WA'S PARKS, WILDLIFE AND CONSERVATION MAGAZINE

LANDSCOPE

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BABS AND BERT WELLS
A photographic legacy

Using DNA
Unravelling mysteries

Dolphin odyssey
Hunt for an elusive species

Yanchep National Park
New look at an old favourite

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ON THE COVER

Front cover The rainbow bee-eater (*Merops ornatus*) is famed for its stunning green, blue, yellow and brown colours. Females are charged with digging a narrow burrow that becomes a nest. The force of the birds entering and exiting works to circulate air in the nest. This photo, captured by Babs and Bert Wells, shows the exact moment that the bird blasts from the nest and is a moment in time that the naked eye could never see. Read more in 'Touched by nature: Never ending story ...' on page 16.
Photo – Babs and Bert Wells/Parks and Wildlife

Back cover Wellington National Park.
Photo – Ann Storrie



A major milestone for biodiversity conservation in Western Australia occurred in September with the passage of the *Biodiversity Conservation Act 2016* to replace the 66-year-old *Wildlife Conservation Act 1950*. Readers of *LANDSCOPE* will already know that Western Australia is endowed with an amazing array of unique native species and habitats, with many of these unfortunately under threat. The articles in this edition demonstrate the variety and diversity of our flora and fauna and the programs people are involved in to assist their conservation.

Many people have been working hard to conserve our unique biodiversity for decades, with outstanding successes, but their efforts have often been hampered, or at best not assisted, by WA's archaic biodiversity legislation. The Wildlife Conservation Act, which various governments have pledged to replace since 1992, did not recognise what an ecological community is or provide any protection for habitats. Threatened species were only protected as 'species likely to become extinct' or 'rare' and there were no provisions whatsoever to encourage, promote or provide assistance for biodiversity conservation efforts of landholders, land managers and community groups.

The new Biodiversity Conservation Act brings biodiversity conservation into the 21st century. It protects threatened species using IUCN Red List international standards and categories and provides a new system to identify and conserve threatened ecological communities to specially protect critical habitats. There are new provisions for listing threatening processes, for biodiversity management programs as well as for recovery planning for threatened species and communities. Importantly the new Act provides specific means for government to work with landowners and community groups by providing formalised consultation and cooperation mechanisms, including biodiversity conservation agreements and biodiversity conservation covenants.

The full range of features of the Biodiversity Conservation Act will come into effect over the next year or so as we make the necessary administrative arrangements and prepare the required regulations. It has taken a long time for the new Act to be realised, but the changes will definitely be worthwhile.

Gordon Wyre, ***Legislative and Policy Reform Director***
Department of Parks and Wildlife

Contributing

Michael Johnston is a research scientist specialising in management of invasive mammals such as feral cats. He joined Parks and Wildlife in 2014 to work with the team responsible for removing feral cats from Dirk Hartog Island National Park. Before this, he worked for over 18 years with key staff from Science Division on the development of baits and baiting strategies for feral cats. He enjoys working on islands whether they be large or small!



David T. Bell was an Associate Professor of Ecology at The University of Western Australia. He is the lead author of recent publications on aspects of birding surveys carried out in cooperation with Parks and Wildlife that have been published in *Amytornis* (the Western Australia Journal of Ornithology), *Australian Field Ornithology* (the major field ornithology journal of BirdLife Australia) and the *Journal of the Royal Society of Western Australia*.



Tracy Shea is Assistant Director Policy and Planning with over 30 years' experience in environmental, parks and nature-based tourism policy development and implementation. She is passionate about improving employment and economic opportunities for Aboriginal people through tourism and land management and enjoys bringing people together to strengthen the connections between people and parks. Tracy is also an executive member of Forum Advocating Cultural and Eco-Tourism (FACET).



Publishing credits

Editors Rhianna King, Mitzi Vance.

Scientific/technical advice John Huisman, Tracy Shea, Lachie McCaw, Keith Morris.

Design and production Natalie Curtis, Gooitzen Van Der Meer, Mandy Pike, Tiffany Taylor, Lynne Whittle.

Illustration Gooitzen Van Der Meer.

Cartography Promaco Geodraft.

Marketing Cathy Birch.
Phone (08) 9219 9913 or fax (08) 9219 9839.

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For more information contact us:

In person 17 Dick Perry Avenue, Kensington, Western Australia 6151

By free post Reply Paid 25, Locked Bag 29, Bentley DC, Western Australia 6983

By email customer.service@dpaw.wa.gov.au

By phone (08) 9219 9071 or (08) 9219 9072

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This page Turtle hatchlings at Dirk Hartog Island National Park.
Photo – Linda Reinhold

Department of Parks and Wildlife

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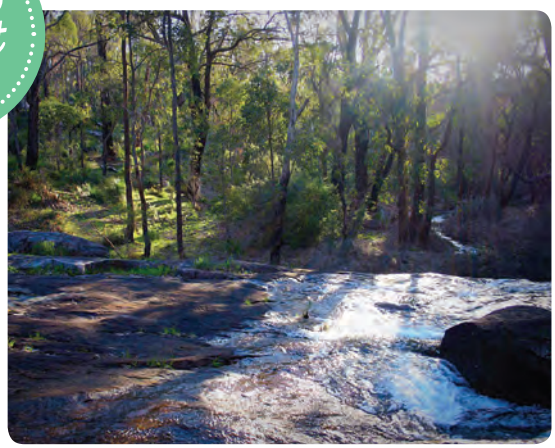
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Snap shot



READERS' PIC

Serpentine National Park

Words and photo by Daniel Morton (aged 14)

Serpentine National Park is known for its natural beauty and amazing bushland. It's not a place that disappoints the eye nor the ear. From stunning waterfalls to tall tree tops and the tune of bird song to add to the sensory wonder of the national park. It is the perfect place to picnic beside the water and gaze upon what seems like heaven on Earth. The flow of water runs through to Serpentine Falls, which is another stunning place to visit.

Have you got a fantastic nature photograph you would like to see published in *LANDSCOPE*? Send it, along with a 100-word description of the species or how and where you took the shot, to landscope@dpaw.wa.gov.au.

New facility at Brentwood enriches visitor's River Journeys

Visitors to the Swan Canning Riverpark now have another place to stop and reflect on the river's unique history and stories, thanks to the latest 'River Journeys' installation.

The interpretation node, located just off Leach Hwy along the Canning River, highlights the natural and cultural heritage values of the Swan and Canning rivers through multi-media and on-site interpretation giving visitors the opportunity to learn about the significance of the area while experiencing it first-hand (see also 'River Journeys', *LANDSCOPE*, Autumn 2016).

Project manager Ben Ansell said the new development was a wonderful addition to the riverfront for the public to enjoy this summer.

"We look forward to seeing people down at Brentwood, using the nodes and enjoying the new ways to engage with nature," Ben said.

Currently there are 19 River Journeys interpretation nodes along the riverfront, of which five were selected by the Noongar Advisory Panel due to their cultural significance.

The tour paths and interactive media for the area are accessible on the GeoTourist App which is available for smart phones or tablets and enables people to create a trail and leave their own audio and photos for others to follow and experience.

For more information about the Swan Canning Riverpark visit parks.dpaw.wa.gov.au/park/swan-canning-riverpark.

Conservation bolstered by dedicated volunteers

Western Australia's conservation was given a helping hand in 2015–16 with 5,189 volunteers contributing 638,747 hours to the conservation and management of WA's natural places.

There are about 250 different programs available that cater to the different needs and interests of volunteers, including assisting with the Wildcare Helpline, helping at the Perth Observatory or the WA Herbarium, or monitoring wildlife including turtles or rare flora, and looking after trails such as the Munda Biddi Trail or Bibbulmun Track.

Karina Knight from the Herbarium volunteer program said volunteers reported immense personal reward from helping out.

"The Herbarium program has been running for more than 25 years and we have a number of original volunteers still contributing," she said.

"People who volunteer at the Herbarium are interested in the remarkable flora and love to share their passion for that with each other."

"We value our volunteers greatly, and put time and effort into making them feel that their time with us is useful and highly valued."

For more information on how to get involved visit www.dpaw.wa.gov.au/get-involved/volunteering-opportunities.

Read more about volunteering from Volunteering WA CEO Tina Williams on page 7.



Above Volunteers Naoko Homma and Helen Paynter mount specimens at the WA Herbarium.
Photo – Karina Knight/Parks and Wildlife

Conference celebrates nature play



The undeniable health benefits of kids spending time in nature was the focus of Nature Play WA's inaugural Children and Nature Conference.

Western Australia's former chief-scientist and Western Australian of the Year Lyn Beazley, Childhood Allergy and Immunology Research Professor Susan Prescott and other speakers from a range of organisations discussed the positive impact of nature on children's health, wellbeing and education, including the connection between nature and immunology and childhood brain development.

The conference focused on the connection between nature and positive childhood outcomes, outlined ways to engage the corporate and political sectors in the global movement to reconnect children to the natural world, and provided an opportunity for attendees to network and exchange ideas.

Parks and Wildlife education officer Linley Brown said attendees included teachers, early childhood care providers, health professionals, parents, conservationists, land managers, State and local government employees and others with an interest in reconnecting children with nature.

"The conference was a great opportunity to connect, learn and build relationships with like-minded individuals, and people went away inspired to look at ways to further promote children engaging in the outdoors," she said.

"Some children have limited opportunities to connect with the natural environment, yet we know that there are many benefits of connecting with nature.

"That's why initiatives like Parks and Wildlife's *Nearer to Nature* are so vital."

For more information about Nature Play WA, visit www.natureplaywa.org.au. For more information about Parks and Wildlife programs designed to get kids out into nature, visit www.dpaw.wa.gov.au/get-involved/nearer-to-nature.

Above Spending time in nature has a range of benefits for children. *Photo – Nic Duncan/Parks and Wildlife*

Guest column



Tina Williams
CEO, Volunteering WA

Throughout my career I have had the privilege of working with numerous volunteers in different areas of community and business. Without their contributions our society would grind to a halt. They enrich our lives, provide vital services that support our disadvantaged, aged and disabled, and assist with conservation and environmental projects, animal welfare and arts.

Volunteering WA is the State's peak volunteering organisation. We are the leading voice for volunteers, work with organisations, groups and the government to strengthen the sector as a whole, and promote the benefits of volunteering. Last year Volunteering WA commissioned a report into the economic, social and cultural value of volunteering in Western Australia. The findings showed we have more than 600,000 volunteers in WA who contributed a staggering $39 billion in value to the economy.

This proves that volunteering is great for our communities, and a raft of research shows that it also has great benefits for the person who is volunteering. Ninety-six per cent of volunteers say that volunteering makes them happier[1] and older people who volunteer are less likely to suffer with depression.

In 2015–16 Parks and Wildlife recorded its highest number of active volunteers with 5,189 contributing 638,747 hours.

From staffing the Wildcare Helpline to campground hosting, collecting seeds, clearing weeds, taking part in native plant and animal surveys or trail maintenance, there is something for everyone who may be interested in volunteering with Parks and Wildlife.

Acknowledgment of the vital work of volunteers in parks was recognised in May when the Kings Park Guides received the Volunteering WA Western Australian Community Volunteer Organisation of the Year Award.

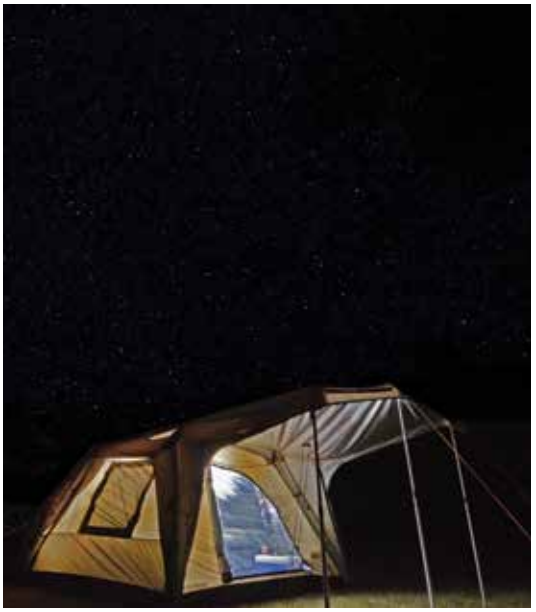
The 2017 award nominations will open early next year. Nominating a volunteer or organisation is a great way of showing your appreciation for the work they do.

For more information about the awards and other resources and opportunities visit www.volunteeringwa.org.au.

1 Post, S. G. 2011, 'It's good to be good: 2011 5th annual scientific report on health, happiness and helping others,' The International Journal of Person Centred Medicine, vol. 1, no. 4, p. 814.

volunteeringWA





Yanchep National Park

Ever popular among locals and visitors, Yanchep National Park has even more to offer thanks to a number of new developments and recreation opportunities. Located an hour's drive from Perth, it's an easy daytrip, a convenient overnight destination or a great place to stop on the way to or from a trip 'up north'.

As one of Western Australia's oldest national parks, Yanchep National Park has seen significant changes; from its original state, when it served as an important meeting place for Nyoongar people to carry out trade, teaching and socialisation, to when it was a getaway and market garden for people of yesteryear, to now as a much-loved national park that attracts up to 320,000 visits each year.

Above Yanchep National Park has a range of walk trails that guide visitors through the park.
Photo – Gooitzen van der Meer/Parks and Wildlife

Above right Camping in the park.
Photo – Peter Nicholas/Parks and Wildlife

Opposite page
Right The park offers a range of accommodation options.
Photo – Parks and Wildlife
Far right Boardwalks guide visitors around the wetlands.
Photo – Miranda Jackson/Parks and Wildlife

There has never been a shortage of things to do and see at this unique natural area, where European and Aboriginal culture co-exist in a landscape made up of manicured lawns, picnic areas and gardens, surrounded by 2,854 hectares of natural bush. And recent developments are making the park even more popular than ever.

PICK YOUR TIME

A trial of camping in the national park has provided a significant change to the way people use the park. Under the trial, 10 hard stands – ideal for short-stay campervans or caravans – and 10 grass stands – great for tents or other camping options – are operating at Henry White Oval. This is proving to be a resounding success with most sites fully booked on most weekends since the beginning of spring.

The campground is attracting a range of campers – from those who want an 'easy' camping option close to home, to people heading north and those returning home again. Being able to have a fully cooked breakfast at the Yanchep Inn, lunch at Chocolate Drops Tearooms and then a barbecue for dinner (or returning to the Inn) – as well as being able to buy ice-creams, hot coffee and cold drinks throughout the day – is a welcome option for many. Those who yearn for the creature comforts of a comfortable bed and four walls are well looked after at the Yanchep Inn, which has hotel and motel-style accommodation.

Being at the park after dark gives visitors the chance to experience the natural surrounds in a whole new light, as well as hear the frogs and insects herald the change from day to night with their chorus of calls, croaks and cricks. After dark is also an opportunity to see the park's resident koalas and kangaroos more active than during the day.

SO MUCH TO SEE

An added benefit of staying overnight is that visitors have more time to explore







"An added benefit of staying overnight is that visitors have more time to explore the park and all it has to offer."

the park and all it has to offer. The park's various walk trails offer visitors a range of options – from a casual stroll with the family, to a 51.8-kilometre trek through much of the park. There are also guided tours of the park's fascinating cave system where you will see stalactites, stalagmites, helictites, columns and shawls. And there is an opportunity to enjoy one of the interactive and informative Aboriginal cultural experiences, which feature didgeridoo playing and talks on the plants, animals and cultural significance of the area, or take part in one of the other free activities run by park staff. During the school term, students visit the park by the bus load, while the *Nearer to Nature* school holiday activities provide a more informal educational experience.

For those who are after a more subdued, passive experience, a picnic on the edge of Loch McNess wetlands provides a relaxing and enjoyable way to while away the day. This also gives visitors an opportunity to appreciate the recovering wetland system. If you're there at the right time of year, you might see swans and their cygnets nesting in the fringing sedges and on the islands, which also provide habitat for fresh-water turtles and tiger snakes.

For something completely different, EasyRider Adventures is offering Airwheel experiences in the park. Squeals of



delight can be heard from those aboard the otherwise-quiet machines as they manoeuvre around a specially designed obstacle course in the fun zone on Bull Banksia Oval or while on a guided tour around the park. Several different types of machines cater to a range of users (including those with mobility issues), meaning people of a range of ages and abilities can take part.

And, for those with an interest in Pokemon, the park is heavily populated with the virtual characters – proof that Yanchep National Park really does have something for everyone.





Top The fringing edges of Loch McNess provide an environment for waterbirds to nest.
Photo – Gooitzen van der Meer/Parks and Wildlife

Above right Nocturnal koalas can often be spotted sleeping in the trees.
Photo – Parks and Wildlife

Right EasyRider Adventures is offering Airwheel experiences in the park.
Photo – EasyRider Adventures

Do it yourself

Where is it? Yanchep National Park is 50 kilometres north of Perth.

What to do? Camping, cave tours, Aboriginal heritage experiences, picnicking, EasyRider tours, bush walking, viewing koalas, kangaroos and wildflowers.

Facilities: Trails and toilet blocks, some of which have been designed to accommodate people with disabilities.

Picnic shelters, tables and free gas barbecues throughout the park offer visitors a tranquil and relaxing setting.

Yanchep Inn has accommodation, bar and restaurant facilities, while Chocolate Drop Tearooms provides light meals and refreshments. The visitor centre stocks a range of gifts and souvenirs and the spectacular Cabaret Cave is available for hire (the only cave in Australia available for hire).

Entry fees apply. Camping can be booked at parkstay.dpaw.wa.gov.au.
For more information visit parks.dpaw.wa.gov.au.

Nearest Parks and Wildlife office:

Yanchep National Park
Cnr Indian Ocean Drive and Yanchep Beach Road, Yanchep, Western Australia 6035
Phone: (08) 9303 7759
Fax: (08) 9561 2316
Email: yanchep@dpaw.wa.gov.au
Facebook: www.facebook.com/yanchepNP/
Online campground bookings: www.parkstay.dpaw.wa.gov.au

PARKS FOR PEOPLE

Discover more about Yanchep National Park

Scan this QR code or visit Parks and Wildlife's '*LANDSCOPE*' playlist on YouTube.



The case of the *mystery chuditch*

by Rhianna King and Keith Morris

A chance sighting of a dead chuditch outside a suburban Perth primary school has provided clues into the distribution of a distinctive threatened species and highlighted the importance of 'citizen science' in the conservation of our State's plants and animals.

What started out as a normal morning walk for Department of Water scientist and school mum Frances D'Souza and her husband Neil Loneragan became significant for conservation when she spotted a dead animal lying on the footpath near Bateman Primary School. Recognising the distinctive white spots, Frances was sure it was a chuditch (*Dasyurus geoffroii*), or western quoll, having seen one in the wild some 27 years before. Later that morning, Frances made a series of calls to government and local government authorities to alert them to her discovery. She also phoned the school, but was advised that the dead chuditch was distressing the children so the school gardener had buried it in a patch of bush on the school grounds.

Later that day, word about the discovery made its way to Parks and Wildlife senior principal research scientist and animal science program leader Keith Morris, whose interest was piqued. He visited the school the next day – shovel in hand – to retrieve the specimen for research. Thankfully, it had been a cool day, and an even cooler night, so the chuditch had been well preserved.

The chuditch was, as Keith puts it, "a very good specimen" – intact, with few obvious signs of injury or trauma. However, it had a broken rear leg indicating that it had most likely been hit by a car. It was a male, and based on its size (1300 grams) and the condition of its teeth, was estimated to be around two years old.

But where had it come from?

CHAPTER TWO

Bateman Primary School is located in Perth's southern suburbs – between Leach Highway and South Street and across from Piney Lakes Reserve. One obvious theory was that the chuditch came from Piney Lakes, where there are known populations of quenda (*Isoodon obesulus fusciventer*). This theory was supported by reports from two members of the public who came forward to advise they had seen chuditch in the bushland in the weeks before. However, Piney Lakes is probably not large enough to support a chuditch population, indicating that it must have come from somewhere else to occur there in the first place.

One possibility was that the chuditch used the remnant bushland corridor associated with the Canning River to journey from the Perth Hills. But this would have involved a risky crossing of the Kwinana Freeway. Another theory was that the chuditch had moved north from the southern rural and urban areas around Baldivis and Mandogalup, possibly via Beeliar Wetlands. We do know that a population of chuditch was found recently in the Paganoni Road area, just north of Mandurah, as some were trapped there by researchers from The University of Western Australia. While remarkable, these possibilities are not totally unbelievable, considering the species' ability to travel long distances.

As solitary animals, chuditch live in large territories (1,000 hectares for males and 600 for females) and have been known to travel several kilometres in a day. They are even more mobile during breeding season, which occurs once a year. Community reports again provided information that supported the theory of a



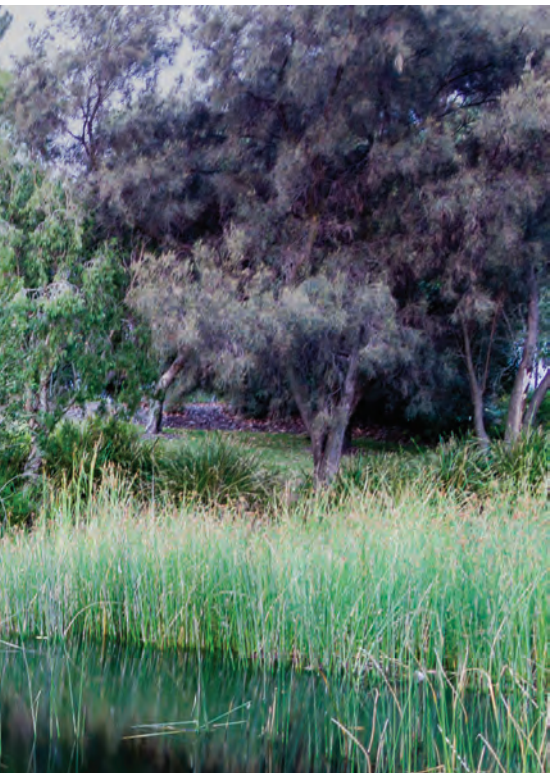
Previous page
Main Chuditch have distinctive features.
Photo – Jiri Lochman
Inset Chuditch occur in the Perth Hills.
Photo – Marie Lochman

Above Piney Lakes Reserve.
Photo – Peter Miller

Right The dead chuditch that sparked the interest.
Photo – Keith Morris/Parks and Wildlife

Opposite page
Far right Quenda are also known to inhabit Piney Lakes Reserve.
Photo – Jiri Lochman









southern suburbs origin with several people coming forward to say they'd seen dead chuditch in those areas on the side of the Kwinana Freeway and Forrest Highway.

CITIZEN SCIENCE

The case of the mystery chuditch has once again highlighted the importance of citizen science in conservation. Had it not been for Frances's keen eye and the reporting of the discovery to Parks and Wildlife, we may have never known about the chuditch and it may have been entombed forever on the school's grounds without anyone knowing its significance.

But the role of citizen science didn't stop with Frances. Her puzzling discovery generated media interest and featured in local and national news outlets. This generated further public interest and resulted in members of the public coming forward with more information about sightings in the area, proving to be invaluable in building a theory about where the animal might have come from. This information also helps build a profile of where this species might still occur, which helps inform land managers and owners, and would-be developers about the distribution of chuditch around the Swan Region.

YESTERYEAR

Chuditch once occurred throughout most of the southern half of mainland Australia, including the Swan Coastal Plain, where they were considered a pest from the 1930s to the 1950s when they preyed on the chickens in semi-rural blocks and poultry gardens. They were often shot and poisoned, and have been affected by loss of habitat through land clearing. The species now occurs in just over five per cent of their former range and is predominately confined to the south-west of WA where chuditch live in the jarrah forest, in some Wheatbelt areas, and along the south coast.



In the 1990s a recovery team was established to help protect chuditch and a number of captive breeding programs were carried out to reintroduce the species to its former range. By 2000, more than 330 individuals had been translocated to six sites – Julimar State Forest, Lake Magenta Nature Reserve, Kalbarri National Park, Cape Arid National Park, Mt Lindesay National Park and a trial release at Lane Poole Reserve. Most of these were successful, but a recent review of their population trends and conservation status suggests that they should still be classified as a threatened species. Since 2014, three contingents of chuditch, totalling 93 animals, have been translocated to the Flinders Ranges in South Australia to expand their distribution beyond WA for the first time in about 60 years (see 'Postcards to home', *LANDSCOPE*, Summer 2014–15).

So, while we may never know for sure where the Bateman chuditch came from, we can be assured that with translocation plans and conservation programs in place, and with the support of astute community members like Frances, the future of the chuditch seems a bit more certain.

Did you know?

Chuditch spots are believed to help the animal camouflage at night when their spots match the dappled light of the moon on the forest floor. Adult males can weigh up to 1.5 kilograms and reach about 60 centimetres in length, while females are smaller at about 55 centimetres and about one kilogram in weight. Females give birth to two to six young at a time, which when born are around five millimetres long and remain in the pouch for 60 days. After they become too big for the pouch, the young are kept in a den (usually a burrow or hollow log). 'Chuditch' is the Nyoongar word for the animal which is also known as a western quoll and native cat.

Above Parks and Wildlife nature conservation operations officer Rebecca Kay releasing a chuditch at Julimar State Forest.
Photo – Rebecca Campbell/Parks and Wildlife

Learn more about chuditch

Scan this QR code or visit Parks and Wildlife's '*LANDSCOPE*' playlist on YouTube.

Rhianna King is a *LANDSCOPE* editor and can be contacted on (08) 9219 9903 or by email (rhianna.king@dpaw.wa.gov.au).
Keith Morris is Parks and Wildlife senior principal research scientist and animal science program leader. He can be contacted on (08) 9405 5159 or by email (keith.morris@dpaw.wa.gov.au).

To provide reports of sick, injured, orphaned or displaced native wildlife contact the Wildcare Helpline on (08) 9474 9055.



A rose by any other name…

One of the core functions of Parks and Wildlife's Western Australian Herbarium is documenting and describing the State's native and naturalised flora. This involves field work to collect plants and map their distributions, followed by their identification, a process that includes detailed examination of the plant's structures, and sometimes genetic 'codes', as well as extensive literature surveys and comparison with existing specimens. In many cases the end result is the recognition of a new species, at which point the formal process of naming the species is instigated (see also 'DNA: Unlocking secrets' on page 36). This is not always simple. Unlike naming a newborn child, or even a pet, there are rules that have to be followed in the naming of any new species of plant or animal. For the plants, these are compiled in a book with the rather cumbersome title of the 'International Code of Nomenclature for algae, fungi, and plants', thankfully most often known by the abbreviation 'ICN' or 'The Code'. In this tome, which is revised every six years, the correct procedures for the naming of new species (or any other taxonomic level) are laid out. Many of these are logical, for example you cannot repeat a name that has been used previously, and each species can have only one valid name (in almost all cases the first name used). If a name is repeated inadvertently, or a previously named species given a new name, the new name is regarded as 'illegitimate' and cannot be used.

So the first step is to ascertain which names have been used previously. In the past this would have meant ploughing through reference books and historical literature, but thankfully web-based resources such as Parks and Wildlife's 'FloraBase', and the Australian and International Plant Name Indices (APNI and IPNI) can now provide much of the information via a simple search. Once this is completed, the creative side comes to the fore; actually choosing a name. Ideally the name should reflect a feature of the plant, so that anyone who sees the name might get an indication of the plant's appearance. As most names are rendered in Latin or Greek, knowledge of those languages is also a necessity. For example, the species name (or 'epithet') of the black-eyed susan *Tetratheca hirsuta* was coined in reference to the coarse hairs on its stems, leaves and flowering stalks, but if you didn't know that 'hirsute' was Latin for 'hairy' or 'shaggy', the name would have no meaning. Species can also be named for the location where they are found, or in honour of the people that collected the specimens, or made a significant contribution to the study of botany (or a related field). Again, knowledge of Latin comes in handy. To most Australians, the name 'australis' would suggest a species found in Australia, when in fact it is derived from the Latin word for 'southern'. Both the species and the country names have the same origin (Australia from 'Terra Australis'). For a species to be named for its Australian location, the epithet would be 'australiensis'.

Above The black-eyed susan (*Tetratheca hirsuta*) was named for its hairy stems and leaves.
Photo – Ryonen Butcher/Parks and Wildlife

Our work, and that of other herbarium scientists, regularly uncovers new species and genera that require naming, and doing so in honour of a deserving colleague is certainly a pleasure. *Cochlospermum macnamarae* – a multi-stemmed shrub that grows to two metres high and three metres wide in the Pilbara – was so named to honour Keiran McNamara, the late Director General of the former departments of Conservation and Land Management and Environment and Conservation. Under the ICN, 'Mc' surnames are spelled in full as 'Mac' when Latinised and surnames ending with –a are ended in –ae. Naming this species in his honour recognised his strong support of science, including taxonomic research at the WA Herbarium and targeted research of potential species of conservation concern.



Never ending story ...

the timeless photographs of Babs and Bert Wells





As Angela Bartle looks through her collection of old family photos, it is not the snaps of early family holidays that draw her attention – although these are extremely precious. It is the beauty and quality of the photos of Western Australian plants and animals that she sees with a whole new appreciation. These are the photos taken by her mother and father – Babs and Bert Wells – the international award-winning photographic team who started their photography career as retirees and left an amazing pictorial legacy for WA and the world.

words by Tracy Shea
photos by Babs and Bert Wells

As a child, Angela and her three siblings – Jim, Felicity and Penney (dec.) – were taken on regular family trips to the bush, where a love of nature and wildlife became a big part of their lives. But it was not until their father Bert retired in his late 50s after 30 years working at the Repatriation Department that he and his wife Barbara 'Babs' started a new life traversing the WA outback photographing its glorious and unique wildlife. Little did they know that their photographic work would have such a profound impact on how Western Australians see the State's plants and animals.





LATE BLOOMERS

Angela recalls the teamwork of her parents as they found their passion for photography. "Dad didn't pick up a camera until he was 55, but it opened a whole new world for him and my mother and gave them new purpose after bringing up four children," Angela recalls.

"When we were young we took for granted what Mum and Dad were doing, but now I can appreciate the patience, teamwork, and largely self-taught skills that went into getting the perfect shot – and they would never settle for less than that."

Though Bert took the photographs, he insisted that his beloved Babs got equal credit and always said that none of the photos would have been possible without the work Babs put in. He made it a condition of use of the photos that Babs's name came before his in photo credits.

Babs had an amazing ear for bird calls, and could reproduce them with an uncanny likeness. She could distinguish species by their calls from long distances, and used to scout ahead for the next subject while Bert was taking his photographs.

Babs became an expert in the biology of the wildlife they sought to immortalise, while Bert's incredible understanding of what was needed, without formal training, was highlighted by his development of the use of the high-voltage, ultra high-speed flash. The results from his equipment made from 'bits and pieces from here, there and everywhere' impressed photographers and confounded electronic boffins. As son Jim explains, "Its use was not without some excitement, as Dad described to us that he received many a body-jolting zap while standing waist-deep in a swamp, out-warbling the reed warblers".

This special technique to balance daylight and synchronise the high-speed flash at 1/10,000th of a second with the relatively slow speed of the shutter (about 1/60th of a second) was pioneered by their friend, renowned photographer and bird expert Michael Morcombe.

Babs and Bert also forged a strong association with the then Woodvale Wildlife Research Centre (now part of Parks and Wildlife), which saw them photograph plants and animals and join biological survey expeditions to work with scientists and technical staff in recording wildlife.

WORLD CLASS

During the illustrious second chapter of their 'working' lives Babs and Bert Wells captured many remarkable moments that saw them receive international accolades, including being twice recognised as fifth in the world for their contributions to exhibitions by the Photographic Society of America. One of their best-known shots,





Previous page
Main Dawson's burrowing bee.
Insets anti-clockwise from right Babs scouting for subjects with her two-way radio; Bert Wells; red-capped robin pair with their young; Bert setting up a shot for an image of the Dawson's burrowing bee.

Above left The coveted transparency collection is housed with Parks and Wildlife in boxes handmade by Bert.

Above An emu with its chicks.

Left and far left A male wasp pollinating an Arrowsmith spider orchid (*Caladenia crebra*).







the photograph of a rainbow bee-eater blasting out of its nest tunnel in the ground (which appears on the cover of this issue of *LANDSCOPE*), is a one-in-a-million image of what the naked eye could never see.

Bert's photograph of a male wasp pollinating an Arrowsmith spider orchid depicts the concept of synergy in nature; the orchid emits a powerful sexual odour similar to that emitted by a female wasp and attracts the male wasp to 'mate' with it, resulting in the orchid being pollinated. Bert's photo captures this moment and helps the viewer learn about the 'tricks' and adaptations used by plants to ensure the survival of their species.

PHOTOGRAPHIC LEGACY

Despite the huge advances in photographic technology since they were plying their craft in the 1970s and 80s, Babs and Bert Wells's images have retained their relevance and continue to 'hold their own' when compared with professional photos taken today, based on the skill required and composition.

By the late 1990s, Babs and Bert had retired, but their photographic legacy found a new home at the then Department of Conservation and Land Management (CALM) – now Parks and Wildlife – where the photos are used regularly in website design, Facebook stories, education materials, *LANDSCOPE* articles and the department's many publications. The hand-written catalogues that came with the 'Babs and Bert Wells Collection' of photographs cover more than 20 years of work and includes treasured photographs of mammals, fish, crustaceans, insects, reptiles and plants of every description.

In 2001, at the age of 84, Bert again launched himself into unfamiliar territory when he mastered (with some help from daughter Felicity) the use of word processing as well as photo scanning and manipulation, and wrote the autobiographical account of his and Babs's photographic adventures in the bush. The book includes stories of people they met, encounters with strangers and some trips with CALM scientists, all richly illustrated with their favourite photos. He called this 357-page, two-volume book *The Never Ending Story*, and it was completed and self-published in 2002 as a private family record.

Bert and Babs passed away in 2003 and 2011 respectively, but they left a profound mark on the natural history of WA, and their collection remains unsurpassed as a photographic record of the State's wildlife.

Top left Western swamp tortoise.

Above left A pair of red-eared firetail finches.

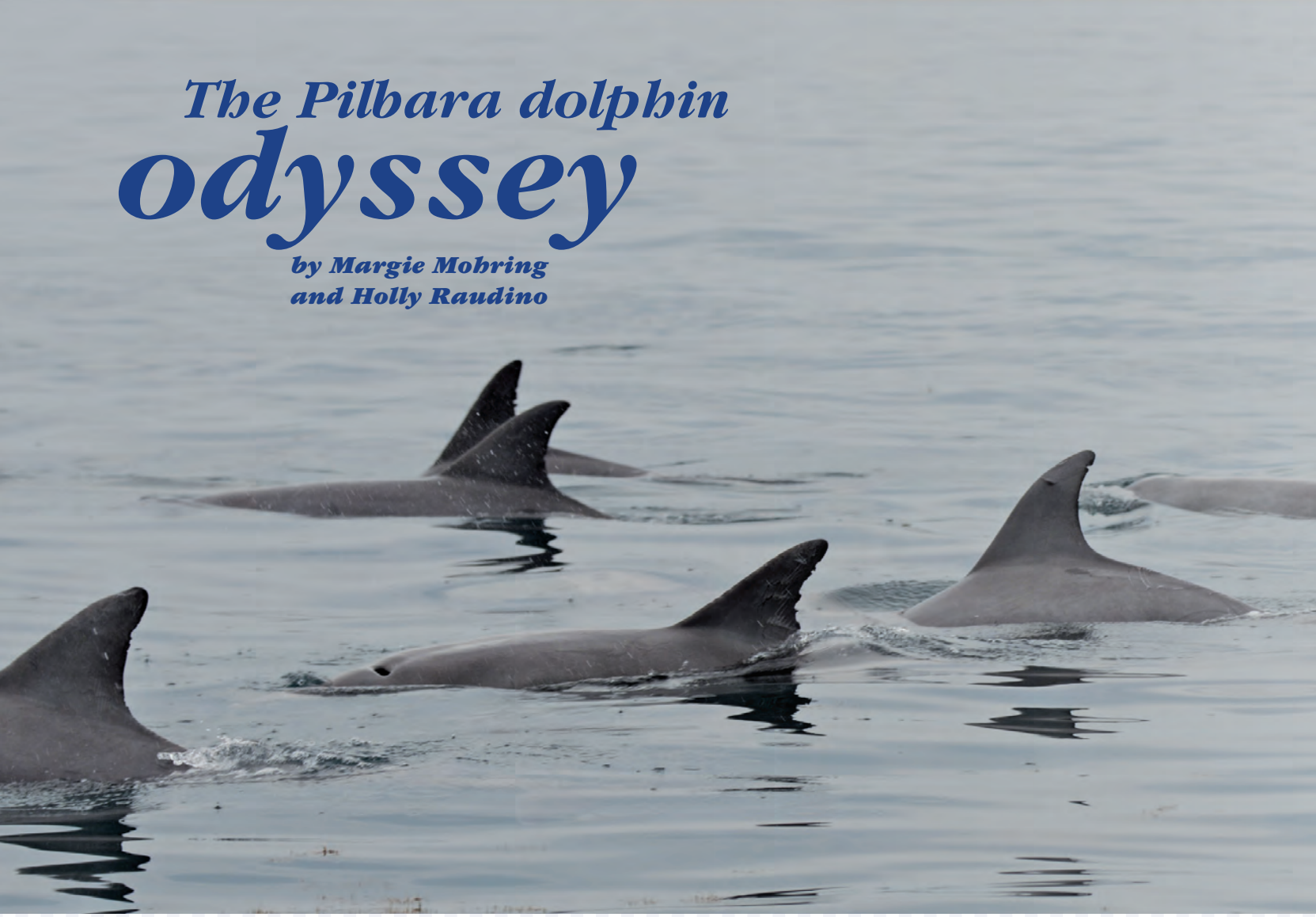
Above A south-west pygmy possum with her young.

Tracy Shea is Parks and Wildlife's assistant director policy and planning. She can be contacted on (08) 9219 8755 or by email (tracy.shea@dpaw.wa.gov.au).

'Touched by nature' is a new feature that tells the stories of people who have used their experiences in nature to enrich the lives of others.

The Pilbara dolphin odyssey

by Margie Mohring and Holly Raudino



A project to identify critical habitat for marine fauna, specifically dugongs, humpback whales and coastal dolphin species in the Pilbara has provided insight into the distribution of these magnificent creatures. For Parks and Wildlife researchers involved in the project, it was a journey of a lifetime.

Above A pod of bottlenose dolphins.
Photo – Holly Raudino/Parks and Wildlife

Opposite page
Right The spectacular Montebello Islands.
Photo – Col Roberts/Lochman Transparencies
Inset top The elusive snubfin dolphin.
Photo – Alex Brown, MUCRU/WWF-Australia
Bottom Australian humpback dolphin.
Photo – Holly Raudino/Parks and Wildlife

by Holly Raudino

The sunlight glitters off the still ocean waters of the Pilbara, the tiny six-seater plane buzzes along only 500 feet above the swell. Five enthusiastic Parks and Wildlife researchers peer out their windows desperately scouring the water below for tell-tale ripples. With their eyes peeled and their microphone recorders at the ready, they hope that today will be the day they spot the elusive snubfin dolphin.

WHERE, WHEN, WHAT AND HOW

The search for marine fauna along the Pilbara coast was carried out as part of Wheatstone Offset funding to identify critical habitat for marine fauna, specifically dugongs, humpback whales and coastal dolphin species. 'Critical habitat' is an area where activities occur that are essential to the survival of a species, such as resting, feeding, nursing and calving. We know of at least two dolphin species that live in the coastal waters of the Pilbara, the bottlenose dolphin (*Tursiops aduncus*), and the less common Australian humpback dolphin (*Sousa sahulensis*) but their population status is uncertain. The Australian humpback dolphin was only recognised as a new species in 2014. Originally assumed to be the same as the Indo-Pacific humpback dolphin found across Asia (*Sousa chinensis*), this new species is recognised to be restricted to northern Australia and Papua New Guinea. The Australian snubfin dolphin (*Orcaella heinsohni*), also recently described as a species in 2005 and only found in northern Australia, is occasionally sighted in Pilbara coastal waters but there are no known resident populations and it is presumed to be an occasional visitor from the Kimberley region.



Very little is known about dolphins in the Pilbara region, so these broad-scale aerial surveys and targeted boat-based surveys help answer questions on population size, distribution and habitat use and preferences. By surveying along set transect lines and using mathematical models we can calculate dolphin abundance and density and identify 'hot spot' areas. From boats we use photo-identification of the individual dorsal fins to track individual dolphins and investigate habitat use and ranging patterns on a smaller scale, including understanding whether individual dolphins are faithful to particular sites or whether they are transient. The aerial surveys help us to understand the species' distribution at a regional level and the dolphin's habitat requirements and preferences. It also helps us answer questions such as whether they prefer particular water depths and distances from the coast, or whether they are dependent on rivers or offshore islands. We aim to eventually be able to predict their distribution over larger areas based on the environmental factors of where we observed them during aerial and boat surveys.

To do this, we need many sightings as these models require a substantial amount of data. In the meantime we can work out basic encounter rates and density, based on our survey effort and the number of sightings. There is concern at a national level that Australian humpback dolphins are widely distributed across northern Australia but in low densities, which has implications for their conservation status. Exceptional areas for humpback dolphins include Ningaloo Reef and the North-West Cape, which has previously been recognised as a hotspot. We are increasing our survey efforts of the Exmouth Gulf and Dampier Archipelago because we have had the most sightings in these areas and believe they may be important for this species. To date, we have had enough sightings to estimate that the population size of bottlenose dolphins in the Pilbara region is in the low thousands of individuals. But we require more sightings of humpback dolphins to estimate their population size. Unfortunately it is not as simple as just counting the dolphins we see. We also need to understand how many dolphins we might miss, how long each species spends on the water surface and how long they dive so that we can correct our population estimates for the time that they are not available to be observed and recorded. It is exciting – for the first time we are beginning to understand the habits of these coastal dolphin populations.

And so the odyssey begins…



by Margie Mohring

FLIGHT 1 EXMOUTH
First day success

After spending time yesterday preparing for our month-long aerial survey, including going over the logistical details, meeting the pilot and getting to know our team members, my head was certainly spinning. Today, we were up bright and early and eager to get started. After a detailed safety briefing our little plane raced along the rough dirt track and leapt into the air. The conditions were perfect. First up, some training transects where we spotted a few turtles. Then, after a couple more practise runs, we started the much-anticipated survey. Up and down the Exmouth Gulf many times, with a few detours to circle some big groups of dolphins to count numbers. We saw several dugongs – they were easy to spot as they leave behind long plumes of sediment where they plow through the mud, snuffling up the seagrass. One herd of dugongs had more than 30 individuals. There was also some excitement when the port-side observers briefly spotted a dwarf minke whale.

The afternoon's trip started by bumping along in the thermals right to the bottom of the Gulf. The stunning, meandering, mangrove-lined rivers were spectacular, especially when you can see their inhabitants: the turtles, manta rays and sharks. Out further you can see the rising tide, sweeping over the burnt dry desert sand. Then, all of a sudden, the sightseeing was interrupted by a commotion in the plane thanks to a possible sighting of a pair of snubfin dolphins. We circled low but did not see them again, so photos and confirmation would have to wait for another day. But the team was buoyed by the knowledge that the elusive snubfin dolphin was out there.

FLIGHT 3 ONSLOW
Cities in the desert

Day two started with a slightly longer journey as we headed to Onslow, taking us more than 30 minutes to reach the transects. But it was a stunning journey! We were able to see the amazing rivers rushing into the sea and the massive Wheatstone LNG development, which stands like a mini city in the desert. When we arrived on the transect we spotted a good scattering of dolphins, a couple of dugongs, lots of turtles and a surprising number of sea snakes. A particularly exciting moment was when I spotted a group of dolphins which I thought had at least six individuals. The protocol is to circle if there are more than five to ensure a good count, and this time was well worth the effort as there were another six dolphins.

This particular morning was so still, not a breath of wind. And when it is warm and still, the *Trichodesmium* algal blooms and forms long plumes in the tide lines. This mixes with rafts of *Sargassum* macroalgae that can be seen from miles away. This phenomenon would normally be dispersed by any winds and choppy waves.

Before we knew it, it was time to head back as we could only fly for about 3.5 hours before we needed to land and re-fuel. But our return journey was made more special when I spotted a pod of large marine mammals (possibly false killer whales) from 1000 feet.

FLIGHT 6 MANGROVE ISLANDS
Getting the job done

Today the weather presented questionable conditions so we checked and re-checked the forecast. We formulated several plans and used the weather readings to decide whether it was viable to venture out. The plane can only do 50 hours before it must be serviced – marking the end of the survey – so we must be selective on when and how long we fly. We decided to fly through the Mangrove and Passage islands and were relieved with the favourable conditions.

We saw some stunning coral-lined islands and a few sparse humpback dolphins but the transects were long and slow.

We headed to Exmouth, bumped along the dirt runway, and then prepared to relocate to Karratha. We flew along at 7,500 feet and the views across the desert, mines, blue tributaries and islands were absolutely stunning.

FLIGHT 8 MONTEBELLO ISLANDS
Marathon of the Montes

We took to the air shortly after first light, slightly concerned that the overcast sky might turn to rain, but knowing that it was still good conditions for the survey. It was a fair journey out to the Montebello Islands and our eyes were glued to the horizon the whole way. The first glimpses were of the massive oil storage tanks on Barrow and Varanus islands. We started surveying our transects, but quickly crossed onto the stunning, complex islands. The islands – too many to name – were separated by beautiful azure water and joined by tiny bridges of land and reefs. The water was crystal clear and provided glimpses of the stunning reefs beneath the surface, and the quiet

Above left The survey team sets off, full of optimism on day one.
Photo – Jane Kennedy

Opposite page
Flight 1 Humpback dolphins in Exmouth Gulf.
Flight 3 A *Trichodesmium* algal bloom could be seen from the air.
Photos – Holly Raudino/Parks and Wildlife
Flight 6 Favourable conditions on flight six made surveying Mangrove and Passage islands possible.
Flight 8 A large group of bottlenose dolphins.
Photos – Margie Mohring/Parks and Wildlife

protected lagoons surrounding on all sides. Out from the northern tip the ocean was boiling, with big swells rolling in. Here it was like 'turtle soup' and the sighting calls were flying thick and fast. At one point there were more than 100 turtles seen. There were even a few groups of dolphins among the islands, including a big pod of bottlenose, and even a couple of dugongs. As we left the Montebello Islands behind, the general sentiment among the team was that we'd rather be swimming in the beautiful water than in the air.









FLIGHT 8

Montebello Islands Conservation Park

Montebello/Barrow Island Marine Reserves

Barrow Island Nature Reserve

FLIGHT 6

Mangrove Islands

FLIGHT 3

Onslow

Pilbara Region

Ningaloo Marine Park

Exmouth

Cape Range National Park

FLIGHT 1

Exmouth Gulf

0 10 20 30 40 50

kilometres

Legend

- Conservation park
- Marine park
- Marine reserve
- National park
- Nature reserve

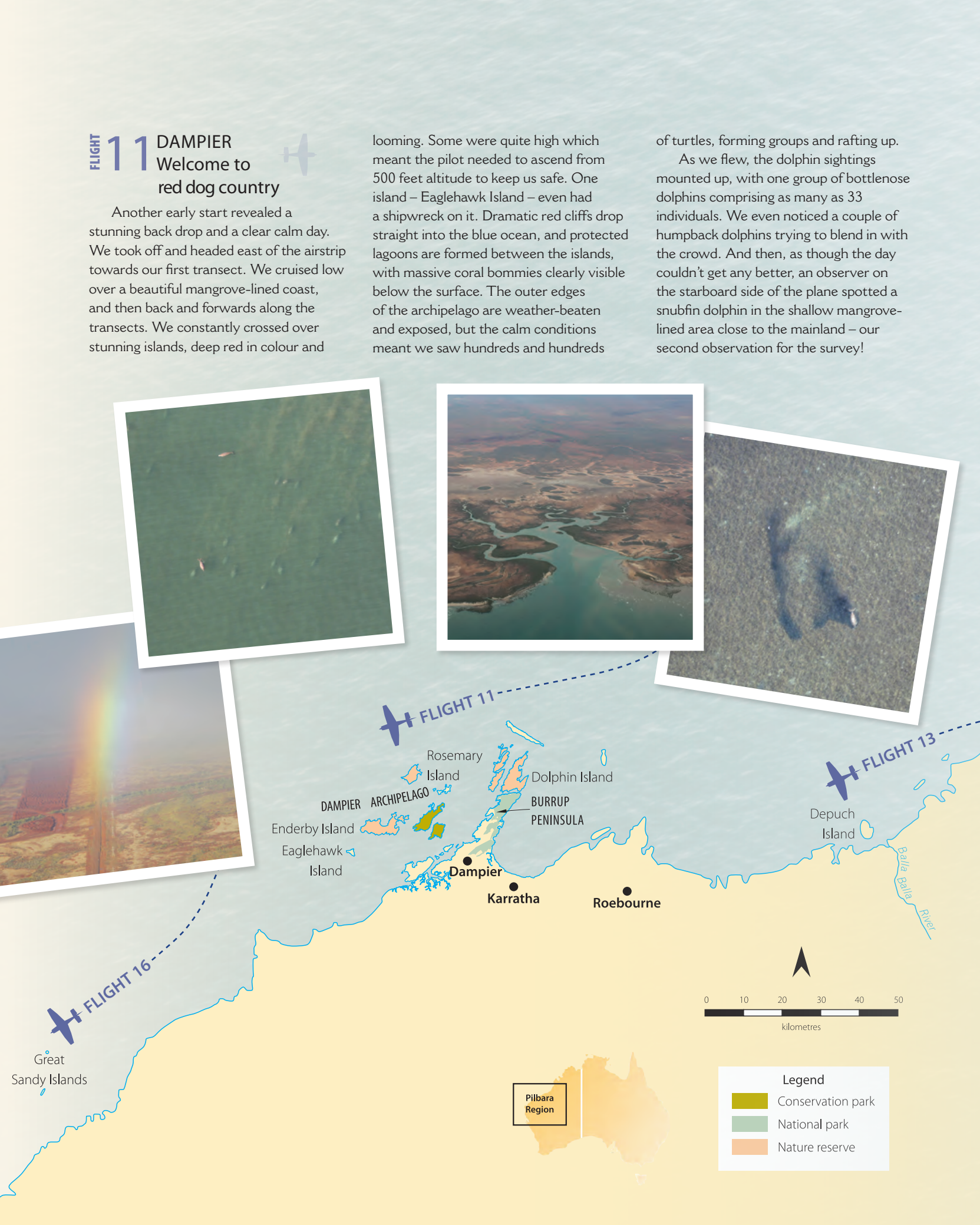
Hear more from the authors

Scan this QR code or visit Parks and Wildlife's '*LANDSCOPE*' playlist on YouTube.

FLIGHT 11 DAMPIER
Welcome to red dog country

Another early start revealed a stunning back drop and a clear calm day. We took off and headed east of the airstrip towards our first transect. We cruised low over a beautiful mangrove-lined coast, and then back and forwards along the transects. We constantly crossed over stunning islands, deep red in colour and looming. Some were quite high which meant the pilot needed to ascend from 500 feet altitude to keep us safe. One island – Eaglehawk Island – even had a shipwreck on it. Dramatic red cliffs drop straight into the blue ocean, and protected lagoons are formed between the islands, with massive coral bommies clearly visible below the surface. The outer edges of the archipelago are weather-beaten and exposed, but the calm conditions meant we saw hundreds and hundreds of turtles, forming groups and rafting up.

As we flew, the dolphin sightings mounted up, with one group of bottlenose dolphins comprising as many as 33 individuals. We even noticed a couple of humpback dolphins trying to blend in with the crowd. And then, as though the day couldn't get any better, an observer on the starboard side of the plane spotted a snubfin dolphin in the shallow mangrove-lined area close to the mainland – our second observation for the survey!



Favourable weather conditions meant we could go on and we managed to churn through 12 transects – making this our longest flight – and we touched down just before our mandated four-hour limit.

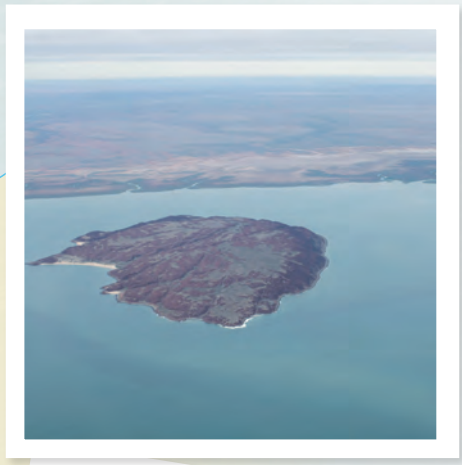
FLIGHT 13 BALLA BALLA
She sees sea snakes

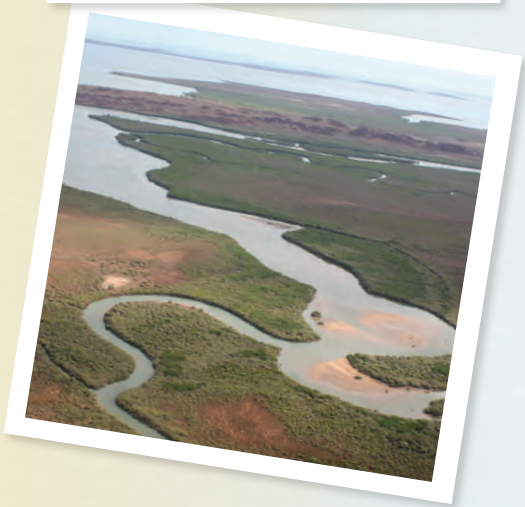
Today we had a 30-minute transit over to Balla Balla – east of Karratha. The first feature we noticed was Depuch Island, a massive rock looming out of the water, far from anywhere, at the mouth of the Balla Balla River. We dived here last year, when we were observing the stunning sponge gardens, with soft corals and sea whips. During that visit we were accosted by many curious sea snakes – and this time was no different.

What we saw here was quite astounding, there were jellyfish bobbing out where the water is 20 metres deep, floating along in the tide lines. And with them were so many sea snakes we could hardly keep count. The cries of 'sea snake' through the microphone were non-stop. We also had a few big groups of dolphins too, one with 20 individuals, and a few groups with more than 10.



"Then, in the final minutes of our last transect (literally metres from the shore) we saw a herd of about 50 dugongs leaving a massive plume of silt in their wake as they foraged in the mud for seagrass."





FLIGHT 16 GREAT SANDY ISLANDS
The grand finale

What better way to set the scene for our final flight than rolling thunder and heavy squalls of rain. But the wind this morning was not too bad and, with only a few transects left, we were optimistic that we could squeeze them in between the storms. So we started extra early, bumped our way through the deluge and reached 3,000 feet to race over to the Great Sandy Islands. And, low and behold, right where we needed to work there was a gap in the clouds, with blue sky shining through, and even a rainbow. It would have been poetic if we spotted another snubfin dolphin, but we did see three humpback dolphins, a few sea snakes and a couple of turtles. Then, in the final minutes of our last transect (literally metres from the shore) we saw a herd of about 50 dugongs leaving a massive plume of silt in their wake as they foraged in the mud for seagrass. We circled several times, got some photos and good counts and flew off with smiles on our faces. It was a perfect end to our Pilbara odyssey.

Opposite page
Flight 16 (top) The last herd of dugongs for the survey.
Flight 16 (bottom) A break in the stormy weather.
Photos – Holly Raudino/Parks and Wildlife
Flight 11 (left) The spectacular Pilbara landscape.
Flight 11 (right) Dugongs create plumes while eating.

Above Searipple Passage on the stunning Pilbara coastline.

Flight 13 (left) Depuch Island at the mouth of Balla Balla River.

Flight 13 (below left) The intricate coastline.
Photos – Margie Mohring/Parks and Wildlife

Below Fin markings and shapes can be used to identify individuals.
Photo – Holly Raudino/Parks and Wildlife



Holly Raudino is a Parks and Wildlife marine fauna research scientist. She can be contacted on (08) 9219 9754 or by email (holly.raudino@dpaw.wa.gov.au).
Margie Mohring is a Parks and Wildlife research scientist. She can be contacted on (08) 9219 9756 or by email (margie.mohring@dpaw.wa.gov.au).



Too posh to pitch

Photos and words by Lauren Emmerson

'Glamping' – or glamorous camping – is gaining popularity throughout the world. Lauren Emmerson takes us on a first-hand journey to Wellington National Park.

With the sound of poles clanging and zips zipping filling the crisp forest air of Wellington National Park, and "where's the insect repellant?" "I don't know, I thought you had it." "No, you said you were going to pack it!" occurring around me, I glance over at my pre-assembled luxury tent and wonder if I'd ever enjoyed a glass of cab sav so much.

The hardest thing we have had to do in the 10 minutes since arriving was find the cheese board amongst the organised tubs of absolutely everything one needs to enjoy a night of camping.

Feeling very self-righteous and indulgent, I cut another slice of camembert and continued to look over the brochures and maps Diane and Stephen Greville from Kiosk at the Dam have given us, just before Diane personally escorted us to our fully equipped camping area. Thank you Wellington Dam glamping package. Yes, I'll have a top up, ta.



DOIN' IT IN STYLE

Anyone who's ever been camping knows the sweet satisfaction of finally being able to sit down after a relationship-testing exercise of putting up the tent and consoling yourself that it doesn't really matter that you forgot your pillow; a rolled up jumper will be just as good.

'Glamping' essentially involves all of the joys of camping without the annoying bits – like packing everything under the sun and lugging it to and from the car, and cleaning the tent when you're tired once you get home.

The glamping experience includes creature comforts like a gas stove, linen and blankets, fluffy pillows and a bed. And the best part is that it is all set up and ready for you when you get there. All you need to bring is food and clothes.

The glamping experience has taken off in Western Australia and indeed the rest of the country and the world. Experiences range from more 'assisted-camping' style options where your tent is set up and you are provided with all the essentials you need, to luxury domes with air-conditioning, fridge and a private spa bath.

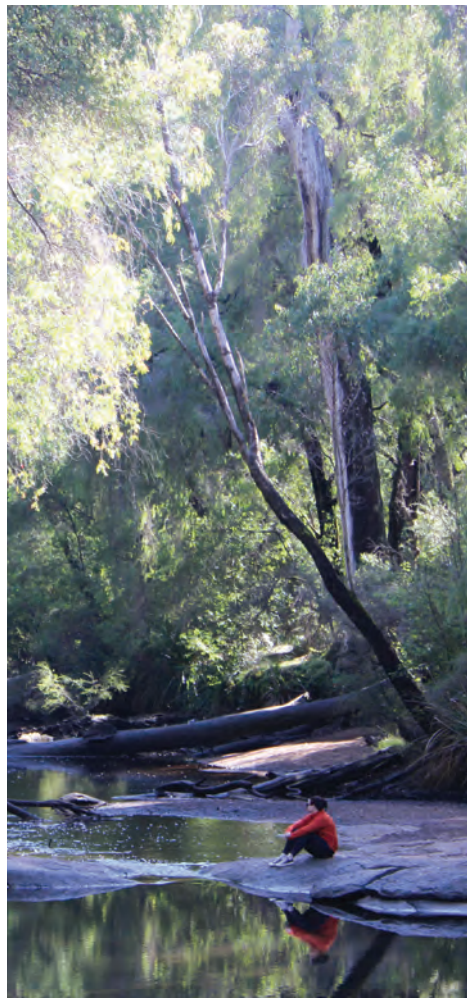
SUITS A RANGE OF TYPES

Kiosk at the Dam operators Diane and Stephen offer a unique glamping experience in Wellington National Park









Opposite page
Main Enjoying some of the perks of glamping at Wellington National Park.

Top left Diane from Kiosk at the Dam provides a warm welcome.

Above Kiosk at the Dam.

Far left Bedding is provided at Wellington National Park.

Left Honeymoon Pool.

and tell us that the first person to book a night of glamping with them was a single mum who wanted her kids to experience camping but didn't have all the equipment.

"Most people spend a lot of years acquiring all the camping equipment they need, or borrow it from friends," said Stephen. "But for those who want to get out of the city but don't have all the gear, glamping is a really good option."

Other 'glampers' include international visitors who want to experience camping in the Australian outdoors as well as interstate visitors, couples, families and inexperienced campers.

A number of glamping experiences are available around the State, with prices ranging from around $160 per night to upwards of $1,200 for more luxury experiences.

For more information about glamping in WA, visit www.westernaustralia.com.

Discover more about glamping at Wellington National Park

Scan this QR code or visit Parks and Wildlife's '*LANDSCOPE*' playlist on YouTube.

Do it yourself

Where is it? Eight kilometres from Collie, two-and-a-half hours' drive from Perth.

Total area: 17,000 hectares.

What to do: Camping, fishing, swimming, seasonal marroning, abseiling, rock climbing, bushwalking, canoeing/kayaking, mountain bike riding, horse riding, white water rafting.

Facilities: Wood and gas barbecues, Kiosk at the Dam, Wellington Mill Cottages, parking, two-wheel-drive and four-wheel-drive access, toilets, picnic tables, barbecue shelter, fire rings with firewood supplied, access to water for swimming and boating.

Camping: Camping is permitted at Honeymoon Pool and Potters Gorge within the park. Fees apply.

Park fees: There are no entry fees.

Nearest Parks and Wildlife office: Wellington District Office, 147 Wittenoom St, Collie, phone (08) 9735 1988.

For more information about glamping at Wellington National Park visit www.kioskatthedam.com.au.

Lauren Emmerson is a Parks and Wildlife project officer – editorial. She can be contacted on (08) 9219 9814 or by email (lauren.emmerson@dpaw.wa.gov.au).

Editor's note: The author paid for her own glamping experience, which was undertaken outside work hours.



For the birds

by David T. Bell, Gavan Mullan, Gary Hearle and Janine Guenther

photos by Janine Guenther

Each winter, a team of volunteers from BirdLife Western Australia travels with Parks and Wildlife to remote areas throughout the State to survey birds. Their data help to construct a picture about the distribution and status of Western Australian birds and informs management decisions. In 2016, the group travelled to the former Waldburg and Yaringa (part) pastoral leases where they spotted a number of our magnificent native species and yielded some fascinating results.



In the arid, inland regions of the Midwest and Goldfields, a number of rangeland leases are being transformed from sheep and cattle stations to sanctuaries for land and nature conservation. These leases were purchased by the then Department of Conservation and Land Management (CALM) between 1999 and 2001 and are now mostly destocked and managed for conservation.

One of the most important principles of conservation is to construct an accurate picture of what species occur in the area, how many there are and how they group together. Each July, volunteers from BirdLife Western Australia, in cooperation with Parks and Wildlife, conduct surveys of the bird populations on former pastoral leases and conservation reserves. They collect data on the status of the bird populations, including observations about whether the birds are growing or retracting from previous years. This information then helps form management strategies for the area.

In July 2016, 17 BirdLife Western Australia volunteers worked with Parks and Wildlife staff to survey the birds on the former Waldburg and Yaringa (part) pastoral leases. The former Waldburg pastoral lease is in the Gascoyne region, south of Mount Augustus National Park and the section of the Yaringa pastoral lease, now managed by Parks and Wildlife, is on the eastern shores of Shark Bay, south of the Wooramel Road House.

On Waldburg, the 2016 surveys identified 89 species, with eight species recorded for the first time on this property. These included the tawny frogmouth, rufous field-wren, slender-billed thornbill, striated pardalote, brown-headed honeyeater, orange chat, brown songlark and the welcome swallow. The 2016 surveys were the first on the Parks and Wildlife-managed former Yaringa (part) pastoral lease. Seventy-four bird species were recorded, including the most easterly documentation of the black sub-species of the white-wing fairy-wren and some other unusual sightings, such as of the stubble, little-button and brown quails, banded lapwings, western bowerbirds, orange and crimson chats and Horsfield's bushlark.





Previous page
Main The chiming wedgebill is full of character and has a distinctive call.

Above An Australian owlet-nightjar was one species the volunteers recorded from the former Waldburg pastoral lease.

During the five-day survey periods on each station, all the bird species seen were recorded and estimates of how frequently they occur were made by intensively surveying 25 permanently marked circular plots with a 500-metre radius spaced throughout the reserve. This data was then compared to any pre-existing pastoral lease records and lists of species in each survey site that have been previously submitted to the *Australia Bird Atlas*. The detailed numerical information provides indications of the variations in bird populations between particular geographic regions and the assemblages of birds occupying different vegetation types and how they change across different seasonal conditions. Subsequent surveys of the GPS-located survey points can also document changes over time in bird populations that are affected by recent rain or drought episodes and various conservation and land management practices.

TRACKING VARIATIONS

For example, surveys on the former Doolgunna and Mooloogool pastoral leases conducted in 2004, 2007 and 2011 demonstrated that some bird species show preferences for particular vegetation types, such as mulga woodlands, riparian eucalypt woodlands, grasslands or shrublands. These surveys also noted that the majority of bird species are permanent residents in these arid interior regions, although particular nomadic and migratory bird species add to the resident



Above BirdLife Western Australia volunteer Martin Knight in the acacia woodland of Yaringa pastoral lease.

Right Black-eared cuckoo was observed on former Yaringa pastoral lease.

Far right Flowering *Eremophila* is a favourite for nomadic honeyeaters.





population on a seasonal basis or following good rains. For example, exceptional rainfall in early 2013 resulted in increased flower and grass-seed production in the lands adjacent to the Fortescue Marsh in the Pilbara and so an increase in the presence of seed-eating birds, such as diamond doves, zebra finches, budgerigars and cockatiels was observed. Increased flowering in the *Eremophila* shrubs on the former Lakeside pastoral lease in 2014 led to increased populations of a number of nomadic honeyeaters. These included pied, black, white-fronted and spiny-cheeked honeyeaters. Early winter rains during 2015 on Wanjarri Nature Reserve in the Goldfields led to a hatch of hairy caterpillars and an invasion of migratory cuckoos, including Horsfield's bronze, pallid and black-eared cuckoos.

"They collect data on the status of the bird populations, including observations about whether the birds are growing or retracting in abundance from previous years."

As many of the former pastoral leases have come under conservation management by Parks and Wildlife in relatively recent times, documenting the impact of sheep and cattle grazing on the current status of bird species is of particular importance. Significantly reduced populations of chestnut-rumped thornbills were recorded on sections of the Fortescue Marsh, due to reduced shrub-layer vegetation in the surveys of 2012. Introduced camel and feral cattle populations also impacted the shrub layer on Kurrara Kurrara (formerly Earaheedy pastoral lease), resulting in reduced occurrences of inland thornbills and redthroats in the 2014 surveys compared to the adjacent Matuwa (formerly Lorna Glen pastoral lease), which has much reduced concentrations of feral grazing animals. Feral cat baiting that was carried out as part of Parks and Wildlife's *Western*



Shield program before the bird surveys on Matuwa resulted in the increased occurrences of a number of the shrub-layer inhabiting birds, such as slaty-backed and inland thornbills.

The surveys also uncover aspects of the basic ecology of bird populations and assemblages. The plant communities on Yaringa and Waldburg are predominantly acacia woodlands with identical foliage layer composition but different species. So the data accumulated could separate the influences of the vegetation structure from the effects of taxonomic variation. Also, aspects of the present mixture of insectivores, granivores and nectarivores, the proportion of predators to prey species and the presence of keystone and indicative species are important considerations for conservation and management.

The impacts of fire on bird assemblages in spinifex-dominated sites were also assessed on Matuwa in 2014. The bird assemblages at sites where the entire area had been burnt by a single fire event were compared to sites that had been burnt using a mosaic patch burning technique, used by Aboriginal people, which resulted in various ages of growth. While this information is valuable, additional studies with different burning regimes are needed to determine whether there are differences in the bird assemblages of the two management options.

FUTURE SURVEYS

Future surveys by the BirdLife Western Australia volunteers, in cooperation with Parks and Wildlife staff, are planned for a number of former pastoral leases and nature reserves in the Gascoyne, Murchison, Goldfields and Pilbara regions in the coming years. New surveys and re-surveys of previously visited reserves will provide a baseline record to help determine aspects of climate change, the impact of future Parks and Wildlife management techniques and potential changes due to alterations of adjacent pastoral lease use on bird populations and their conservation. Cooperative programs with volunteer public groups often lead to ways to better conserve and manage aspects of animal populations in Western Australia. More information about getting involved can be found at www.birdlife.org.au.

Above Winter ephemeral understorey in the acacia woodland of the former Yaringa pastoral lease.

Below Volunteers Roma Bell and Professor David T. Bell.



Professor David T. Bell was Associate Professor of Ecology at The University of Western Australia, now retired. He can be contacted on (08) 9407 8938 or by email (dtrcbell@iinet.net.au).

Gavan Mullan is a senior operations officer in Parks and Wildlife's Geraldton District based in Carnarvon. He can be contacted on (08) 9941 3754 or by email (gavan.mullan@dpaw.wa.gov.au).

Gary Hearle is an operations officer and also based in Parks and Wildlife's Carnarvon Office. He can be contacted on (08) 9941 3754 or by email (gary.hearle@dpaw.wa.gov.au).

Janine Guenther is a photographer, journalist and tour operator. She can be contact on 0487 085 596 or by email (j.guenther@verlag360grad.com).

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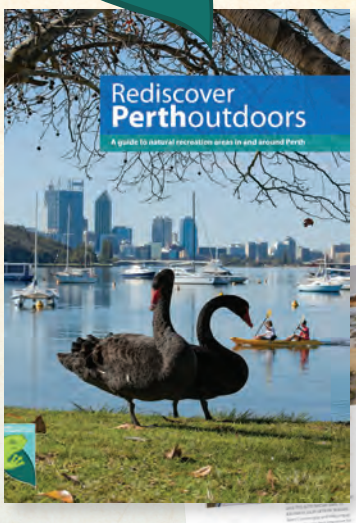
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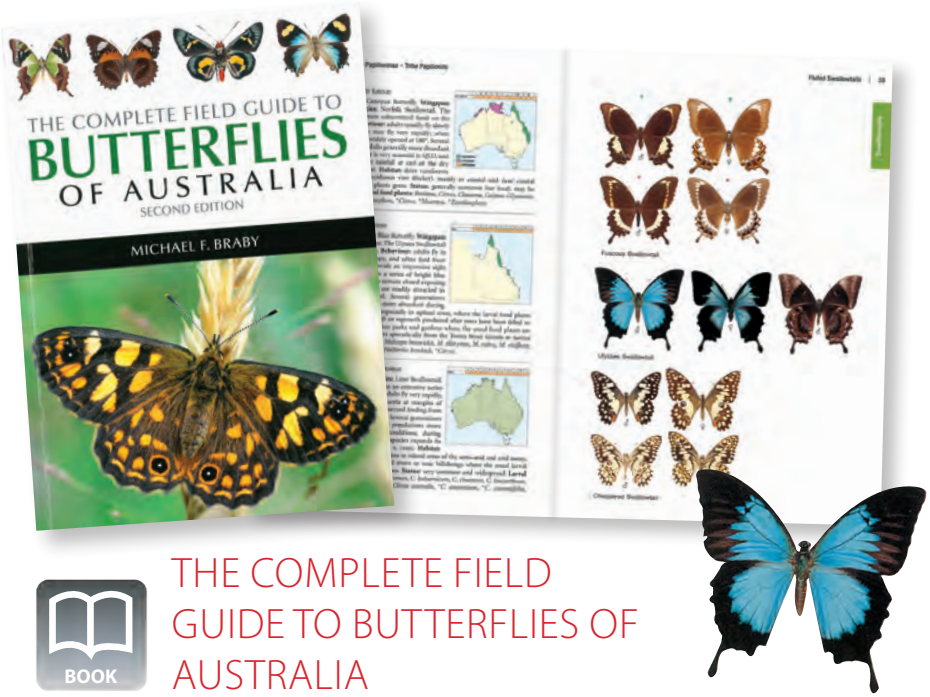
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BOOK

THE COMPLETE FIELD GUIDE TO BUTTERFLIES OF AUSTRALIA

If you're interested in Australian butterflies, then this book is definitely one for your collection. This extremely thorough field guide provides written descriptions of the 435 known species of mainland Australia as well as stunning illustrations and flight maps to help everyone – from the curious gardener to seasoned collectors – identify what they might have spotted.

The book's introduction contains a raft of useful information, from details about their morphology (including detailed diagrams and descriptions of the body parts and fascinating photos of differently shaped and sized eggs) to facts about their lifecycle and behaviour. The book also contains photos of different habitat types, plus a section on how to get the most out of the book and a chapter on how to collect, preserve and present specimens.

The second edition of The complete field guide to butterflies of Australia *is written by Michael Braby and is available for $49.95 from www.publish.csiro.au and good bookshops.*

WILDFLOWERS WA

APP



WildflowersWA is a handy reference tool designed to help locals and visitors learn about and appreciate Western Australia's magnificent wildflowers. It presents information about thousands of species in a way that can be understood by users of all levels of expertise and contains stunning photos.

An intuitive search function enables users to search for flowers by their type, colour, leaf size and shape, plant size and habitat, meaning you don't have to be a botanist to identify plants in their natural environment.

WildflowersWA was created by an experienced team of experts – Libby Mattiske, John and Margaret English and Cameron Blackburn – with the help of a dedicated team of volunteers.

WildflowersWA *is available at http://wildflowerswa.net for an annual subscription of $27.50. The team is currently working on an offline app version.*



EXPLORE MARINE PARKS WA

APP

Western Australia has more than 13,500 kilometres of coastline, pristine beaches and rich marine life. And now, thanks to a free, easy-to-use app, visitors and locals can more easily navigate the State's marine parks and learn about common and more unusual marine species.

This handy app includes a section on how to 'Explore Marine Parks' where users can toggle between the app and Apple Maps to plan their routes and check their location. Detailed park maps provide information about what activities can be carried out (including fishing) in different zones.

A 'Wildlife' section describes the key species that can be found in each area and provides information about some of the State's most fascinating marine creatures, which you can search for by name or location.

A key strength of the app is the interactivity of all the sections, which enables you to decide your destination based on where you want to go or what you want to see. And because all this data is downloaded to your phone, you can access the information wherever you are, even if you're out of mobile range.



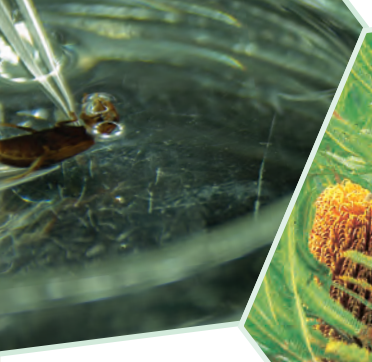
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Marine Parks WA *was developed by Parks and Wildlife with support from Department of Fisheries and Exxon Mobil Australia and is available for free for iPhones and iPads. Search for 'Marine Parks WA' on the app store.*

DNA

UNLOCKING SECRETS







DNA profiling has come a long way since it was first discovered by Swiss physician Friedrich Miescher in 1869. Nearly 150 years later, Parks and Wildlife scientists and managers are using genetics to discover and understand species, inform decisions, solve mysteries and fight crime. And that's just the beginning.

BY RHIANNA KING, KYM OTTEWELL, DAVE COATES AND MARGARET BYRNE

Using DNA to solve crimes and unlock mysteries has long captured the imagination of scientists, novelists and script writers alike. The ability to burrow down to the blueprint of all known organisms to reveal their growth, development, functioning and reproductive characteristics provides us with a precise way to identify and discriminate between individuals, populations and species. And while it's not exactly how it's portrayed in the crime shows – where mysteries are neatly solved usually thanks to a combination of science and extremely good luck – DNA sequencing and genetic studies are being used extensively by Parks and Wildlife scientists in a range of applications to help biodiversity conservation.

THEN AND NOW

What began as a small laboratory in the Wildlife Research Centre at Woodvale nearly 30 years ago has developed into one of Australia's leading agencies in the application of DNA technology to biodiversity conservation. The initially small plant genetics research group, which subsequently moved to the WA Herbarium, has expanded into a sophisticated and highly regarded program under the impetus of botanist Dr Margaret Byrne – now the department's director of science and conservation – and senior principal research scientist David Coates. This expansion, carried out in collaboration with other organisations and tertiary institutions, has seen the use of genetic information being integrated across the department in a myriad of ways.

UNLOCKING SECRETS

Following the adage 'all creatures great and small', Parks and Wildlife scientists situated in the Sid James Conservation Genetics Lab at the Keiran McNamara Conservation Science Centre are involved in a range of ground-breaking projects. Within the team is Parks and Wildlife research scientist Kym Ottewell, who is no stranger to exciting discoveries – she was the scientist who did the DNA profiling on a mystery whale, which turned out to be a rare Omura's whale, that had washed up on an Exmouth beach (see 'Scientific serendipity', *LANDSCOPE*, Spring 2015). This was a truly significant find as it was the second record in Australia and extended the species' known distribution.

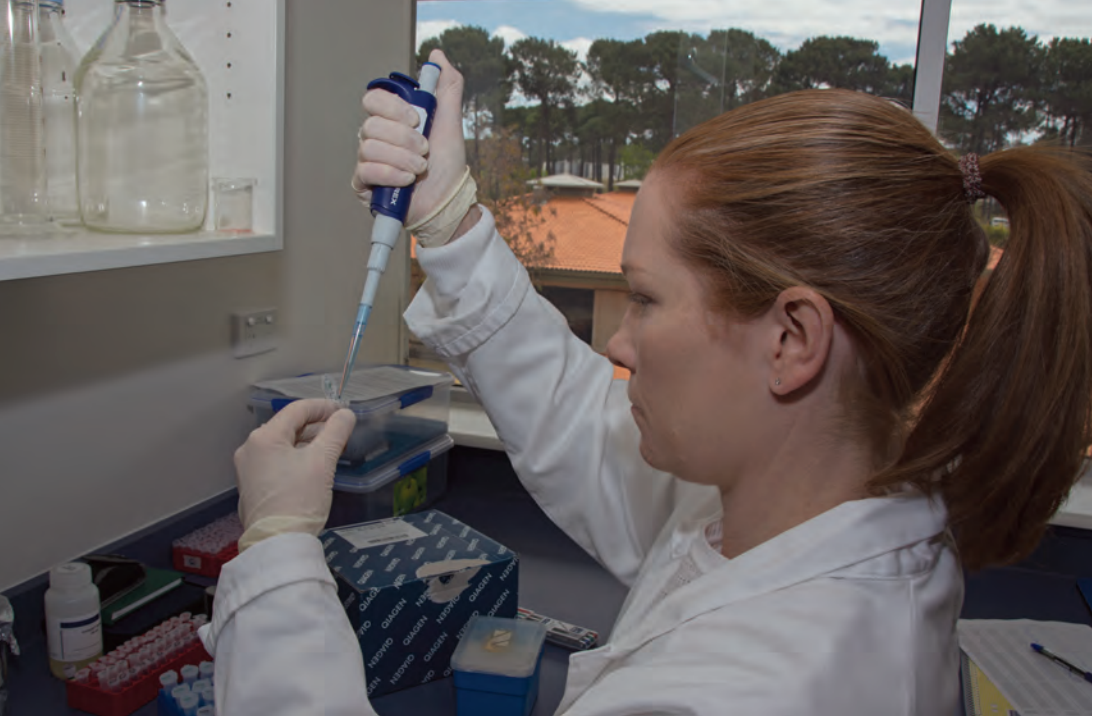
Kym and her colleagues use genetics to map the DNA profile of WA's native animals to help inform projects around the State, as well as monitor recent native wildlife translocations such as the one to Matuwa (formerly known as Lorna Glen) (see 'A sacred partnership: managing Matuwa and Kurrara Kurrara', *LANDSCOPE*, Summer 2015–16). Using genetic samples taken from animals before their release at Matuwa, and from animals born at the site, researchers have been able to monitor how populations of golden bandicoots, brushtail possums, and burrowing bettongs (boodies) have fared since being reintroduced to the area. High genetic diversity and low inbreeding are signs that the populations are doing well and that they are increasing in size. Monitoring these populations at regular intervals enables Parks and Wildlife to practice adaptive management, which will help to ensure the long-term success of this important fauna restoration project.

For species that are difficult to capture, scientists have devised more innovative ways of collecting DNA. Bilbies are elusive, highly dispersed and notoriously difficult to capture in traps. But, as a species of national significance, it is vital that we keep a handle on their population health, especially in northern WA, where there are multiple threats to wild populations. Parks and Wildlife research scientist Martin Dziminski and technical officer Fiona Carpenter spend time in the Pilbara with their eagle eyes to the ground, looking for bilby scats to collect and bring back to the genetics laboratory where the DNA is extracted. While collecting bilby scats might not be everyone's cup of tea, this work provides valuable insight into the number of animals or individuals within sub-populations and allows for understanding of gene flow between sub-populations, which can be used to better inform management and conservation measures.

Opposite page
Main Kristy Quinlan carefully prepares a beetle specimen for DNA extraction.
Photo – Peter Nicholas/Parks and Wildlife
Inset left Fiona Carpenter and Frank Morris collecting bilby scats.
Photo – Martin Dziminski/Parks and Wildlife

Above DNA from beetle larvae helps inform surveys of wetland systems.
Photo – Peter Nicholas/Parks and Wildlife

Above right The critically endangered feather-leaved banksia.
Photo – Sarah Barrett/Parks and Wildlife







Similarly, species or specimens that are difficult to identify – for example, juvenile animals that have yet to develop the adult morphological features that are used to characterise them – can be identified using a technique known as DNA barcoding. This is where a short DNA sequence from the unidentified specimen is compared against an international database of DNA sequences from known species. Parks and Wildlife technical officer Kirsty Quinlan has been successfully using DNA barcoding to identify species of aquatic beetle larvae (which obviously lack the identification features of adults) collected in biodiversity surveys of WA aquatic ecosystems conducted by research scientist Adrian Pinder. These analyses enable Adrian and his team to provide a more complete taxonomic survey of wetland systems as well as extending our understanding of the distribution and diversity of WA aquatic invertebrates.

Parks and Wildlife also uses genetic surveying to map seed collection zones for key species used in revegetation and mine site rehabilitation. This work provides mining companies and their consultants with information about patterns of genetic diversity and where to source seeds for restoration. In some cases these recommendations must include adjustments made for our changing climate and other environmental factors. Margaret Byrne and her colleagues have been investigating signals of genetic adaptation to climate in widespread species distributed across broad climatic zones, and the results suggest that seed can be sourced from the more arid areas for planting in more mesic areas to spread the climate adaptation genes into mesic populations ahead of changes in climate. While investigating genetic signatures of adaptation to climate in the iconic gimlet (*Eucalyptus salubris*), they also found two cryptic genetic lineages that may represent different taxa.

One rare plant that has been the subject of genetic research, is the feather-leaved banksia (*Banksia brownii*) – a critically endangered species that occurs in small populations on the south coast and is highly susceptible to *Phytophthora* dieback. David Coates and his team have been conducting genetic surveys on this species to assess the impact of *Phytophthora* and to understand the genetic differences between geographically isolated population clusters. Using seeds from now-extinct populations, they were able to show that more than a third of the total genetic variation assessed in this species has been lost due to extinction caused by *Phytophthora* dieback. They also found that the Stirling Range populations were genetically different from more southerly populations near Albany and thus separate translocations in *Phytophthora*-free sites were established for the Stirling Range and the southern populations. Further genetic studies are underway to establish how the translocated populations are tracking genetically and help resolve whether they will be self-sustaining in the future.

In addition to doing work on known species, staff and volunteers at Parks and Wildlife's WA Herbarium examine plant specimens to ascertain whether they are new to science. A recent discovery was a new sub-species of *Eremophila microtheca* that is now listed as critically endangered. Genetic studies by Parks and Wildlife flora conservation officer Tanya Llorens and colleagues revealed strong genetic differences between geographically disparate populations, one near Eneabba and the others in Kalbarri National Park. The small isolated Eneabba population was subsequently recognised as a new sub-species and is in the process of being described by Parks and Wildlife botanists.



Opposite page
Far left Parks and Wildlife technical officer Fiona Carpenter working to extract DNA from bilby scats.
Photo – Peter Nicholas/Parks and Wildlife
Below far left A new subspecies of *Eremophila microtheca* was confirmed using DNA sampling.
Photo – Andrew Brown/Parks and Wildlife
Right Red-tailed black cockatoos are the subject of poaching.
Photo – Rick Dawson/Parks and Wildlife

Left Taking a cheek swab from a snake.
Photo – Peter Nicholas/Parks and Wildlife

X-FILES

Another way the department uses DNA is in the investigation and prosecution of cases of illegal poaching and smuggling of native wildlife – a burgeoning black market. Parks and Wildlife officers investigate many cases each year (see 'A scaly tale', *LANDSCOPE*, Autumn 2016) and are increasingly using genetic sampling to build cases that lead to successful prosecutions.

The department has teamed up with Dr Peter Spencer at Murdoch University to build a wildlife forensics capability. One of the early cases occurred in 2010 when a member of the public photographed a man up a ladder allegedly taking a red-tailed black cockatoo chick from its nest. Wildlife officers travelled to the nest site where they collected discarded egg shells and sampled DNA left by the mother on the outside of the shell. When they tracked down the offender at his home in Morawa, they discovered a red-tailed black cockatoo, which they alleged was the bird taken from the nest. However, they did not need to proceed with testing, as the offender volunteered his guilt and was charged with two counts of taking fauna.

In a case of 'right place at the right time', the wildlife officers at the property at Morawa heard screeches of red-tailed and Carnaby's black cockatoo nestlings coming from a property next door. An investigation led to the wildlife officers discovering 14 cockatoos at the property. DNA material from one of the nestlings was closely related to an adult sample taken 10 years earlier in Bindoon (150 kilometres away). This match proved that the nestlings had been poached from the wild, and not bred in captivity (as was claimed). After being presented with the DNA evidence, the accused pleaded guilty to unlawful possession, was fined $4,610 and required to forfeit his bird cages.

DNA sampling is also used as evidence in some cases of animal cruelty. In one case, a man was found guilty of kicking a quokka on Rottnest Island after DNA tests revealed that blood on his shoes belonged to the quokka.

Parks and Wildlife is developing a DNA database of reptiles that can be used to positively identify species of seized animals. In many cases, juvenile reptiles can look markedly different to the adults, so a positive visual identification is not always easy. In some cases, officers are presented with exotic reptiles that come from overseas or atypical specimens such as albinos or hybrids. This database will help establish whether animals kept in WA are native to the State or have been illegally imported. It will also help determine parent-progeny relationships and whether licensed keepers are illegally breeding animals they hold licenses for. Parks and Wildlife officers have established a technique for gathering cells from inside a snake's mouth (similar to a cheek swab in humans) that enables them to take DNA without having to mark or scar the animal.

MOVING FORWARD

Genetic tools are becoming commonplace in plant and animal management and Parks and Wildlife continues to lead the way in their application in conservation. And with the amazing recent developments in genomics there will be many more innovative ways in which genetics and molecular biology can contribute to wildlife management in ways that were not even thought of a few years ago.

Rhianna King is a *LANDSCOPE* editor. She can be contacted on (08) 9219 9903 or by email (rhianna.king@dpaw.wa.gov.au).
Kym Ottewell is a Parks and Wildlife research scientist. She can be contacted on (08) 9219 9086 or by email (kym.ottewell@dpaw.wa.gov.au).
Dave Coates is a Parks and Wildlife senior principal research scientist. He can be contacted on (08) 9219 9048 or by email (dave.coates@dpaw.w.a.gov.au).
Margaret Byrne is Parks and Wildlife's Science and Conservation director. She can be contacted on (08) 9219 9078 or by email (margaret.byrne@dpaw.wa.gov.au.





The bountiful baler

by Alan Kendrick, John Huisman and Michael Rule

You may occasionally chance upon a weathered and broken baler shell on nearly any beach in Western Australia as these large marine shells occur around the entire coast. While a beachcomber may even find a strikingly patterned intact shell, the more observant visitor may be lucky enough to see a living specimen of these distinctive gastropods in any of WA's oceanic marine parks and reserves. These impressive shells are not uncommon in intertidal and shallow marine habitats, but may be well camouflaged with algae or partially buried in sand or muddy sediments.

Baler shells belong to the genus *Melo* and include some of the largest and most well-known species of the mollusc family Volutidae, which occur in many marine habitats around the world. Most common in the southern hemisphere, volutes are particularly diverse in Australia's coastal seas, where about a third of all known species can be found. While they occur around Australia, different baler shell species occur in the tropical north and temperate south.

WESTERN AUSTRALIA'S BALER SHELLS

Four species are currently recognised from northern Australia, where the aptly named northern baler (*Melo amphora*) is the most prevalent. This species is distributed across the north of Australia and extends down the Western Australian coast to Shark Bay. Northern balers can grow to about 50 centimetres in length with highly domed shells that may become covered in algae as they age. The distinctive straight shoulder spines on the spire are prominent on smaller individuals, but are often eroded or lost with age. Northern balers can often be seen along WA's northern coast on the extensive reefs, rock pools and tidal flats that become exposed as tides recede. Other northern species have more limited distributions, such as *Melo ashmorensis*, which was only described in 2005 and has so far been recorded only from offshore reefs of north-western Australia. In contrast, only one species, the southern baler (*Melo miltonis*) occurs in WA south of Shark Bay. This is the largest marine gastropod in coastal waters of Australia's south coast. Characteristically smaller than the northern baler, this shell rarely exceeds 35 centimetres in length and has a narrower shell with incurving spines on the spire and a strikingly patterned brown and white body. Due to the smaller tides and less extensive intertidal habitats of WA's south, southern balers are more frequently seen alive by divers.

Baler shells breed by producing a large, leathery egg-mass that is fixed to a firm structure on the seabed. The egg mass comprises about 100 capsules (each containing an embryo) joined in rows. Upon hatching, the young undergo direct development; that is they lack the pelagic or free floating larval stage common to many molluscs and move from the egg directly to the seabed when they are





"… baler shell artefacts were also distributed far from the coast into central Australia along trade routes and examples have been found in the Great Sandy Desert in WA …"

about 2.5 centimetres in length. (See also 'Understanding marine 'connectivity'', *LANDSCOPE*, Winter 2016.) One consequence of this lack of dispersion is that genetic mixing between populations is limited, causing balers of the same species in different locations to vary considerably in their shell form and colour pattern. Interestingly, baler shells with an apparent mix of *M. amphora* and *M. miltonis* features occur where the ranges of these species overlap at Shark Bay, suggesting that the northern and southern species may hybridise at this location. All volutes are thought to be carnivores and commonly feed on other molluscs. Southern baler shells are known to feed on quite large molluscs like turban shells and abalone. Baler shells themselves have been recorded as prey consumed by tiger sharks (*Galeocerdo cuvier*) caught off the WA coast.

A LONG ASSOCIATION WITH PEOPLE

Baler shells have provided food and useful materials for Indigenous people for a very long time in Australia and more broadly across south-east Asia. The shells were formed into scrapers and adzes, spoons and containers, discs for spear-throwers and objects like pendants that had high ceremonial value. The common occurrence of baler shells in neolithic burials in the Philippines and other sites throughout the Pacific suggests that these shells were ritually important.

The long use of baler shells by Aboriginal people in WA can be seen in shell middens associated with human occupation along the coast over thousands of years, at locations like rock shelters near Monkey Mia at Shark Bay and Mandu Mandu on the Ningaloo coast. In WA's Kimberley region, baler shells were used to collect and store water, and also to mark water sources. The incongruous presence of a baler shell in the arid interior landscape would inform traditional owners or visiting people of a nearby source of water. Evidence shows that baler shell artefacts were also distributed far from the coast into central Australia along trade routes and examples have been found in the Great Sandy Desert in WA and the Flinders Range in South Australia.

So while baler shells have held value for Indigenous people throughout the region over thousands of years, today they may simply play a role in brightening up a walk along the beach or add interest to a swim, snorkel or dive.

Opposite page
Main A northern baler in shallow water at the Montebello Islands Marine Park.
Photo – Suzanne Long/Parks and Wildlife
Left A young southern baler showing its distinctively patterned body at Shoalwater Islands Marine Park.
Photo – John Huisman/Parks and Wildlife

Above left A northern baler at Long Reef, northern Kimberley.
Photo – Clay Bryce/WA Museum

Above A northern baler laying an egg mass.
Photo – Alan Kendrick/Parks and Wildlife

Alan Kendrick is Parks and Wildlife's marine science program leader. He can be contacted on (08) 9219 9793 or by email (alan.kendrick@dpaw.wa.gov.au).

John Huisman is the Parks and Wildlife WA Herbarium curator. He can be contacted on (08) 9219 9137 or by email (john.huisman@dpaw.wa.gov.au).

Michael Rule is a Parks and Wildlife temperate research scientist. He can be contacted on (08) 9219 9800 or by email (michael.rule@dpaw.wa.gov.au).



NOSES ON LEGS:

detector dogs helping with feral cat contol

by Michael Johnston, Mark Holdsworth, Sue Robinson and Dave Algar

More than just man's best friend, dogs are helping in the fight against feral cats on Dirk Hartog Island National Park to enable the island to be restored to its former glory and repopulated with its original wildlife.







Ever loyal and keen to please, dogs are proving extremely helpful in verifying the absence of cats on Dirk Hartog Island National Park. Six dogs, including 'Clay', a wiry-coated terrier, completed a six-week survey searching for signs of cat activity on Dirk Hartog Island as one of the techniques used to validate eradication success. Similar to detection dogs used by quarantine services at airports, the dogs used in this project adopt a seated 'focused response' posture when they locate their intended quarry, in this case cat scats or fresh scent. Clay also barks loudly to tell her handler about her find and to hurry up with the reward – a game with a favourite tug toy amid enthusiastic praise from her handler.

AMBITIOUS PROGRAM

The *Dirk Hartog Island Ecological Restoration Project* seeks to reduce the impact of invasive species on the 620-square-kilometre island in preparation for the re-introduction of at least 10 mammal species that were formerly present (see also 'Turning back time on Dirk Hartog Island', *LANDSCOPE*, Spring 2014). These have become locally extinct on the island during the past four centuries since Dirk Hartog landed on the island in 1616. Like so many other extinctions across Australia, feral cats have been one of the main culprits.

Dirk Hartog Island is the largest landmass from which the eradication of feral cats has been attempted worldwide. Until recently, feral cats were widespread over the island with dietary analysis indicating that they were consumers of a range of terrestrial and marine species, such as turtle hatchlings. A number of techniques are being used to monitor and then remove these introduced predators from the island. Given the size of the island, a 13-kilometre-long floppy-top and electric barrier fence was erected in 2014 across the island to restrict the movement of cats and create two management areas.

In May 2014, aerial baiting using *Eradicat*® baits, specifically developed in WA by Parks and Wildlife to target feral cats, was used as the primary control technique to reduce the cat population in the roughly 220-square-kilometre southern management zone. Targeted trapping followed in areas where cats were detected. Monitoring of individual cats, fitted with radio-collars, indicated that the baiting program was very effective, with 14 of 15 radio-collared cats poisoned.

The monitoring program consists of systematic searches along tracks, beaches and at bird roosts for cat signs such as footprints and scats. A number of automated cameras were also installed before baiting and continues to be used to monitor for any remaining cats island-wide. Results so far suggest that the initial stage of the program has dramatically decreased the population, with only seven un-collared cats detected and trapped in the five months following baiting.





Previous page
Main Dirk Hartog Island National Park.
Photo – Susan Pederson/Parks and Wildlife
Inset bottom left Clay searching down a hole.
Photo – Mark Holdsworth
Inset bottom right A feral cat sighted on Dirk Hartog Island.
Photo – Neil Hamilton/Parks and Wildlife

Above Clay detects some old cat scats.
Photo – Mark Holdsworth

"Dirk Hartog Island is the largest landmass from which the eradication of feral cats has been attempted worldwide."

FOLLOWING THE SCENT

Detector dogs are increasingly being used to assist with conservation monitoring work (see also 'Tackling toads', *LANDSCOPE*, Winter 2014). Their acute sense of smell provides an excellent means in detecting their target, in this case cats, and acts as a quality control on other monitoring methods. An experienced team of dogs and handlers was contracted to conduct the Dirk Hartog Island survey. Some had previously been involved with similar programs on Tasman Island off Tasmania and Macquarie Island in the sub-Antarctic.

The dogs were deployed to search areas furthest away from the track alignments and camera plots. These areas could harbour cats that had









Top The location of cat scats are recorded using GPS devices.
Photo – Michael Johnston/Parks and Wildlife

Above Mala is one of the species to be returned to the island.
Photo – Janine Guenther

Above right Western end of the barrier fence.

Right Sue Robinson, Michael Johnston and Bax recording a find.
Photos – Michael Johnston/Parks and Wildlife

avoided detection by cameras and track observations. Data from GPS collars previously fitted to some feral cats had provided information on their home range and behaviour on the island. The survey transects for the dog team were arranged to intersect with the smallest known home range area at least once.

The dog team's first week on Dirk Hartog Island was dedicated to establishing a work routine, and learning about their new habitat. The sight and smell of new species, such as sand goannas and ghost crabs, were among the barrage of new distractions that were rapidly learned and subsequently ignored before the task of finding cat scats began for the next five weeks.

The first survey was undertaken during winter 2015 to minimise the chances that poison baits, dropped 12 months earlier, would be found by the dogs. Nonetheless, dogs were always muzzled when outside of their pens, unless they were busy playing tug with their handler, in case they come across an old bait. Surveys were conducted through the cool morning hours between 5am and 11am to avoid snake encounters and minimise the risk of snakebite.

Western Shield

The work being done at Dirk Hartog Island National Park to eradicate cats complements the State-wide wildlife recovery program *Western Shield* which is working to control introduced predators on conservation lands throughout WA with the aim of restoring native animal populations.

Since the project was launched in 1996, *Western Shield* has cemented itself as one of the largest wildlife conservation programs in Australia. It is delivering the greatest impact of any program for protecting species and allowing threatened species to persist.

Baits used in the program contain the poison 1080, which occurs naturally in certain native plants in the *Gastrolobium* genus. Native animals have a high tolerance to this compound, whereas introduced predators do not, allowing the effective targeting of foxes and feral cats.

The program involves laying one million baits annually across more than 3.8 million hectares of Parks and Wildlife-managed land reducing fox numbers by 55 per cent in south-west baited areas.

Impressively, 37 new populations of threatened native animal species have been established under the program and populations of at least 53 species of chuditch, woylies, black- flanked rock wallabies and numbats among others remain in existence due to the program.

A feral cat bait, *Eradicat*®, has been developed and successfully trialled by Parks and Wildlife scientists and is being expanded to new sites of the program.

This means feral cats can now be controlled on a landscape scale in key areas where they pose a threat to native animals.

Hear more about *Western Shield*

Scan this QR code or visit Parks and Wildlife's '*LANDSCOPE*' playlist on YouTube.





Top Turtle Bay, Dirk Hartog Island National Park.
Photo – Janine Guenther

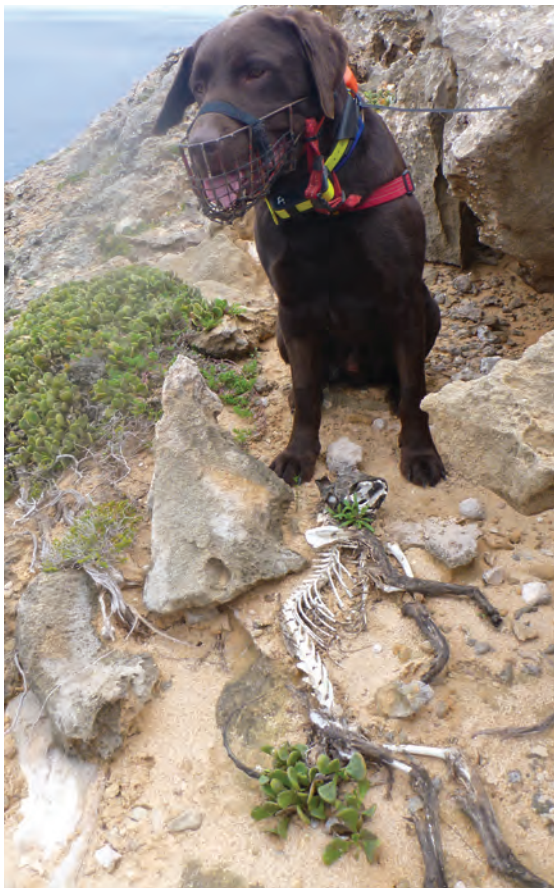
Above Greater stick-nest rats will be returned to the island.
Photo – Kim Branch/Parks and Wildlife

Opposite page
Above right Bozo with a long-dead cat.
Photo – Mark Holdsworth
Above far right Sue Robinson and Bax.
Photo – Michael Johnston/Parks and Wildlife
Right Bozo on patrol.
Photo – Mark Holdsworth

ALL IN A DAY'S WORK

Each day, two handlers and their dogs walked two loop routes within the priority search areas, each taking two to three hours. On each search, the handlers discreetly placed a fresh cat scat to ensure the dogs were still searching correctly and to reinforce a positive reward experience for finding a scat. Each dog wore a GPS logger, which revealed that the dogs covered up to twice as much ground when compared to the handlers' GPS tracks. During the 2015 survey, the dogs covered a total of 874 kilometres, with the long-legged 'Bax', a malinois, leading the way with 253 kilometres, while the handlers walked a total of 540 kilometres.

In addition to the work of the dogs, the handlers, Sue Robinson and Mark Holdsworth, accumulated approximately 100 hours of spotlighting using high-power headlamps. In some open vegetation and high dune areas the spotlighting was effective for several hundred metres and it provided an additional survey method and contributed to the confidence of the search result.



"... the dogs covered a total of 874 kilometres, with the long-legged 'Bax', a malinois, leading the way with 253 kilometres, while the handlers walked a total of 540 kilometres."



By the end of the 2015 survey, the dogs had detected just one recent cat scat. Interestingly, the handlers found some old latrines and single desiccated scats but the dogs were not interested in these, indicating they were very old and possibly pre-dated the death of the last cat trapped in the south. One thing that Clay and her colleagues cannot interpret for us is the age of the scats. The areas where scats were found were searched by a different dog. The dogs did not adopt their 'focused response' posture during repeated surveys in these areas suggesting that it had been some time since a cat was resident. A cat was subsequently removed in November 2015 and there were no fresh detections made during the follow-up 2016 winter survey.

The combination of monitoring techniques provides a high level of confidence that the south of Dirk Hartog Island is likely now to be cat-free. However, the cost of missing a cat in a program of this nature warrants continued vigilance and monitoring for another two years. Additional monitoring techniques will also be employed to provide further verification that eradication has been achieved.

The dogs had a well-earned break on the day before they left the island, while their handlers visited the area north of the barrier fence to undertake a reconnaissance in preparation for the winter 2017 survey. At twice the size, this northern area will require considerable search, trapping and monitoring effort to confirm hat cats have been removed. It's a big task but Clay and her pack are up for the challenge.

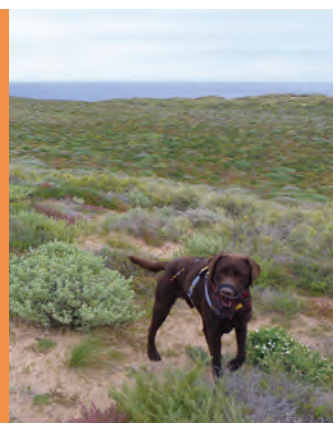
Michael Johnston is a research scientist at the Department of Parks and Wildlife's Science and Conservation Division at Woodvale. He has worked on feral cat management techniques for the past 20 years. He can be contacted by email (michael.johnston@dpaw.wa.gov.au).

Mark Holdsworth worked for the Tasmanian State Government as a wildlife management officer and ornithologist for more than 30 years. He now shares his expertise across a range of conservation endeavours across the nation including the Dirk Hartog Island Cat Eradication Project. He can be contacted by email (mark.holdzy@bigpond.com).

Sue Robinson is a wildlife biologist specialising in invasive species management. Since 2002, a significant part of her work has been focused on the training and deployment of detector dogs for eradication and biosecurity programs. She can be contacted by email (robinson_sue@bigpond.com).

Dave Algar is a senior research scientist at Parks and Wildlife's Science and Conservation Division at Woodvale. He has worked throughout WA conducting research on feral cat control for the past 20 years. He can be contacted by email (dave.algar@dpaw.wa.gov.au).

The Dirk Hartog Island Ecological Restoration Project *is funded by the Gorgon Barrow Island Net Conservation Benefits Fund.*



From seasonal wetlands
to banksia woodlands:

Restoring the Greater Brixton Street Wetlands







Located just 15 minutes from the CBD, Brixton Street Wetlands supports more than 500 species of flowering plants – a staggering 20 per cent of Perth's floral diversity in only 0.005 per cent of the area. A labour of love to conserve this area has seen it, and all the species it supports, thrive.

by Kate Brown, Grazyna Paczkowska, Anne Harris and Fiona Felton

From the seasonal wetlands of the Pinjarra Plain to the banksia woodlands, the Greater Brixton Street Wetlands protects a series of threatened ecological communities that house an incredibly rich and varied floral diversity. The wetlands, only 15 minutes from the CBD, support more than 500 species of flowering plants, 20 per cent of Perth's floral diversity in only 0.005 per cent of the area. Many species are rare and restricted with some only found in the wetlands.

Located on the eastern side of the Swan Coastal Plain in Kenwick, the area protects one of the largest vegetation remnants crossing the winter wet alluvial flats of the Pinjarra Plain. Often flooded through winter and spring, these flats are dominated by tall shrublands of swishbush (*Viminaria juncea*) with a rich understorey of shrubs, herbs and sedges. Large clay pools are often encountered where there are deeper depressions. These deeper pools appear to rely solely on rainwater and are characterised by temporally overlapping suites of annual herbs and geophytes (plants that die down to bulbs, corms or tubers) that flower and set seed as the pools dry through spring. During summer, the clay substrates dry to impervious pans. The seasonal clay-based wetlands of south-west Australia house more than 600 plant species, of which at least half are annual or perennial herbs, many endemic to the claypans.

Opposite page
Main Greater Brixton Street wetlands hosts a raft of species.
Photo – Kate Brown/Parks and Wildlife
Inset above left Red-tailed black cockatoos occur in the area.
Photo – Marc Russo
Inset below left *Utricularia inaequalis* occurs in the wetlands.
Photo – Kate Brown/Parks and Wildlife

Above Flora surveys continue to uncover exciting new finds.
Photo – Juliet Wege/Parks and Wildlife

Illustration – Margaret Pieroni









1. Spider net grevillea (*Grevillea thelemanniana* subsp. *thelemanniana*) **2.** *Ptilotus pyramidatus.* Both species are known only from the Greater Brixton Street Wetlands. **3.** Greater Brixton Street Wetland is the only known location on the Swan Coastal Plain for the *Comesperma griffinii*. *Photos – Kate Brown/Parks and Wildlife*

FLOWERING OVER THE SEASONS IN THE DEEP POOLS

The pools in the claypans are sometimes dominated by shrublands of robin redbreast bush (*Melaleuca lateritia*) and beds of the hoary twine-rush (*Leptocarpus canus*). As the deeper pools fill with winter rains, stalked water ribbon (*Aponogeton hexatepalus*) and the aquatic pennywort (*Hydrocotyle lemnoides*) appear. The water levels start to drop in late winter as flannel flowers (*Tribonanthes* spp.), blue squill (*Chamaescilla gibsonii*) and early nancy (*Wurmbea dioica*) come into flower. Throughout late spring and early summer, sundews (*Drosera* spp.), trigger plants (*Stylidium* spp.) bladderworts (*Utricularia* spp.) and purple small isotome (*Isotoma pusilla*) carpet the drying clay pans followed in early summer by swathes of swamp wallaby grass (*Amphibromus nervosus*).

On slightly higher ground, the winter wet flats of the Greater Brixton Street Wetlands support a complex mosaic of shrublands and sedgelands. Sandy rises are covered in marri/kingia woodlands and to the north where two sand ridges cross the seasonally wet flats, low banksia woodland and callitris shrublands persist.

RESTORATION WORKS

The plant communities of our seasonal wetlands are among the most threatened in Western Australia and have recently been listed under the Commonwealth Environment Protection and Biodiversity Conservation Act as critically endangered. More than 90 per cent has been cleared for agriculture and urban development, and weed invasion is a major threat to those that remain. South African geophytes are serious weeds of seasonal clay-based wetlands and watsonia (*Watsonia meriana* var. *bulbillifera*) and sparaxis (*Sparaxis bulbifera*) in particular can form dense monocultures that displace the herbaceous understorey. Some South African perennial grasses are also a major threat to these systems. Ten years ago, the former Department of Environment and Conservation assumed management responsibility for the wetlands and a number of long-term studies were carried out to investigate how to manage South African geophytes and perennial grasses where they invade the area's seasonal wetlands. The role fire might play in the invasion process and the window of opportunity it offers for control of these weeds has also been investigated. In addition, seed burial trials have been carried out on some of the geophytes to try to understand how long the seed remains viable in the soil following a control program.

















Above left *Chamaescilla gibsonii* is one of the species that occurs in the area.
Photo – Kate Brown/Parks and Wildlife

Above right Signage helps visitors understand the values of the area.
Photo – Sallyanne Cousans

Some of the claypan specialists from the Greater Brixton Street wetlands include **1.** Blue squill (*Chamaescilla gibsonii*). **2.** *Rhodanthe pyrethrum*. **3.** Aquatic pennywart (*Hydrocotyle lemnoides*). **4.** Stalked water ribbon (*Aponogeton hexatepalus*). **5.** Spike rush (*Eleocharis keigheryi*). **6.** Claypan granny's bonnet (*Isotropis cuneifolia* subsp. *glabra*).
Photos – Kate Brown/Parks and Wildlife

Our studies have revealed that both watsonia and sparaxis can be controlled very specifically and effectively by particular herbicides with little collateral damage to co-occurring native flora. Seed burial trials indicated the seed of sparaxis remains viable for less than 12 months in the soil and importantly, once these weeds have been controlled, invaded wetland communities recover and native flora slowly moves into areas previously dominated by watsonia or sparaxis. Trials set up to investigate control techniques for haas grass (*Tribolium uniolae*) burnt in a bushfire in the first year of the study, subsequently revealed that seed germinates *en masse* following fire and that the autumn following a summer fire offers a small window of opportunity to control this highly invasive grass. Parks and Wildlife staff have worked closely with local community group The Friends of Brixton Street Wetlands for a number of years to restore disturbed areas and to implement results of these studies across the class 'A' nature reserve.

The reserve was saved from urban development in the early 1990s largely through the efforts of The Friends group. For nearly 30 years the group has been actively raising the profile of the area, generating local interest and supporting and attracting funding for management. They currently organise community walks through the reserve each month and meet weekly in the wetlands to address on-ground management issues. They have also worked hard to raise the profile of all the blocks that make up the Greater Brixton Street Wetlands *Bush Forever* site and in 2015 successfully sought funding through the Perth NRM's Resilient Landscapes Program to begin management of threatening processes across the entire site. The three-year project was a collaborative effort between Armadale Gosnells Landcare Group in partnership with Parks and Wildlife, The University of Western Australia, The Friends of Brixton Street Wetlands and the City of Gosnells. Works to be undertaken include weed mapping and management across the site, trials of different techniques to manage weeds where they are impacting on rare flora, development of a hydrological plan to manage disturbances to surface water flows and some of the drains that cross the reserve, restoration of the disturbed plant communities on the boundary of







the reserve, and studies on the impacts of frequent fire on the threatened communities. Rare flora and invertebrate fauna surveys are also a part of the works program.

The wetlands house an amazing aray of invertebrate fauna including a rare short-tongued native bee (*Leioproctus douglasiellus*), known only from a couple of seasonal wetlands on the Swan Coastal Plain. The bee is not well-studied but it is assumed that it is solitary, ground-nesting and produces a single generation each year, with emergence of adults timed to coincide with flowering of food-plants. In the Greater Brixton Street Wetlands, the bee appears to specifically frequent plants of *Goodenia pulchella*, a small herbaceous perennial confined to winter wet depressions. Adults emerge at the same time the *Goodenia* comes into flower, as the wetlands dry towards the end of spring. The bees probably live for no more than a few weeks making survey and study particularly difficult.

Invertebrate sampling of the deeper pools in the claypans was undertaken by Parks and Wildlife in 2013. The study revealed that the site provides habitat for a rich aquatic invertebrate fauna including a number of rare and highly restricted species. A rare water flea and an undescribed ostracod known only from the claypans at Brixton Street and those in Drummond Nature Reserve were found, as well a rare water mite. Also found in the deeper pools is the shield shrimp *Lepidurus apus*, commonly known as a tadpole shrimp. It is one of a lineage of shrimp-like crustaceans that have had a similar form since the Triassic period and are sometimes considered living fossils.

Thanks to the work of dedicated scientists, individuals and community groups over many years the conservation values of the Greater Brixton Street Wetlands are well recognised. Remarkably though, through the survey efforts of Parks and Wildlife officers, botanical consultants and volunteers, new discoveries continue to be made. These include the *Ptilotus pyramidatus* collected in 2010 from the wetlands, the only collection of the species since 1845. Working with the community and local government to protect and restore the area will hopefully provide not only a safe haven for the disappearing flora and fauna of the Pinjarra Plain but also a place where future generations can get a glimpse of some of the remarkable biodiversity that once extended across the eastern side of Perth's Swan Coastal Plain.

Above left The clay pans are inundated through winter and spring.

Top The beautiful dotted triggerplant (*Stylidium guttatum*) occurs in the area.

Above *Levenhookia pusilla*.
Photos – Kate Brown/Parks and Wildlife

Discover more about Brixton Street wetlands

Scan this QR code or visit Parks and Wildlife's '*LANDSCOPE*' playlist on YouTube.

Kate Brown is Parks and Wildlife's *Urban Nature* ecologist. She can be contacted on (08) 9442 0321 or by email (kate.brown@dpaw.wa.gov.au).

Grazyna Paczkowska a Parks and Wildlife *Urban Nature* conservation officer. She can be contacted on (08) 9442 0322 or by email (grazyna.paczkowska@dpaw.wa.gov.au).

Anne Harris is a Parks and Wildlife flora conservation officer. She can be contacted on (08) 9303 7740 or by email (anne.harris@dpaw.wa.gov.au).

Fiona Felton is a Parks and Wildlife nature conservation officer. She can be contacted on (08) 9303 7713 or by email (fiona.felton@dpaw.wa.gov.au).

by Lauren Emmerson

kaleidoscope
kids exploring nature

Rehabilitating the bush after a big fire



"It's really good that students from Perth care about us and the fire we had, and want to help our wildlife." Liam (from Waroona), 11

After carefully growing 2,000 marri seedlings, 50 *River Rangers* from Ardross Primary School journeyed to Waroona to help restore some of the habitat that was lost due to the devastating bushfire in the shires of Harvey and Waroona in 2016. Ten *Bush Rangers* from Waroona District High School who helped with the planting and shared their experiences of the bushfire with the younger *River Rangers* cadets.

In January 2016, a large bushfire burnt through more than 69,000 hectares in the shires of Harvey and Waroona and tragically claimed the lives of two people. The fire perimeter was in excess of 392km and burnt for almost three weeks.

Above left *Bush Rangers* helping *River Rangers*.
Left and right Students help with the planting.
Photos – Ardross Primary School





"I like rehabilitating the bush area after the fire and helping the black cockatoos." Arthur (from Ardross), 11

River Rangers is a cadet program for students in Years 5 and 6. It seeks to engage and educate the next generation of children to help us protect our local rivers and empower them to make positive changes to their local communities and environment. *River Rangers* take part in a range of activities, such as tree planting, litter pick-ups, bird and bat box building, biodiversity surveys, water quality testing and building native gardens. Visit dpaw.wa.gov.au/get-involved/nearer-to-nature/river-rangers for more information.

RIVER RANGERS





"It was an inspirational experience." - Brearley, 14

"Seeing professionals do that was amazing." - Sonny, 15

Did you know?

- The western desert Aboriginal people call black-flanked rock wallabies '*warru*'.
- Black-flanked rock wallabies are extremely shy and feed at night on grasses, herbs, leaves and fruit.
- They don't need to drink water but instead conserve water by sheltering from the hot sun in caves.

Wallabies released in Kalbarri National Park

Wallabies carry their young in their pouch to keep them safe, so *Bush Rangers* from Kalbarri District High School thought backpacks were the perfect way to carry black-flanked rock wallabies down into Four Ways Gorge in Kalbarri National Park. The wallabies, which were sourced from the Wheatbelt, were being released to join a trio of elusive wallabies that was recently discovered in the park (see 'Surprise! Rock-wallabies found in Kalbarri National Park', *LANDSCOPE*, Autumn 2016). The *Bush Rangers* will be involved in ongoing monitoring to make sure the newcomers settle into their new home.

Above far left Wallaby released with a tracking collar.
Above left Ready to go down to the gorge.
Photos – Kalbarri District High School

LANDSCOPE's **Kaleidoscope kids exploring nature** page is an exciting regular feature for kids.



Chuditch *(Dasyurus geoffroii)*

Chuditch, also known as a western quoll, is characterised by its white spots, which are thought to help camouflage it while it's on the move at night. Male adults can weigh up to 1.5 kilograms while female can weigh up to one kilogram. Chuditch were once widespread across 70 per cent of Australia but are now found only in the south-west of Western Australia. You can read more about chuditch in 'The case of the mystery chuditch' on page 11.

Illustration by Gooitzen van der Meer

Reference photo by Jiri Lochman

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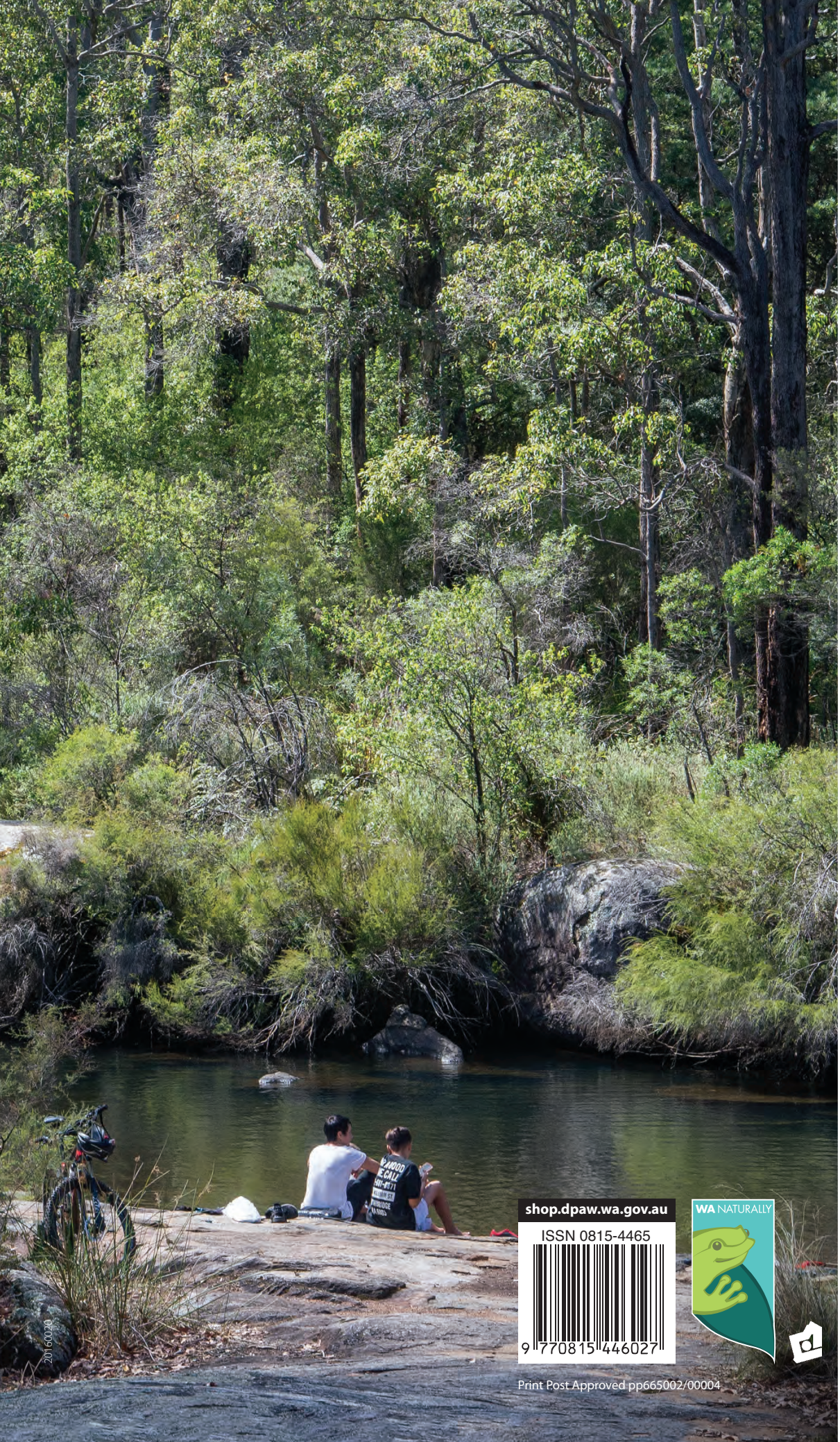
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