cockatoo.

Both species are threatened and are 'rare or likely to become extinct'. Like so many of the world's parrot and cockatoo species, they are threatened due to a range of reasons but the overall population has suffered an estimated 50% reduction in abundance as a result of loss and modification of habitat, nest competition with other birds and feral bees, poaching, and shooting by orchardists. Given such a dramatic population decline, urgent action is required for the conservation, management and protection of these charismatic WA birds.

Why knowledge of genetics is important to conservation

Conservation genetics is a mixture of scientific disciplines including molecular ecology, population genetics, mathematical modelling and evolutionary relationships. The application of conservation genetics for species conservation uses molecular tools to examine the relationships within and between populations of species, and also their mating systems, and attempts to establish the genetic diversity of different groups of animals by comparing their genetic profiles (DNA fingerprints) - exactly the same technology that is used in human forensics. Conservation genetics is used in the management of small or declining populations by defining management units within a species and acquiring a genetic perspective of a species' ecology.

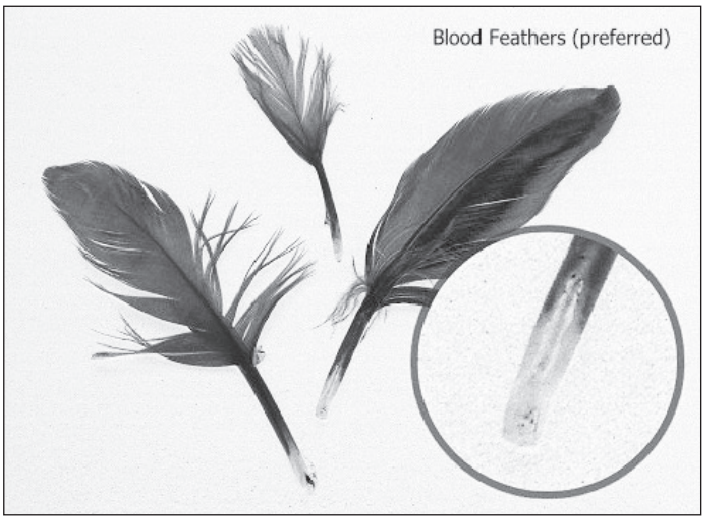
Genetic diversity is seen as important for species to evolve and adapt to new and changing environments. When small populations become smaller they lose much their genetic information because there are not enough individuals to keep all the genetic differences. This leads to an increased risk of extinction because, with fewer individuals around, mating among relatives (inbreeding) may become inevitable.

With the aid of molecular tools, genetic markers can identify populations where genetic issues are likely to affect the prospects of long-term survival. For example, populations of species in different geographical locations may be genetically differentiated and require specific management strategies for their recovery. All this can be summed up as looking at the 'genetic health' of a population.

Conservation genetics of the white-tailed black-cockatoos

Current research at Murdoch University's Wildlife Genetics Lab is focusing on key areas central to the conservation, management, and protection of white-tailed black-cockatoos in WA. Firstly, the conservation genetics of this threatened species is being elucidated, as this will provide wildlife managers with the species' level of genetic health.

The project focuses on the use of 'microsatellites', which are the same pieces of DNA used in human forensics and paternity testing. They are highly variable and can be used to identify individuals with a high degree of confidence - less than one in one million birds will have exactly the same DNA profile. Microsatellites are studied with the polymerase chain reaction (PCR) which requires minute amounts of DNA for analysis. The sensitivity and power of PCR means that the cells at the end of a plucked feather contain sufficient DNA to generate a DNA fingerprint for an individual bird!



Consequently, a microsatellite DNA-marker profiling system for cockatoos is a powerful tool to investigate population differences, movement patterns, evolutionary potential, and genetic breeding systems.

continued on page 13

continued from page 12

Black cockies

FAUNA

White-tailed black-cockatoo feathers – how you can help

To determine whether populations of birds which nest in specific geographical areas are genetically differentiated (i.e. do Moora cockatoos have the same genetic profile as Albany cockatoos?) and to assess which nesting areas are critical to the survival of the species, feathers are being collected and analysed. A critical aspect of this project requires feathers from young birds before they fledge the nest with their parents, as the establishment of a DNA profile database from the entire nesting area (Geraldton to Esperance) is essential. If cockatoos nest on your property and you would like to become involved in this study please contact me for further details. (If you are unsure if these cockatoos nest on your property and would like to have a property assessment, please contact Birds Australia's Project Officer, Dee Stojanovic.)

White-tailed black-cockatoos have numerous feeding and roost sites throughout their yearly migration. If these birds visit your property and happen to shed feathers, they are also a valuable resource for this project. Place the feather(s) in an envelope addressed to me with the following details: (1) location; (2) date collected; and (3) species identification (if possible). Alternatively, I will post prepared bird feather envelopes to you upon request.

Nicole White - Black-Cockatoo Project
Murdoch University, Wildlife Genetics Lab
Lab: (08) 9360-2787 Office: (08) 9360-2312

Dee Stojanovic – Birds Australia
Carnaby's Black-Cockatoo Project Officer
Phone: (08) 9387-8412 Mobile: 0428 762 292

Nicole White is studying for a PhD at Murdoch University.

Bush detective

Who made this trail?

Smooth clear trails such as this are often visible in bushland, running for 100m or more, like this one in everlastings. Who made it?

A close inspection reveals the answer – they are meat ant highways, leading from the nest site to foraging areas. These neat and tidy roadways are formed by tens of thousands of ants going out to work each day. They even have inward and outward lanes marked, but by scent instead of white lines.

As you can see from the anthill behind, the nesting colonies can become very large and may form satellite colonies nearby.

Meat ants (*Iridiomyrex purpurea*) are predators and scavengers that scour a wide area around their nest. They sense movement from vibrations in the ground and will sally forth to catch prey or attack an enemy. There can be few people in southern Australia who have never, at some time, poked a stick in a meat ant's nest, just to watch them boil out of the nest entrances and race ferociously around. But don't get in the way! They bite rather than sting, but half a dozen or so running up your leg under your jeans, biting as they go, can be the cause of quite spectacular bush dances! (I once saw a large number run up a horse's leg – for several minutes he imitated a buck-jumping champion!)

Meat ants are native, but they have increased enormously in numbers, as hard ground (such as gateways and tracks) are ideal for their nests. When they are in very large numbers (as they often are around the edges of remnant patches in farming areas) they can adversely affect the ecology of the bushland by removing a very high proportion of the litter fauna essential to proper cycling of plant and animal debris.

Penny Hussey

MEMBERS' PAGE

A WHITE NEW HOLLAND HONEYEATER

Occasionally people notice white colour forms of various animals, but we have not heard of a white New Holland honeyeater before. It is not completely white, having pale blue eyes and grey around the head, as well as the normal yellow wing patch, so it is showing leucism and is not an albino (see an explanation in WW 10/4 p 9).

These photos of a white and a normal bird were sent in by Helen James and David Poynton of Honeymoon Hill Estate, Margaret River. Helen says it is an amazingly beautiful bird which is part of the general flock of small birds that frequent the property. There is abundant shrub cover in which to hide from predators. It would be interesting to know if it will breed in the coming season, and perhaps produce more individuals with this striking colour form.

Photos: Helen James

What is this ...?

Bev Lockley observed this black and white insect on her property near Katanning last December. It was running around among the leaf litter, stopping every so often to wave its abdomen up and down in the air. It looked like a large ant, but was solitary, and did not appear to be eating anything.

It is commonly called a 'velvet ant', but isn't an ant at all, it is a female wasp! Velvet ants are in the family Multillidae, one of the flower wasp group. The males are winged and clearly look like wasps, the females are not winged and look like hairy ants. There are about 500 Australian species, mostly in the genus *Ephutomorpha*. This is probably the most common SWWA species, the greater black velvet ant, *E. formicaria*.

Velvet ants are parasitic on burrowing wasps and bees. When Bev saw this one scurrying around, the ant was probably searching for underground nests containing bee or wasp larvae. When she finds one she will enter the burrow and lay an egg on the larva. It is not known how she locates the nests – maybe by scent? As she is bobbing her abdomen up and down, she could be emitting a pheromone to attract a male who perhaps may swoop down and carry her off to mate.

(Read the orchid story for a photo of a male flower wasp and more on their fascinating life stories. Isn't it a wonderful world we live in? - Ed.)

Photo: Bev Lockley

Boodies – ecosystem engineers in the arid shrublands

Boodies (*Bettongia lesueur*) also called burrowing bettongs, were once widespread in Australia. Jim Noble of CSIRO described their extent and the distinctive warren shape in WW5/1 (Jan 2001) – we also reproduced a great historical photo from the WA Museum. In his article Jim postulated that a combination of boodies and periodic fire was responsible for maintaining the open grassy shrublands seen by early settlers in the semi-arid shrublands of southern Australia. After a few years of stock and rabbits, combined with fewer fires and the extinction of boodies and other small marsupials, these southern rangelands became dominated by a dense growth of native shrubs and the grass component essential for stock was much reduced.

Jim and his colleagues have now written another paper elaborating on this theme*. It uses mathematical modeling to investigate different scenarios involving boodies, shrubs and fire. They conclude that a high density of boodies (as shown by relict warrens), together with an average of five fires every hundred years, would maintain the grassy shrubland so prized by the early pastoralists. The challenge now is how to manage with stock instead of boodies.

Although much of this paper is mathematical, there are interesting snippets about marsupial digestive processes and fire behaviour. If you manage land in the southern rangelands or the northern and eastern edges of the wheatbelt, you will find its conclusions thought-provoking.

* Noble J.C., Hik, D.S. & A.R.E. Sinclair. 2007. *Landscape ecology of the burrowing bettong: fire and marsupial biocontrol of shrubs in semi-arid Australia*. The Rangeland Journal. 29: 107-119.

IN BRIEF

Why are many remnant trees in decline?

Everyone will be aware that many of the trees in remnant vegetation are in decline. These are the widespread, common trees that give character and sense of place to so much of our landscape. For example, *Western Wildlife* has, over the years, featured problems affecting wandoo, tuart, marri, jarrah, yate, salmon gum and flooded gum. Leaving aside threats such as climate change and altered hydrology leading to salinity, what factors might be causing this decline? Some researchers in Tasmania* looked at whether past land management might be a contributory factor.

In 49 remnants they took detailed measurements of the current condition of the site, especially of soil, understorey composition and tree health. Then they asked each landholder specific questions about management history, and sometimes records were found to stretch back 80 years. The mass of data was subjected to mathematical analysis and they found that 60% of the variation in overstorey tree health was associated with the cover of native shrubs, litter, moss and lichen in healthy sites, and with cover of exotic pasture grasses in declining sites. Soil attributes explained 72% of the variation in tree health, with healthy sites having lower soil nitrogen and pH, and higher soil organic carbon.

So, get your remnants – even small ones – fenced off and give those beneficial natural soil-based ecosystem processes a chance to get going again!

*Davidson, NJ, et al: 2007. *Eucalypt health and agricultural land management within bushland remnants in the Midlands of Tasmania, Australia*. Biological Conservation 139: 439-446.

Gnammas contain amazing diversity of freshwater fauna

In the wheatbelt, the only pools that are probably unthreatened by salinity are the rain filled gnammas on rock outcrops. Their invertebrate fauna is amazingly diverse and, moreover, varies substantially between different types of gnammas (see WW 3/3) and between outcrops. A recent study* of outcrops near Hyden found 66 invertebrate taxa. On Wave Rock, even after sampling 57 pools, new species were still being added to the list!

The fauna studied are small, often needing a microscope to see, and include insects, crustaceans, mites, worms and snails, however they are an essential part of the food chain, especially for frogs. Many of the species are endemic and they often have poor means of dispersal between pools – let alone between rock outcrops. Most survive the dry summer as eggs in the debris at the bottom of the pool.

This work reinforces the theory that every rock outcrop in the wheatbelt could have a unique assemblage of invertebrate fauna. Conserving this diversity means conserving the gnammas themselves. If stock (or feral goats) are allowed access, they will trample and powder the basal debris, destroying the over-summering organisms and the nutrient substrate on which they depend. In addition, stock faeces will build up in the gnammas and cause eutrophication. So fencing out hoofed stock is essential.

This winter, have a look at a gnamma near you to see what invertebrates you can see. [For a list of publications with illustrations to help ID contact the Editor.]

*Jocque, M., Timms, B.V. and L. Brendonck. 2007. *A contribution on the biodiversity and conservation of the freshwater fauna of rocky outcrops in the central wheatbelt of WA*. J. Royal Society of WA, 90: 137-142.

COMING EVENTS

Malleefowl Bush Camp Outs

4-9th May - Lake Muir (west of Mt Barker)

1-7th June - Mt Jackson (100 kms north of Bullfinch)

As with previous surveys, volunteers will need a good degree of fitness and self-sufficiency in camping. Further information will be provided upon application.

If you would like a registration form and haven't already advised me, please RSVP by 30th March email: sdennings@bigpond.com fax (08) 9828 2383 or phone (08) 9828 2083.

Teams of 10-15 persons are required for each survey and acceptance will be on a 'first in, best dressed' basis.

Susanne Dennings

IN BRIEF

BALGA FLOWERING

In last years' *Western Wildlife* there were several articles about the growth rate of balga and at what age it first flowers. Below is an early record.

In 1924 The Australian Forestry Journal Vol 7, p 25 published a brief note about *Xanthorrhoea preissii,* in particular about a balga growing in a garden in Cottesloe. Planted 22 years previously, its trunk had reached a height of 79 cm and a diameter of 35 cm. This plant was not artificially watered 'for the first few years of its life'. Later on, when the house was connected to the water service, it received water with the rest of the garden.

The author also several times burnt the dry leaves, the last time being 'last season'. In 1923 the plant first flowered, producing a flower stalk 3.7m long.

The article has a photograph of this balga, with a man standing nearby

Ian Abbott

An international snippet ...

TIRITIRI MATANGI - A SUCCESS STORY

You don't need to be a beaky bird watcher with a silly hat to enjoy this bird sanctuary with its friendly endangered species, beautiful beaches and cool native forest.

Tiritiri Matangi Island, 22 ha in size and only 30 km from central Auckland, is an open bird sanctuary and a real conservation success thanks to thousands of volunteers planting around 300,000 native trees during the last 21 years, allowing the reintroduction of 11 endangered bird species as well as tuatara, New Zealand's living dinosaur.

The island is unique because of the large number of bird species to be seen in a very short time and with such ease. Viewing and getting around is easy from well-constructed boardwalks suitable for all fitness levels. Many of the birds are relaxed around people and you can get quite close. Native pigeons, tuis, fantails, baby blue penguins and bellbirds as well as rarer native birds – kokake, takahe, saddleback, stitchbird, red crowned parakeets, North Island robin and the little spotted kiwi can all be seen on the island.

You will also meet Greg, the island takahe. Greg, a bird of

character as well as size, may try to climb up your body and perch on your head - not to be encouraged, as he supports his weight by digging six claws into your flesh! Greg is a member of an endangered species, being one of only 17 birds on the island and about 230 in New Zealand. This species was thought to be extinct until rediscovered in 1948.

I am proud to have been involved in the revegetation of Tititiri Matangi Island as part of an early community involvement program while a member of the Auckland Technical Institute Tramping Club in1984.

Zara Kivell

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.