

WA'S PARKS, WILDLIFE AND CONSERVATION MAGAZINE

LANDSCOPE

Volume 32 Number 3 Autumn 2017 $7.95

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ON THE COVER

Front cover Honey possums (*Tarsipes rostratus*) are tiny marsupials that have a unique long snout and brush-tipped tongue, which are perfectly suited to probing flowers. Apart from some bats, honey possums are the only mammals in the world that feed exclusively on nectar and pollen. They are found only in south-west Western Australia and occur in heathlands that support species such as banksias, dryandras, grevilleas, eucalypts and bottlebrushes.
Photo – Sallyanne Cousans

Back cover Warren National Park.
Photo – David Bettini



Western Australia's Swan Canning Riverpark is renowned for its natural beauty and cultural, recreational and economic significance.

It also supports a variety of native animals including a resident population of 20 bottlenose dolphins, more than 85 fish species, more than 100 birds species and the largest blue swimmer crabs in Australia. Native plants also thrive on the foreshores.

The Riverpark is widely used for a variety of pursuits including boating, swimming, walking, picnicking, fishing, canoeing, waterskiing and cycling. It is the basis for many community events including the Avon Descent and a number of festivals, concerts and sporting events.

Over the past decade the Riverpark has come under increasing pressure from Perth's burgeoning population and the associated demands for land and water use. It is also bearing the scars of changes made by industrial, agricultural and suburban development. These add to the complex web of ecological pressures that impact our rivers and increase their vulnerability to oxygen depletion, nutrient enrichment and other biodiversity threats.

The *Swan Canning River Protection Strategy* outlines river management actions for partners in the State and local government, industry and community.

The strategy was developed in partnership with 20 local government authorities, 15 State Government agencies, natural resource management groups and through an extensive community consultation process. The strategy recognises Perth's rapid growth and the associated river pressures and will help conserve the Riverpark's natural, cultural and social amenity values.

In 'Caring for our rivers' on page 28 you can read about the community engagement projects that support Parks and Wildlife's operational river management initiatives. These include sustainable gardening workshops, citizen science, cadet education for primary and high schools and behaviour change programs targeting priority nutrient input suburbs. As community members who use and care for our Riverpark, we can all make a difference.

Rod Hughes, ***Director of Rivers and Estuaries Division***
Department of Parks and Wildlife

Contributing



Mat Vanderklift is a senior research scientist with CSIRO Oceans and Atmosphere, and a research group leader in a program focused on coastal research. His core expertise is in studying marine food webs and the ecology of coral reef and seagrass ecosystems. His work has spanned ecosystems from temperate southern kelp forests to tropical coral reefs, and organisms from seaweed to sharks.

Mark Thornley is a Parks and Wildlife senior policy officer and has more than 25 years' experience in communications, publishing and marketing. He works in the Rivers and Estuaries Division where he oversees corporate partnership and marketing opportunities. He has written and photographed two tourism books that have been published and sold internationally.



Grace Milne is a Parks and Wildlife communications officer. A recent graduate from the University of Notre Dame, she works on a range of different projects to develop departmental publications, liaise with the media and create audio visual material to communicate the work of the department. She has a passion for health and fitness and a love for the outdoors.





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This page Enjoying the Swan Canning Riverpark at dusk.
Photo – Megan Lewis

Department of Parks and Wildlife



READERS' PIC

Osprey and whistling kite

Photographer Ken Tracey

"An unimpressed osprey doesn't care to share its breakfast with a hopeful whistling kite at Point Peron."

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.



Promising signs for Western ground parrots

A survey of bird calls in Cape Arid National Park has revealed that young western ground parrots (*Pezoporus flaviventris*) are present in the park a year after bushfires tore through about 90 per cent of the bird's habitat.

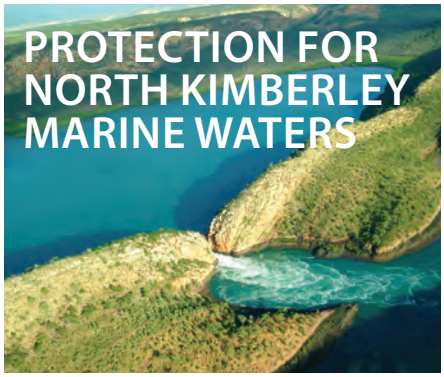
This is an encouraging sign for the critically endangered species as scientists believe there are fewer than 150 individuals left in the wild.

The calls are evidence that some of the western ground parrots that remain in the wild bred last spring.

To give the birds the best chance of survival after the bushfires, Parks and Wildlife conducted emergency baiting with *Eradicat*® cat baits in Cape Arid National Park and Two Peoples Bay and Mount Manypeaks nature reserves to protect the vulnerable species from predation. Feral cats are known to use fire boundaries to prey on displaced native animals. The baiting also helps to protect Gilbert's potoroos, noisy scrub-birds, quokkas and western bristlebirds, which are also at risk following the fires.

Automated recording units have been deployed to monitor sites where the birds were heard and at sites further east in Nuytsland Nature Reserve.

Above Parks and Wildlife staff and volunteers (left to right) Abby Thomas, Jim Creighton, Sarah Comer, Emma Massenbauer, Lucy Clausen, Steve Butler and Saul Cowen.
Photo – Jennene Riggs/Riggs Australia



An Indigenous Land Use Agreement signed late last year between the Balanggarra traditional owners and the State Government marked the official creation of the North Kimberley Marine Park, protecting a massive 1,845,000 hectares of marine waters.

The park stretches from Prince Frederick Harbour in the west to the Northern Territory border in the east and protects coral reefs, mangrove-lined creeks and bays, and sandy beaches that are home to a variety of marine species including dugongs, whales, dolphins, sawfish and turtles.

The park will be jointly managed with traditional owners, the Balanggarra, Wunambal Gaambera, Ngarinyin and Miriuwung Gajerrong people, who have cultural, spiritual and social connections to north Kimberley sea country.

The North Kimberley Marine Park was the final step in creating the Great Kimberley Marine Park, a 'super park' made up of the four biggest marine parks in the Kimberley. The park covers more than three million hectares encompassing North Kimberley, North Lalang-garram, Lalang-garram / Camden Sound and Lalang-garram / Horizontal Falls marine parks.

Above Lalang-garram / Horizontal Falls Marine Park.
Photo – Jim Sharp/Parks and Wildlife

Learn more about the North Kimberley Marine Park

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

WANT TO WATCH OUR VIDEOS?



To learn more about the subjects of our *LANDSCOPE* stories and access in-depth interviews, behind-the-scene footage and species profiles, visit the '*LANDSCOPE*' channel on YouTube (www.youtube.com). Or you can download a free QR reader to your smart phone or tablet that will scan the QR codes dotted throughout the magazine and take you directly there.



Above New facilities at Wellington Dam.
Photo – Parks and Wildlife

The tranquil jarrah forest of Wellington National Park in Western Australia's south-west can now be enjoyed from one of 60 new camp sites at Potters Gorge, many of which have lake views.

A $2.8 million upgrade of the existing campground was opened to the public in time for the summer school holidays and is proving popular with campers.

In addition to the 54 new camping sites for tents and caravans, and one group site suitable for six tents, the upgrade features new toilets and camp kitchens, new roads and paths, and improvements to the day-use area. A new mountain bike pump track has also been constructed in the campground area, and each new site has its own fire ring and picnic table.

The popular site is a great base to go fishing, canoeing, swimming, picnicking and bushwalking.

Dryandra Woodland to become a national park

Dryandra Woodland, near Williams and Narrogin in the Wheatbelt, has been earmarked as a proposed national park.

This area is the largest remaining remnant of Wheatbelt woodland, especially wandoo and powderbark woodlands, and provides a sanctuary for many threatened species including one of the few remaining wild populations of numbats, woylies and tammar wallabies, as well as reptiles.

The national park will continue to protect these values, while providing opportunities for people to enjoy them.

Dryandra Woodland has two campgrounds that offer family-friendly camping, as well as accommodation in forestry cottages at the Lions Dryandra Village. There are a number of walk and drive trails that showcase a range of vegetation types, historical and cultural sites and landscapes. Barna Mia is a premier nocturnal animal viewing facility that offers guided tours.

Guest column



Ezra Jacob-Smith
WA Parks Foundation, Park Ambassador

As a Nyoongar man living in a capital city, parks are extremely important because they provide me with an invaluable connection to my culture. They protect and preserve our sacred sites and other important places that tell the story of one of the world's oldest continuing cultures. They are also sources of food, water, medicine, cultural resources and materials. I regularly visit areas such as Walyunga and John Forrest national parks with my family to learn and practice culture. Continuing these traditions fills me with an enormous sense of pride.

Through my studies I have also learned what science has discovered about the environment, such as how it functions and how we depend on it. Parks provide habitats for our native flora and fauna and sustain many environmental functions that are crucial to our survival, including providing us with clean drinking water and clean air.

The WA Parks Foundation is based on the vision of encouraging our community to embrace, connect with and care for our natural environment. I am proud to be an ambassador for the foundation because this vision resonates with my cultural obligation to protect Country and with my interests in conservation and environmental sustainability as an environmental engineer.

Creating opportunities for people to connect with our parks helps to foster a sense of pride in our natural heritage and encourages all sections of society to appreciate the link between healthy environments and sustainable communities. The success of the foundation is dependent on collaboration between community or volunteer groups, government agencies and the corporate sector. Through this approach, I believe the foundation will become an important conduit to connect the goodwill of people with the potential and capabilities of organisations who can work together to achieve success. We are all connected to Country in different ways and each of us has an important role to play to ensure our parks are protected and conserved for the future.

Ezra is an environmental engineer who specialises in terrestrial water resources, environmental and social sustainability and is a WA Parks Foundation Park Ambassador.

To learn more about the foundation, visit www.ourwaparks.com.au or see 'Connecting people to parks' on page 41.





Penguin Island Conservation Park

Located just 700 metres offshore from Mersey Point near Rockingham, Penguin Island is a wildlife haven for a raft of charismatic creatures, and a popular spot for day-visitors.

Pick a good day and a visit to Penguin Island has all the makings of a perfect day out – riding the ferry, crystal clear water to swim in, an island to explore, wildlife to discover and all a short distance from Perth. And it seems 80,000 visitors each year agree.

After buying ferry tickets (make sure you get the package deal which includes entry to the Penguin Experience) a quick coffee from the Mersey Point kiosk is a perfect way to prepare for the day ahead. A short trip on the ferry is made entertaining by a talk by the captain, who shares some of the fascinating history of the island and highlights some of the wildlife that visitors might hope to see once there. Before you know it, the mainland is well behind you and you've arrived at the eastern point of the 12.5 hectare island.

Once you've disembarked from the ferry with all the provisions you need for the day – a packed lunch, drinking water, and the usual necessities for a trip to the beach – you walk along a jetty and past the kayaks of the people who have chosen to paddle their way there.

PENGUIN EXPERIENCE

A short stroll along the boardwalk past the research centre leads you to the island's picnic area. Here you can enjoy views across Shoalwater Bay back to the mainland under the shade of the Norfolk Island pines and Rottnest Island tea trees.

During the island's open season (mid-September to early June) the Penguin Experience – Island Discovery Centre runs three talks a day. A population of 10 little penguins (*Eudyptula minor*), for which the island is famous, delight and entertain visitors while a volunteer shares information about the penguins and the island's other native residents.

A WILDLIFE HAVEN

While the island gleans its name from being home to Western Australia's largest colony of little penguins, it is also an important environment for more than 30 other species of seabirds that have been observed on the island. These include the bridled tern, silver gull, pied cormorant and the Australian pelican. It is also home to terrestrial species including the little eagle, singing honeyeater and buff-banded landrail. About 2,500 pairs of bridled terns, a tropical species, migrate to the islands of Shoalwater Bay in spring to breed. The birds leave the area in April to return to the north-west Sulawesi (Celebes) Sea.

Above Beautiful Penguin Island.
Photo – Len Stewart/Lochman Transparencies

Above right The island is popular for a range of recreational pursuits.
Photo – Ann Storrie

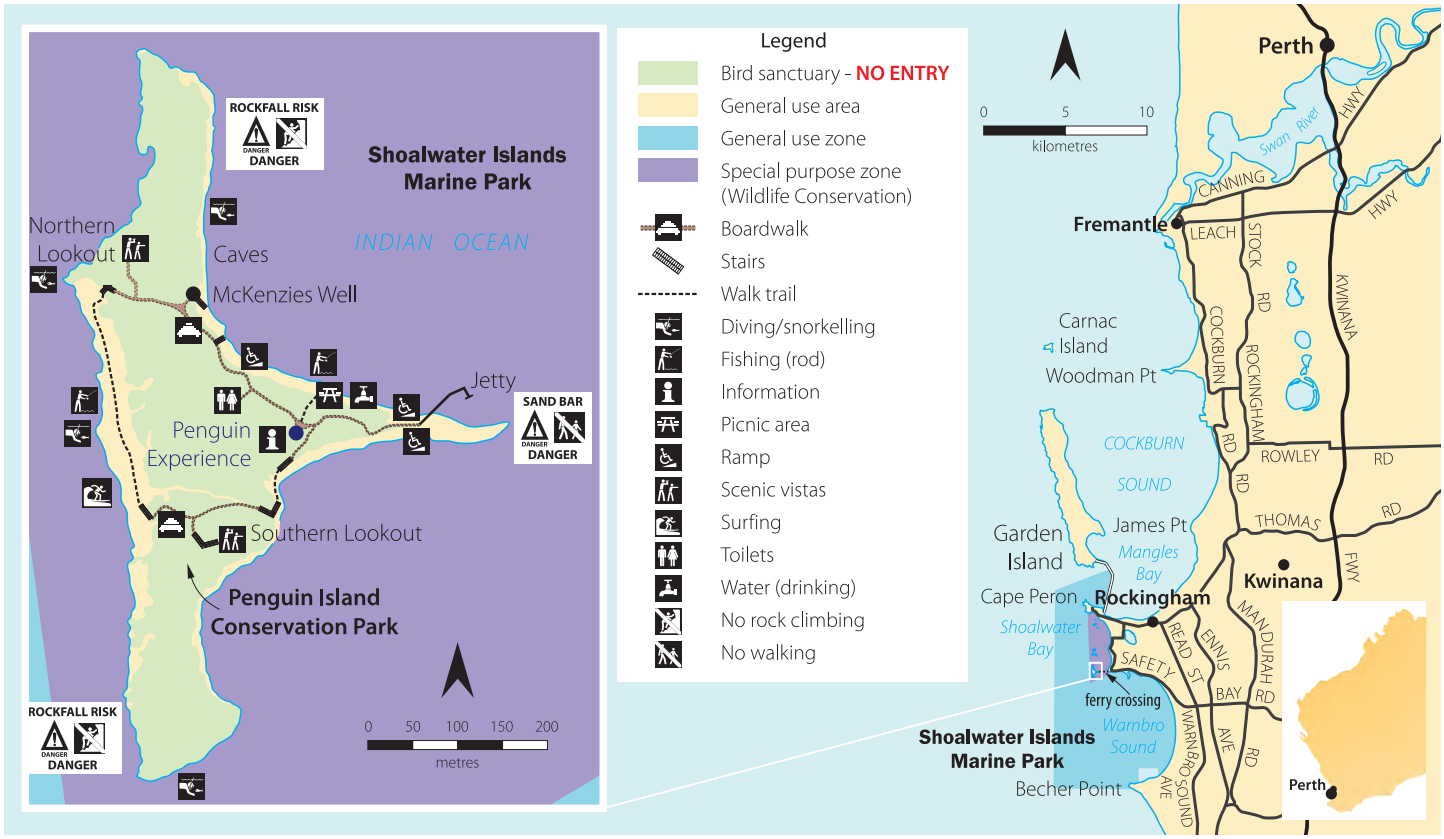
Opposite page
Right Little penguins can be seen up-close at the Penguin Experience – Island Discovery Centre.
Photo – David Bettini
Below right Aerial view of Penguin Island.
Photo – Marc Russo

"... little penguins (*Eudyptula minor*), for which the island is famous, delight and entertain visitors ..."



Learn more about little penguins

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





TAKE A WALK

These and other species can be spotted on a two-kilometre walk around the island. The journey starts at the Penguin Experience and follows a coastal boardwalk through seabird nesting habitat. It includes a walk along the western beach and takes in lookouts at the northern and southern ends of the island. From the northern summit lookout you can clearly see Shag Rock and Seal Island. While at the opposite end of the island you can climb to the top of the southern point, which is the highest on the island. From here, you can see the chain of islands that were originally a continuous land mass when the sea level was 130 metres lower 18,000 years ago.

As well as enjoying the magnificent scenery, the walk gives visitors an opportunity to spot some nesting birds, while minimising the impact on the natural environment. These nesting birds now have a better chance of survival since the island was declared rat-free in 2016 after 5,000 black rats were removed as part of a baiting and biosecurity program. The program began in 2013 and aimed to control the rats which preyed on penguin chicks and other birds including their eggs, and native skinks. Extensive monitoring using motion sensing cameras and cage traps has not recorded a rat on the island in three years.

The walk also guides visitors past a series of caves that were hollowed out by the first known European resident of the island – Seaforth McKenzie, an eccentric Canadian who squatted on the island from about 1914 and was given a formal lease in 1918. McKenzie, who became known as the 'King of the Island', planned to make the island into a holiday resort and even held a ball in one of the larger caves and converted another into a library. He lived on the island with an Aboriginal companion until about 1929.

UNDER THE SEA

The waters around the island, which are part of the Shoalwater Islands Marine Park contain an abundance of treasures that can be explored by divers and snorkellers. The temperate and subtropical waters support invertebrates such as sea stars,





" ... you can see the chain of islands that were originally a continuous land mass when the sea level was 130 metres lower 18,000 years ago."

urchins and shellfish, as well as numerous fish species. Bottlenose dolphins also visit the area and the islands provide a haven for Australian sea lions. A number of turtle species – loggerheads, leather backs and green turtles – are also sometimes seen in the waters around Penguin Island.

Another way to view the marine life is to take a cruise on the dolphin, penguin and sea lion-watching charter that leaves from Penguin Island at least twice a day. This experience can be included in your package when you're purchasing your ferry ticket.

A shipwreck – the *Belle of Bunbury* – that sits just offshore of Penguin Island can also be explored. The 42-tonne coastal schooner was wrecked in December 1886 after striking rocks near the island. Other water sports, such as windsurfing, kitesurfing, kayaking and surfing can also be enjoyed in the marine park.

So, no matter whether you're looking for a day of adventure, want to discover more about the island's wildlife or simply looking for somewhere different to explore near Perth, Penguin Island really is a perfect day out.

Opposite page
Left The island can be explored on a loop walk.
Photo – Michael Clitheroe

Above Shoalwater Islands Marine Park is a haven for sea lions.
Photo – Peter Nicholas/Parks and Wildlife

Above right The ferry runs throughout the day between the island and Mersey Point.
Photo – Alex Steffe/Lochman Transparencies

Below The bridled tern is one species that occurs on the island.
Photo – Jiri Lochman



Do it yourself

Where is it? 50 kilometres south of Perth. Catch a ferry to the island from Mersey Point in Shoalwater Bay near Rockingham from mid-September to early June.

Total area: 12.5 hectares

Facilities: Penguin viewing facility, picnic facilities, toilets.

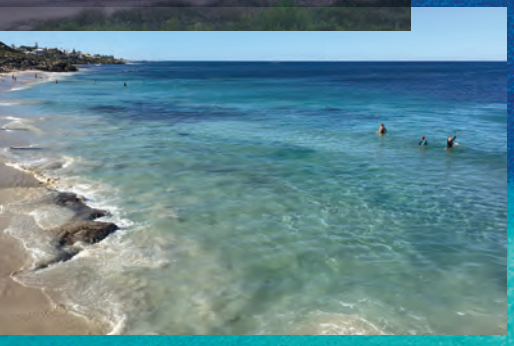
What to do: Nature appreciation, swimming, snorkelling, windsurfing, kitesurfing, kayaking, surfing, walking, picnicking, photography. Spearfishing is prohibited around the island.

Nearest Parks and Wildlife office: Swan Coastal District, Safety Bay WA 6169, phone: (08) 9592 7802 or (08) 9592 9047 (10am–3.30pm).

Safety information: *Weather conditions can change quickly, making crossing the sand bar very dangerous. Parks and Wildlife strongly recommends against walking the sand bar between Mersey Point and the island. When you're visiting the island, remain on the boardwalks, walk trails and sandy beaches and stay clear of limestone cliffs, caves and overhangs as they may be unstable and prone to collapse.*

For information on ferry and tour services please contact Rockingham Wild Encounters on (08) 9591 1333 or visit www.rockinghamwildencounters.com.au.















Thirty years of Marmion and Ningaloo marine parks

This year marks 30 years since the first Western Australian marine parks were created – at Marmion and Ningaloo. Their gazettal in 1987 marked a significant development in the management of Western Australia's environment, and a milestone in protecting our marine life.

by Rhianna King and Peter Barnes


changing tides





Previous page
Main The stunning Stanley Pool at Ningaloo Marine Park. *Photo – David Bettini*
Insets (clockwise from top right) Ningaloo reef attracts a range of bird species. *Photo – Parks and Wildlife*; Baler shell; Marmion Marine Park is as a popular surfing spot. *Photos – Ann Storrie*; Marmion Marine Park is a favourite recreational site for locals. *Photo – Rhianna King/Parks and Wildlife*; Reefs along the coastline in Marmion Marine Park provide excellent snorkelling. *Photos – Ann Storrie*; Bullseyes can be found in Burns Reef. *Photo – Pam Sutton/Parks and Wildlife*; Cape Range National Park is an ideal spot to enjoy Ningaloo Marine Park. *Photo – Sally Bostwick/Parks and Wildlife*

Above left Cuttlefish are one of the park's charismatic creatures. *Photo – Pam Sutton/Parks and Wildlife*

Above Sunset at Marmion Marine Park. *Photo – Ann Storrie*

Western Australia has more than 13,500 kilometres of coastline (about 40 per cent of the continental coastline of Australia), much of which is considered to be among the least disturbed in the world. These spectacular waters are a literal treasure trove of diverse and fascinating marine life – from the New Zealand fur seals that live in Walpole and Nornalup Inlets Marine Park on the State's south coast to the leafy sea dragons of Ngari Capes Marine Park in the south-west; from the stromatolites of Hamelin Pool Marine Nature Reserve in Shark Bay, to the nursing humpbacks of Lalang-garram / Camden Sound Marine Park in the Kimberley; and a suite of marine plants and animals along the coast that is found nowhere outside Australian waters.

The historic first steps towards WA's marine reserve system occurred in 1987, when the first two marine parks were created – at Marmion in Perth and at Ningaloo, near Exmouth – to conserve our magnificent marine species. This visionary move began the process of conserving areas of marine biodiversity and providing special places for people to enjoy, appreciate and learn about the spectacular marine life of WA.

DIVER'S PARADISE IN OUR SUBURBS

The waters of Marmion Marine Park were long used by the Nyoongar people, with Trigg Beach being a documented camping and fishing site during the warmer months. In the 1960s the natural and recreational values of the Marmion reef and lagoon ecosystems were noted by the Australian Marine Science Association. More than 20 years later, a study recommended that the Environmental Protection Authority assess the Sorrento–Mullaloo reefs with the aim of establishing an 'aquatic reserve'. In 1985, the then Department of Conservation and Environment commissioned a study to characterise and describe the marine environments and communities of the area and to identify and evaluate present and future impacts on the proposed marine reserve. This research formed the basis of a draft management plan for the marine park, which was prepared with input from more than 65 community and interest groups.

On 13 March 1987 the marine park, which at the time was dubbed the 'Kings Park of the ocean', was gazetted – protecting 9,500 hectares of urban coastal waters and foreshore lands from Trigg to Burns Beach and extending 5.5 kilometres offshore. Thirty years later, the marine park attracts as many as 1.75 million visits each year from people who enjoy the ocean and beaches as part of a number of recreational pursuits.

Marmion Marine Park boasts beautiful shallow lagoons perfect for wading and beachcombing, stunning swimming and surfing beaches, and reefs and small islands for divers and snorkellers to explore.

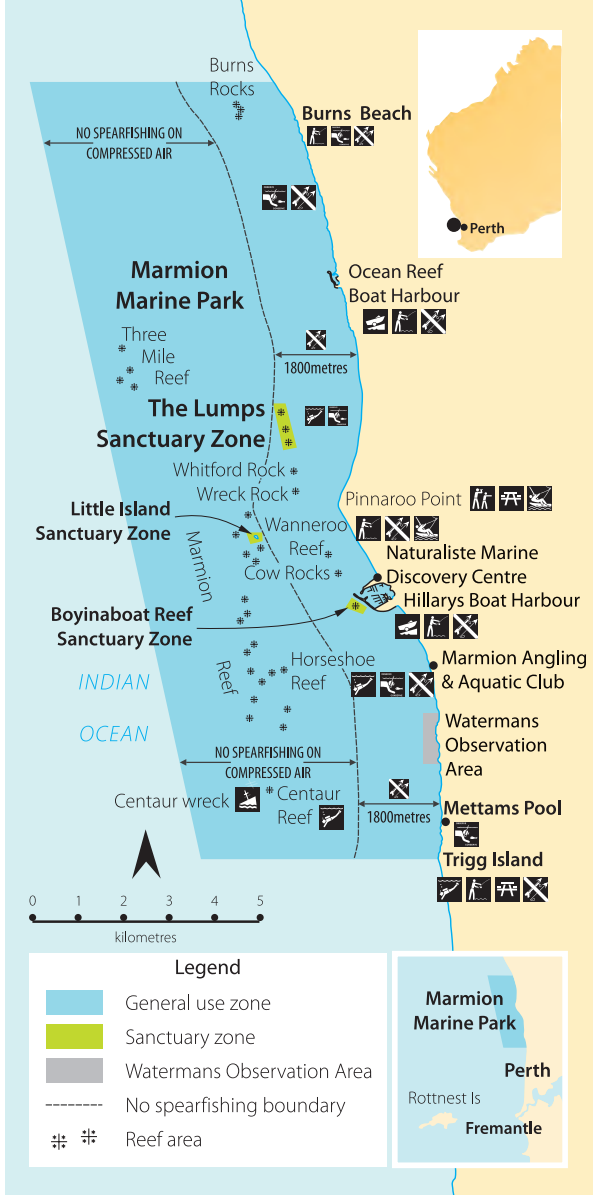
A variety of fish live in the caves and ledges of the reef areas, including western blue devils, old wives, banded sweep, crested and dusky morwong, horseshoe leatherjackets, truncate





Above Marmion Marine Park provides a perfect kayaking spot.
Photo – Peter Nicholas/Parks and Wildlife

Left An aerial photo of Hillarys Boat Harbour, and its surrounds taken in 1987.
Photo – State Library of WA



coralfish, bullseyes, wrasse and red-striped cardinalfish. You may also be lucky enough to spot colourful nudibranches (sea slugs), sponges, sea fans, hydroids, sea urchins and sea squirts. Green turtles also occur in the area.

A number of diving and snorkelling opportunities exist in the park for those keen to glimpse these amazing species. One of Perth's most popular dive sites, Boyinaboat Reef, is just 75 metres from the sea wall of Hillarys Boat Harbour. Located in a sanctuary (no-take) zone, it lies in about six metres of water at the southern end of a chain of inshore reefs. Alternatively, boat-based diving can be enjoyed at North Lump, Wreck Rock, Cow Rocks and Wanneroo Reef. The *Centaur*, which was wrecked in 1874 in the southern part of the park, is also a popular dive spot. Mettams Pool offers fantastic snorkelling close to the shore, which is perfect for kids and those building confidence.

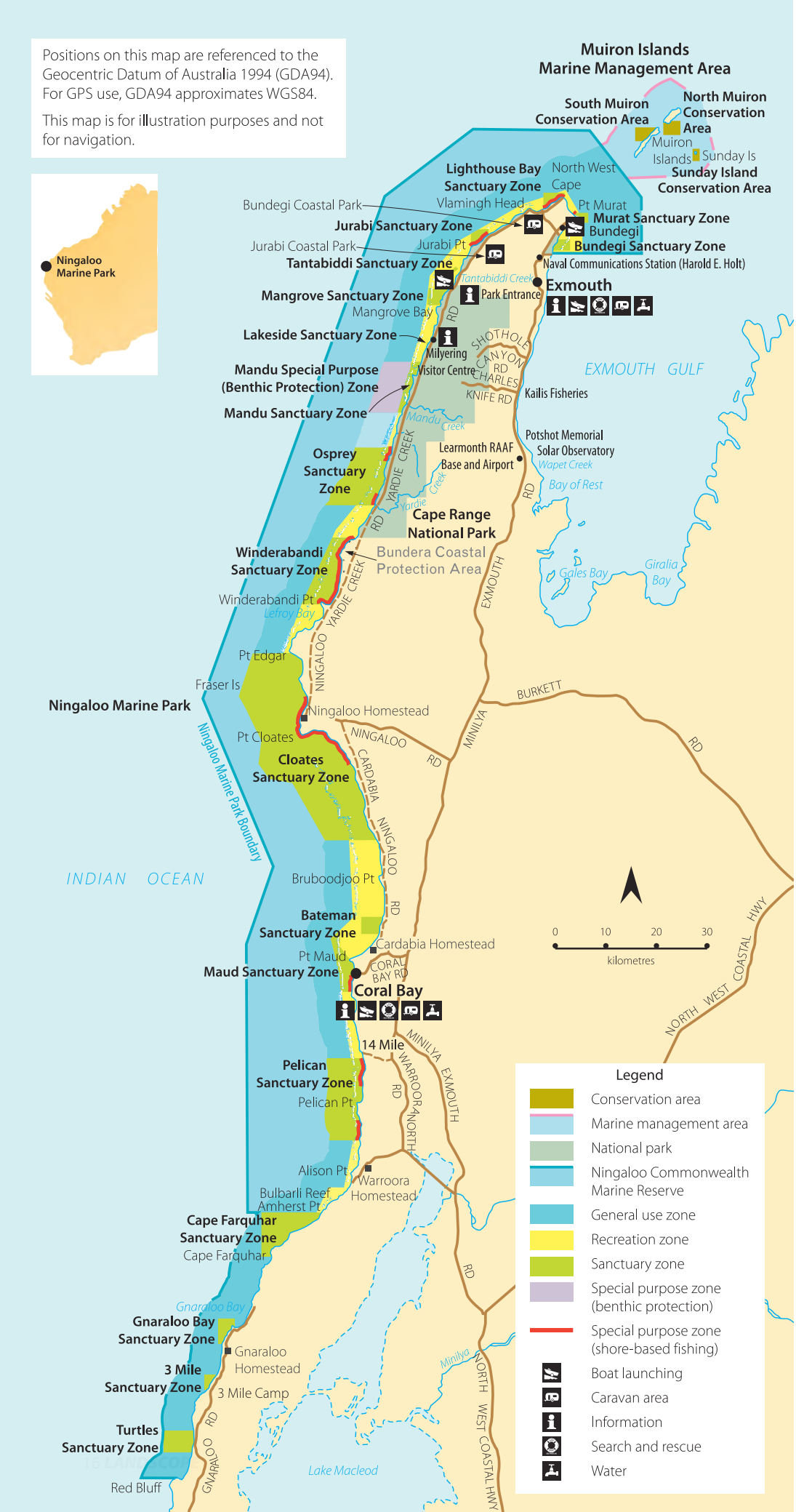
Bottlenose dolphins and Australian sea lions can be spotted throughout the year in the park, with an unusual white sea lion even recorded swimming with its darker relatives at Burns Rocks in late 2016. Humpback whales pass through the deeper waters during their annual migration between June and November. Tours are available from Hillarys Boat Harbour to take people out to get a closer look at these mammoth creatures – whose fate is a far cry from those targeted by whaling between 1849 and 1852 when a whaling station operated from the beach at Sorrento (just south of where the Sorrento Life Saving Club now stands). The station was established by Irish settler Patrick Marmion, from whom the park gets its name. For a century, the abandoned whaling station was a prominent landmark along the coast due to the large brick chimney that formed part of the processing works. For decades it was used as a navigation aid for boats, until finally being demolished in 1953.

Seabirds flock to the area throughout the year and are best viewed at Little Island, Burns Rocks, Trigg Island and Hillarys Boat Harbour, and gannets, ospreys and sea-eagles are frequently seen diving for fish out to sea. Caspian terns, oystercatchers and little pied cormorants can often be seen along the beaches.

A WATERY WONDERLAND

More than 1,500 kilometres north of Marmion Marine Park, adjacent to the Ningaloo Coast from Red Bluff in the south to Bundegi in Exmouth Gulf, lies Australia's largest fringing coral reef – Ningaloo. This magnificent marine environment finally became a marine park in August 1987, after a long and hard-fought journey.

Like Marmion Marine Park, the Australian Marine Science Association identified that Ningaloo should be protected as a marine park in the 1960s. This recommendation was again made in 1974 by the Conservation and Reserves Committee, and in 1975 the Environmental Protection Authority reviewed the recommendation and submitted it to State Cabinet.







Top Lionfish are found in the reefs of Ningaloo Marine Park
Photo – Tony Howard/Parks and Wildlife

Above Five species of turtle occur in Ningaloo Marine Park, including the Hawksbill turtle.
Photo – Tourism WA

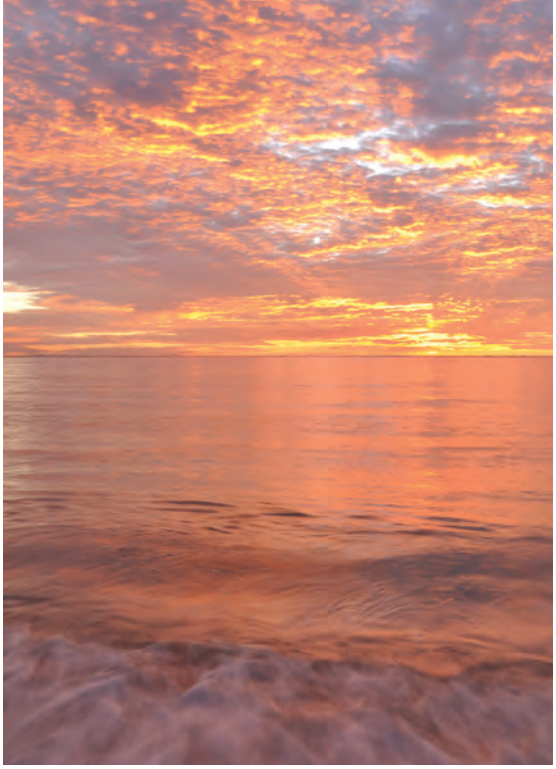
Know your zones

Sanctuary zones are look but don't take zones. No extractive activities are permitted in these zones, which mean no recreational or commercial fishing or removal of marine life or habitats is allowed. Mining activities are also prohibited.

Special purpose zones are managed for a particular priority purpose such as a seasonal event or type of activity. Uses that are incompatible with the priority purpose are not permitted.

Recreation zones are managed for nature conservation and recreation, including recreational fishing where this is compatible with maintaining conservation values.

General use zones are managed for nature conservation while allowing for sustainable commercial and recreational activities.







Above left The magnificent waters of Ningaloo Marine Park.
Photo – Sally Bostwick/Parks and Wildlife

Above The waters of Ningaloo Marine Park house a raft of coral, fish and megafauna to discover.
Photo – Tourism WA

Left An ancient shell necklace was found, providing clues into aboriginal use of the area.
Photo – Parks and Wildlife

"The area was acknowledged for its tourism, fisheries and research values and the local community was optimistic that marine park status would increase visitor numbers."

The recommendation was endorsed in February 1976; however, in the absence of legislation to create an 'aquatic national park', the area was managed under the Fisheries Act by the Department of Fisheries and Wildlife. The area was acknowledged for its tourism, fisheries and research values and the local community was optimistic that marine park status would increase visitor numbers. Finally in 1987, Ningaloo Marine Park was proclaimed by the State and Commonwealth governments with more than 5,000 square kilometres protected. The park boundaries were amended in 1992, and were extended in 2004 to cover the whole 300-kilometre reef system with no-take 'sanctuary zones' increased from eight to 34 per cent of the marine park. In 2011, the significance of this area was internationally recognised when Ningaloo Reef was awarded World Heritage status.

Of course these events have occurred in the relatively recent history of the area, with Aboriginal people inhabiting the Cape Range Peninsula for at least 30,000 years. Deposits of marine shells; the remains of crabs, sea urchins, turtles, turtle eggs and dugongs; and even an ancient shell necklace were found in the area and have provided clues into Aboriginal culture.

European pastoralists arrived in the area in the 1880s but pressure on the ocean and its marine life began as early as 1792 when American whalers began operating off the coast, with commercial whaling occurring in the area up until 1963. Commercial turtle harvesting began in the 1960s and many thousands of turtles were harvested from the area, with commercial rock lobster fishing also carried out. During the 1970s and 1980s the area became a drawcard for visiting recreational fishers, an activity still popular today. Fortunately, the marine park affords protection to the area's vast array of marine plants and animals while still offering visitors the opportunity to catch a fish for their dinner in most of the park.

Beneath the idyllic turquoise waters lies a riot of up to 500 fish species including Clark's anemonefish, convict surgeonfish, beaked leatherjackets, blue angelfish, blue spotted rays, lionfish, blue-green chromis and yellow boxfish and as many as 200 coral species. Many of these can be viewed just metres from the beaches along the entire coast with Lakeside, Turquoise Bay, Gnaraloo Bay, Sandy Point and Coral Bay being some of the most popular areas. Those looking for a bit more adventure







Above left The opportunity to swim with whale sharks draws thousands of visitors to Ningaloo Marine Park each year.
Photos – Danielle Robb/Parks and Wildlife

Above top Yellow polyps (*Tubastrea* sp.) is one species that occurs in the park.
Photo – Tony Howard/Parks and Wildlife

Above Unique and spectacular marine life for divers and snorkellers to discover is abundant at Ningaloo and Marmion Marine Parks.
Photo – Doug Coughran/Parks and Wildlife.

can combine snorkelling with kayaking at the moorings at Bundegi Beach, Coral Bay, Osprey Bay and Tantabiddi (see 'Adventure out: Kayaking on Ningaloo Coast', *LANDSCOPE*, Winter 2014).

The charismatic megafauna found at Ningaloo have led it to be considered the marine megafauna capital of the world. Where else can people encounter several species of dolphins (including the newly recognised Australasian humpback dolphin), three species of threatened turtles, dugongs, giant manta rays, the largest population of migrating humpback whales in the world, as well as killer whales, minke whales, pilot whales, pygmy blue whales and of course whale sharks.

Visitors can join one of the organised charters from April to July each year to experience the whale sharks. These gentle giants can grow up to 16 metres long and weigh 11 tonnes. They are thought to live for up to 100 years and only reach sexual maturity after 30 years. Swimming with them is simply amazing and for many visitors is a once-in-a-lifetime experience. Tour operators in the area also take visitors to view the coral from glass-bottom boats, as well as on dive charters, swimming with manta rays and marine wildlife, and whale watching tours. Mass coral spawning occurs each year after the full moon in March or April and is a further drawcard for visitors. The spawning allows coastal food webs to flourish, attracting the large filter feeders including the whale sharks and manta rays. Visitors also have the opportunity to watch turtles nesting – the unforgettable sight of tiny hatchlings erupting from their nests on the beaches is one to behold. People can also learn about the species that occur in the marine park – loggerhead, green, flatback, leatherback and hawksbill – at the Jurabi Turtle Centre.

Ningaloo Marine Park receives more than 500,000 visits a year. Since its gazettal in 1987, significant works have been undertaken to support nature-based tourism in the marine park and the adjacent Cape Range National Park. Recent upgrades to the national park provide opportunities for people to camp at Kurrajong and Osprey Bay while providing easy access to the nearby marine environment.

FORWARD FLOW

In the years since Marmion and Ningaloo marine parks were created, 15 other marine parks have followed. Like the originals, these were created to protect natural features, and cultural and aesthetic values, while allowing sustainable recreational and commercial uses to continue. To meet their obligations in national and international agreements and conventions, a National Representative System of Marine Protected Areas is being developed by the Commonwealth and all of the Australian States and the Northern Territory. Central to this work – and similar to that underpinning the terrestrial reserve system – is the idea of a comprehensive, adequate and representative (CAR) reserve system. In WA, this seeks to ensure that where possible marine conservation is 'comprehensive' (that WA has marine reserves within each of its 19 marine bioregions); 'adequate' (that reserves are of the necessary number, size and tenure status to provide effective long-term protection); and 'representative' of plants and animals found in Western Australian waters.

The Western Australian marine reserve system followed the recommendations outlined in the *Wilson*



Report headed by Dr Barry Wilson. The report was the result of seven years' work in which Dr Wilson and his colleagues considered the State's 12,500-kilometre coastline and identified areas which were to be investigated for their marine conservation values and possible dedication as conservation reserves.

Within each marine park there may be four types of management zones that cater for a range of activities. These are recreation zones, general use zones, 'no-take' areas known as sanctuary zones and special purpose zones. WA also has one 'marine nature reserve' at Hamelin Pool, a 'look but don't take' area created primarily for conservation and scientific research to protect a particular significant ecosystem or habitat, in this case the marine stromatolites.

As we look back on the past 30 years, we can be proud that what started as two pioneering marine parks is now part of a statewide system of marine parks and reserves. Together our marine parks conserve about 18 per cent of WA's waters, of which 2.4 per cent are in sanctuary (no-take) areas. This is complemented by fisheries regulations, which also apply in all marine parks. By working together to reduce human impacts on the marine environment we can preserve it for the enjoyment of future generations and protect our precious marine life for years to come.

Above Kitesurfing is popular at a number of spots along the WA coast.
Photo – Parks and Wildlife

Right Yellow box fish.
Photo – Johnny Gaskell



Rhianna King is a *LANDSCOPE* editor and can be contacted on (08) 9219 9903 by email (rhianna.king@dpaw.wa.gov.au).
Peter Barnes is a Parks and Wildlife marine program coordinator based in Exmouth. He can be contacted on (08) 9947 8000 or by email (peter.barnes@dpaw.wa.gov.au).

For more information about marine parks in Western Australia, visit www.dpaw.wa.gov.au/management/marine/marine-parks-wa.

Explore Marine Parks WA on your phone



Marine Parks WA is a free Parks and Wildlife app that provides users with an easy-to-use guide to the State's marine parks as well as information about common and unusual marine species.

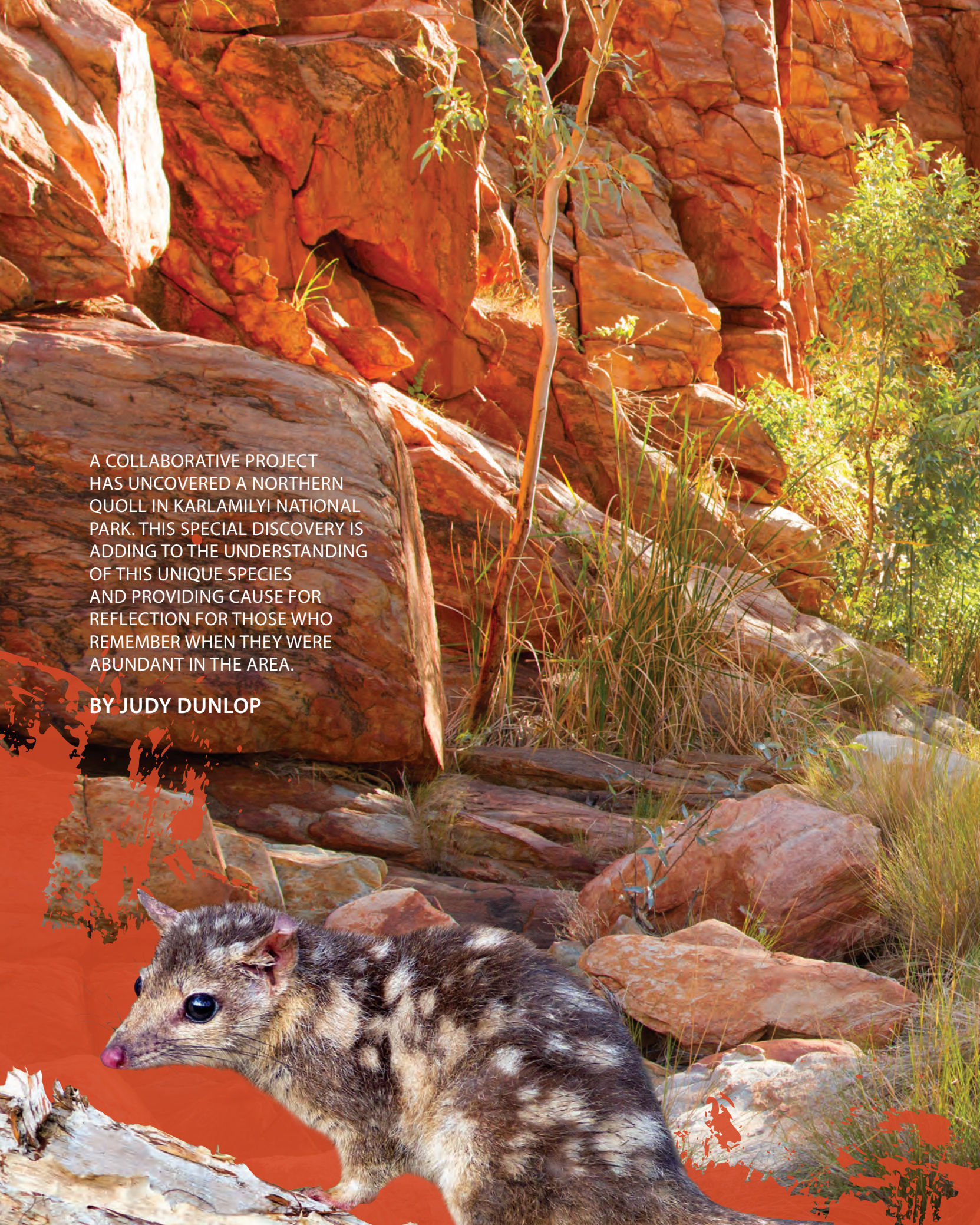
The 'Explore Marine Parks' section gives users access to maps to help them plan their routes and check their location. Detailed park maps provide information about what activities can be carried out (including fishing) in different zones.

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

Because you download the data onto your iPhone or iPad, you can access the information whenever you need it, even if you're out of range.

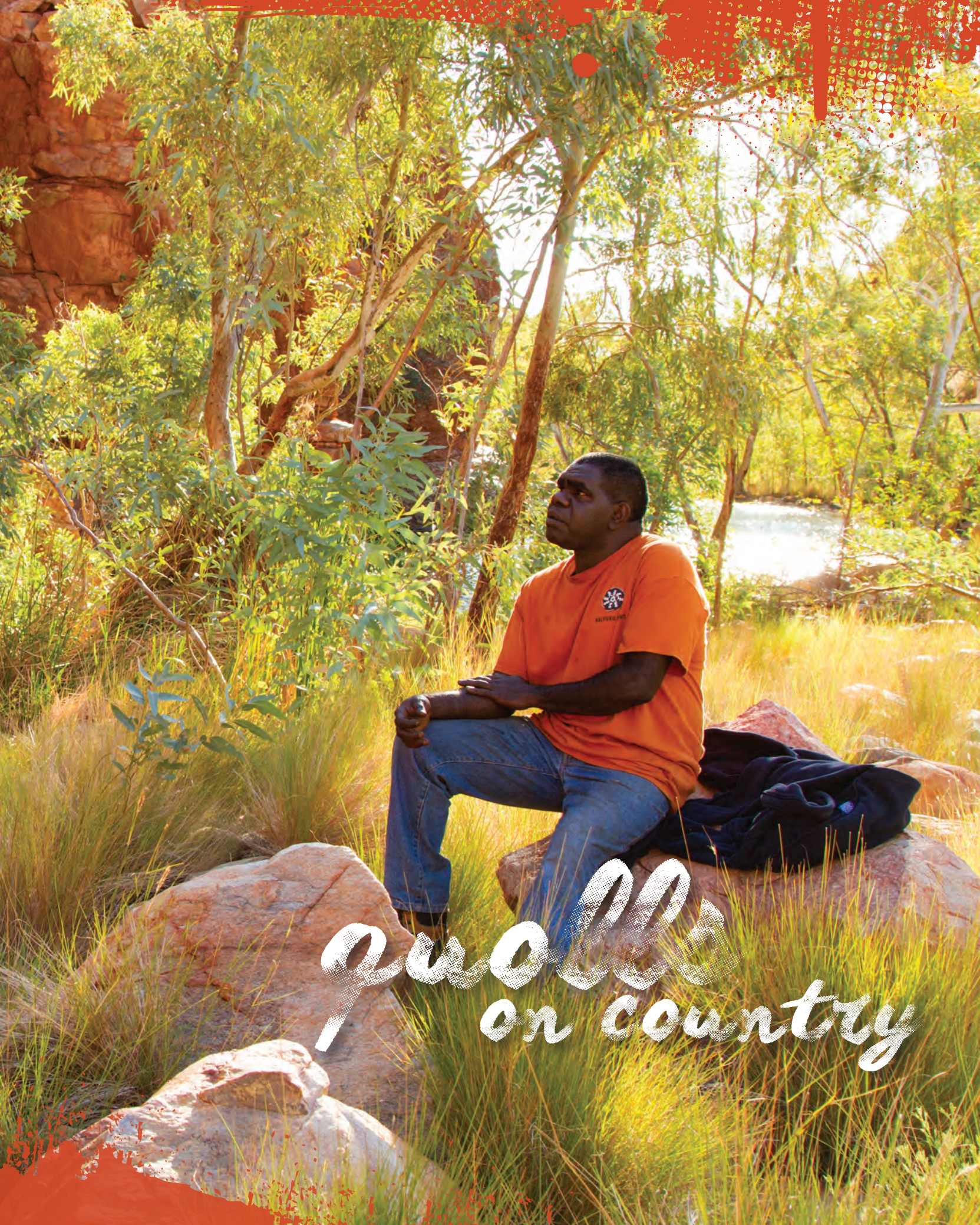
The Marine Parks WA *app was developed by Parks and Wildlife with support from Department of Fisheries and ExxonMobil Australia and is available for free for iPhones and iPads. Search for 'Marine Parks WA' on the app store.*





A COLLABORATIVE PROJECT HAS UNCOVERED A NORTHERN QUOLL IN KARLAMILYI NATIONAL PARK. THIS SPECIAL DISCOVERY IS ADDING TO THE UNDERSTANDING OF THIS UNIQUE SPECIES AND PROVIDING CAUSE FOR REFLECTION FOR THOSE WHO REMEMBER WHEN THEY WERE ABUNDANT IN THE AREA.

BY JUDY DUNLOP


on country



Nanjabai sits perched on a rock at the edge of a small rocky pool at the beautiful and tranquil Desert Queen Baths and tenderly strokes the soft, spotted fur of the northern quoll (*Dasyurus hallucatus*) she's holding. Then, in a simple but poignant gesture, she says "Nyaru wiminji, nyaru", which means "sorry quoll, sorry". She is expressing her sadness that this is the first 'wiminji' (as it's locally known) that she has seen here, in what is now known as Karlamilyi National Park (formerly known as Rudall River), in more than 50 years. The last time she saw quolls inhabiting the rocky hills was when she was a girl living traditionally on country with her family.

JOURNEY TO REDISCOVERY

The quoll Nanjabai is holding was captured in a small cage trap set on the side of one of the rocky pools in Desert Queen Baths. He had eaten the peanut butter and sardine bait and eyed me cautiously as I approached to remove him from the trap. After he was weighed, measured, microchipped and had a small piece of tissue taken from his ear for DNA analysis, Martu elders and rangers from the remote communities of Punmu and Parnngurr, examined him. Nanjabai spoke in Martu about how these animals used to be "everywhere, everywhere, in all the rocky places". But this find was the first time European people have captured a northern quoll in Karlamilyi National Park.

The impetus for the search was the discovery of the existence of quolls during a fauna survey in 2012 by Jeff Turpin and Tim Gamblin from Bamford Consulting Ecologists, who were carrying out a fauna survey in the area when they came across a suspiciously quoll-like scat (which was later confirmed via DNA to be that of a quoll) in a small cave. They also captured pictures of one on a remote sensing camera that had been set in the park for 41 days.

In April 2015, I travelled to Karlamilyi National Park with some of the Kanyirninpa Jukurrpa (KJ) Martu rangers from the nearby community of Parnngurr with hopes of trapping a quoll. Although we found a scat in a small cave, and had one more elusive animal pop up on camera, sadly, our traps were empty every morning.

Then, as part of an ongoing wider research project about quolls, which aims to better understand their ecology, population demographics and distribution throughout the Pilbara region, I had the opportunity to go back in September 2016 with the Martu rangers who were also searching for endangered black-footed rock wallabies.

AN ENIGMATIC CHARACTER

Northern quolls are the smallest of the four quoll species existing in Australia. All are nocturnal, with large eyes and ears, long tails and spotted fur. The species is of a similar size to a meerkat but with the voracity of a much larger beast and will dine on almost anything it can find, including small reptiles, mammals, roadkill, fruits, crustaceans and invertebrates.

Previous page
Main KJ Martu ranger Neil Lane at Desert Queens Bath, Karlamilyi National Park.
Photo – Judy Dunlop/Parks and Wildlife
Inset Northern quoll.
Photo – David Bettini

Above Northern quolls are characterised by their pointed faces and spotted fur.
Photo – Jiri Lochman







They have an unusual life cycle where females live for up to three years, but the majority of males live for only one. Males invest so much energy in travelling to find females and fighting with other males during the breeding season that they lose body condition and eventually undergo complete immune system collapse, resulting in death in the weeks following mating. This fast-paced lifestyle is seen in some smaller marsupials such as antechinus and phascogales, but is unusual for a species of this size. Their mating strategy is thought to be a combination of a tight energy budget and vigorous sexual competition driven by a very short breeding season in females. This enables females to have litters sired by more than one male, and ensures that the offspring are healthy and strong. Other quoll species living in more mesic environments in Australia, such as chuditch, eastern or spotted-tail, live for several years and do not experience male die-off.

Evidence appears to be growing that northern quolls may have roamed more widely in the landscape before the arrival of Europeans and the entourage of new species that accompanied them. Quolls would have spent their nights hunting small rodents, reptiles and centipedes in spinifex sandplains and open grasslands with little risk of predation. Now, the presence of the European fox and feral cats in these open areas is thought to have forced quolls to stick to the safety of rocky escarpments and dense creeklines, effectively reducing their distribution in the north of WA.

Wiminji (quoll) are significant to the Martu people and form parts of stories and song lines in the area. There is some uncertainty whether the same name was used for chuditch and northern quolls (*D. geoffroii* and *D. hallucatus,* respectively), and the Pilbara is a unique location where the fossil record indicates that both species may have coexisted.

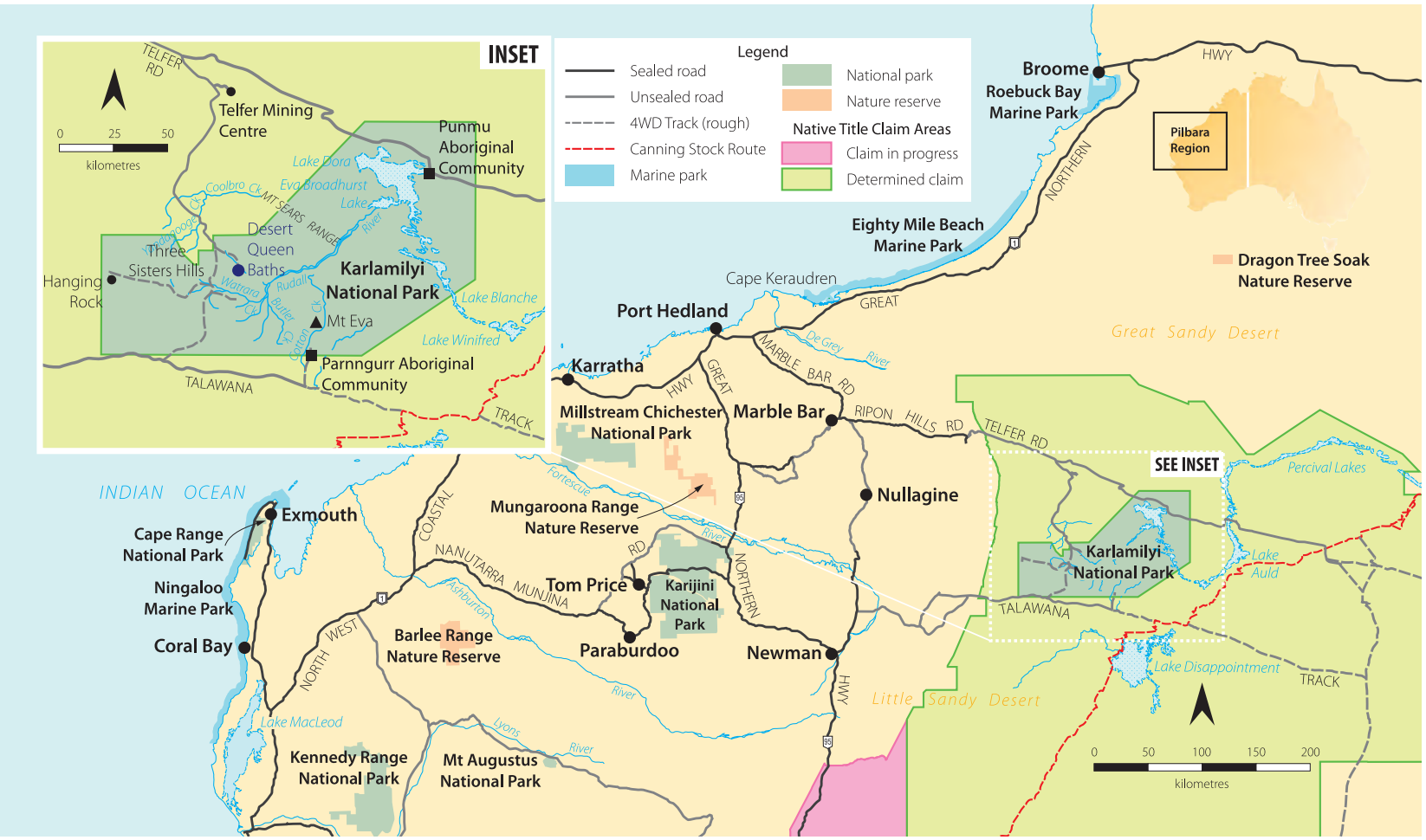
Learn more about the quoll discovered at Karlamilyi National Park

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

Top left Collecting data on the animal will provide greater understanding of the species and what recovery actions are needed.

Above left Old and new euro scats were also found during the survey.
Photos – Judy Dunlop/Parks and Wildlife

Above Judy Dunlop with KJ Martu rangers (left to right) Jeremy Sammy, Neil Lane and Ashwin Biljabu examine the trapped quoll.
Photo – Alicia Whittington/Parks and Wildlife



WHO WOULD HAVE THOUGHT?

The modern extent of northern quolls in the Pilbara is from the coast west of Karratha to around Nullagine in the east. The discovery of northern quolls at Karlamilyi National Park was surprising because it is sandwiched between the Little and Great Sandy deserts – famously sandy places – rather than the complex rocky ranges that northern quolls usually rely on. The next nearest record of northern quolls is 200 kilometres west, near the town of Nullagine in the eastern Pilbara.

Analysis of the DNA from northern quolls across northern Australia has revealed several different and unique genetic populations. The species can roughly be grouped as Queensland, Northern Territory and islands, Kimberley and Pilbara. There is some degree of mixing between the Queensland, Northern Territory and Kimberley populations, but preliminary evidence indicates that the Pilbara population is completely isolated, with no records of animals crossing the arid sandy areas between Port Hedland and Broome. So, the animal found at Karlamilyi is "out on its own", and may therefore have travelled from the north-east or from the Pilbara, in the west. The DNA collected from this animal will be subject to DNA profiling and analysed by experts at Murdoch University to determine whether his genotype best belongs with the Pilbara or Kimberley group.

Northern quolls are not the only threatened species inhabiting this arid region of Western Australia. Other species that are likely to inhabit the park include the greater bilby (*Macrotis lagotis*), great desert skink (*Liopholis kintorei*), mulgara (*Dasycercus* sp.), woma python (*Aspidites ramsayi*), northern marsupial mole (*Notoryctidae caurinus*)



Right Many species of bird including the Australasian grebe occur in Karlamilyi National Park.

Opposite page
Top left The team setting a trap for black-flanked rock-wallabies in the national park.
Top right Traps were set for both wallabies (left trap) and northern quolls (right trap).
Right Nanjabai Chapman, a Martu Elder who is part of the KJ ranger team.
Photos – Judy Dunlop/Parks and Wildlife
Inset far right *Cane toad.*
Photo – Jiri Lochman







and potentially the elusive night parrot (*Pezoporus occidentalis*). Pre-European fossil remains from a nearby cave included bones from the now-extinct pig-footed bandicoot. Endangered black-flanked rock-wallabies (*Petrogale lateralis*) were recently discovered at Karlamilyi via use of remote cameras, and KJ rangers are working with Parks and Wildlife to learn more about the extent of this population. And, surprisingly,

Advancing feral threat



Cane toads pose a serious threat to quolls in Queensland, the Northern Territory and the Kimberley region of WA as ingestion of toad toxin is lethal for quolls and other frog-eating predators. The advance of cane toads across northern Australia from its first introduction point in Queensland has reduced the populations of many top order species, including goannas, freshwater crocodiles and snakes. Cane toads are currently moving at approximately 50 kilometres per year, and may colonise the Pilbara (and potentially its offshore islands) unassisted in the next 10 to 46 years. Modelling of potential habitat for the cane toad indicates that areas with permanent water, closer to the coast will be most suitable for the invasive pest. The predicted habitat of cane toads in the Pilbara almost entirely overlaps that of northern quolls, so inland populations of northern quolls such as that at Karlamilyi and island refuges protected from toads will be very important for the continued survival of northern quoll populations.



the threatened Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) was also detected at Desert Queen Baths last year, a significant range extension from the rugged Pilbara to the west. Despite its vast size, there is a lack of knowledge of the species in Karlamilyi National Park. However, the partnership between Martu and Parks and Wildlife is making strides in filling the knowledge gaps.

AN ANCIENT LANDSCAPE

At 12,830 square kilometres, Karlamilyi National Park is Western Australia's largest national park, and the second largest in Australia. The Broadhurst and Throssell ranges occur on the northern margin of the park, and divide the two sandy deserts. The park is surrounded by the Martu Native Title Determination, a parcel of exclusive possession native title land. Martu are recognised as the traditional owners and occupiers of this combined area, which is more than twice the size of Tasmania. Karlamilyi River runs through the area, with many permanent pools and several areas of significance to Martu.

The Martu are among the last of Australia's Indigenous people to make contact with the European world, with many coming in from a completely traditional desert life in the 1950s and 1960s. The older Martu have stories of first contact with European civilisation and of coming into stations and missions from the desert. Old people have first-hand experience of traditional life and have extensive traditional ecological knowledge of their country. This provides an important and time-limited opportunity to preserve and transfer this knowledge.

Back on Country, the rangers listened intently to elder Minyawe Miller as he spoke about the land and shared stories about the quoll and other species that have vanished from the landscape since he was a boy living in this area. Then we released the quoll back into its environment and, with a final wave from Nanjabai, the quoll scampered up vertical rocks and deep into a nearby crevice. Meanwhile, I carefully stored the small vial containing DNA that would reveal some of the secrets of this lone animal and prepared to return home knowing that this important rediscovery had been an extremely successful collaboration between traditional owners, universities, mining companies, environmental consultants, and government departments.

Above Incredible geological formations abound throughout Karlamilyi National Park. *Photo – Judy Dunlop/Parks and Wildlife*

Below Judy Dunlop (centre) with the KJ Martu rangers on the survey. *Photo – Tina DeGroot*



Judy Dunlop is a Parks and Wildlife research scientist who specialises in working on Western Australia's threatened fauna, especially in the arid zone. She can be contacted on (08) 9405 5174 or by email (judy.dunlop@dpaw.wa.gov.au).

This project could not have been completed if not for the contribution of KJ Martu rangers, Gareth Catt and Zan King from KJ, Bamford Consulting Ecologists Jeff Turpin and Mike Bamford, Parks and Wildlife's Alicia Whittington, Cameco Australia's Tim Duff and Simon Williamson, and Murdoch University's Peter Spencer.



APP

SKYVIEW

The *SkyView* app is a massive hit in my family. Once downloaded onto your iPhone or iPad, the app works with the camera function and overlays imagery so you can see what planets, stars, satellites, space stations, constellations and space junk is around Earth. By tapping the graphics you can bring up more information about what you're looking at and see beautiful illustrations of the zodiac constellations.

The app can be used during the day or night. The best place to use the app is away from light pollution and, because you don't need wifi to use it, you can use it in the bush.

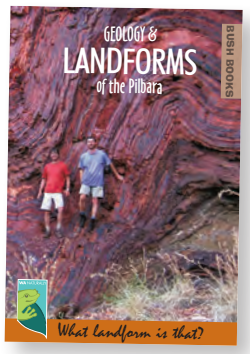
I recently splashed out the $2.99 to upgrade from the free version to the paid one and, in my opinion, it is worth every cent. The simple and intuitive format of the app and the basic, easy-to-understand information makes it perfect (and fascinating) for users of all ages.

This is one lot of screen time I don't mind my kids having before bed!

Developed by Terminal Eleven, the full version of SkyView *is available for Apple iPads, iPhones, iPods and Apple Watches from the App store for $2.99. A free version is also available.*

BOOK

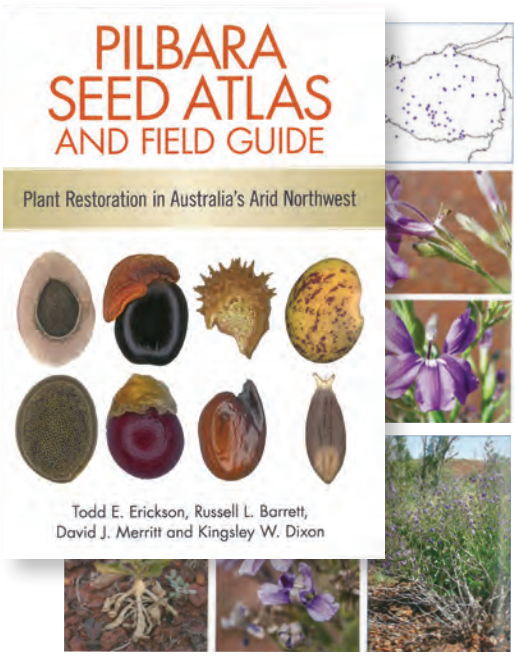
GEOLOGY & LANDFORMS OF THE PILBARA



With the plants of the Pilbara covered in the *Pilbara Seed Atlas and Field Guide* (below), those interested in geology will enjoy the pocket-sized reference guide *Geology & Landforms of the Pilbara*. Written by local geologist Iain Copp and published by Parks and Wildlife, the popular Bush Book title provides a wealth of information about the fascinating process and features that have shaped the magnificent Pilbara landscape, which is one of the oldest regions in Australia.

The handy book separates the area into landscape types and provides insight into the ancient formations that characterise each area. The easy-to-understand descriptions make it accessible, while the photos depict the area's beauty.

Geology & Landforms of the Pilbara *is published by Parks and Wildlife and is available for $6.95 from shop.dpaw.wa.gov.au, Parks and Wildlife offices as well as from good bookshops and visitor centres.*



BOOK

PILBARA SEED ATLAS AND FIELD GUIDE – PLANT RESTORATION IN AUSTRALIA'S ARID NORTHWEST

The Pilbara is a unique and ancient landscape that contains about 1,800 known species of plants as well as being an area of significance for natural resources. The *Pilbara Seed Atlas and Field Guide* describes 103 plants and provides guidelines for collecting, cleaning, storing and germinating their seeds. This information is designed to assist those working in the field to rehabilitate and restore plant communities, particularly during ecological restoration projects. But it will also be of interest to naturalists and people interested in growing species found in the Pilbara.

The book uses comprehensive diagrams and colour photos to illustrate identifying characteristics and the subtle differences between species, while fascinating x-rays and macro photographs show a level of detail well beyond that seen by the human eye.

Written by a cohort of eminent botanists, this book is sure to become a well-thumbed resource for those with an interest in Pilbara plants.

Published by CSIRO, Pilbara Seed Atlas and Field Guide *has 312 pages and is available in paperback for $79.95 from www.publish.csiro.au and good bookshops.*



Caring for our rivers





The Swan Canning Riverpark is at the heart of Perth, and caring for it involves the whole community. Parks and Wildlife partners with dedicated volunteers, through a range of programs and projects, to care for this special ecosystem. This helps improve river health, water quality and the community's overall enjoyment of the Swan and Canning rivers.

by Mark Thornley



The Swan Canning Riverpark comprises the Swan and Canning rivers and has a combined shoreline of 358 kilometres providing a diverse and resilient ecosystem. The Riverpark is home to a varied fish community, with more than 100 species recorded, and a resident population of 20–25 Indo-Pacific bottlenose dolphins and their calves. Seahorses coexist with anemones, and seagrass, prawns and crabs abound. More than 85 bird species including black cockatoos, ospreys and swans have been recorded around the rivers. While small mammals such as water-rats, brushtail possums, quenda, snakes, lizards, spiders and insects also inhabit the foreshores.

The river system has cultural significance for the Whadjuk people, who have had a connection to it for more than 40,000 years. Today, it is also a source of limitless recreational opportunities for all Western Australians, whether it be walking along the riverbank, participating in water sports or picnicking, or taking advantage of the vibrant commercial and tourism activity. More than 40 parks and reserves line the banks, and, at most times of the year, the fringes of the rivers are teeming with people enjoying the park's natural values.

BY THE COMMUNITY, FOR THE COMMUNITY

Managing and protecting this river system is an immense responsibility. As with all the lands and waters it manages, Parks and Wildlife works with the community to conserve the intrinsic values of the Riverpark. It does this through a range of programs and initiatives designed to support and facilitate community involvement. Some of the ways people can become involved include:



Previous page
Main South Perth foreshore at sunset.
Photo – Andrew Skiers
Inset top Western Australian seahorse.
Photo – Alex Steffe/Lochman Transparencies
Inset centre Wakeboarding is a popular and colourful activity on the river.
Photo – Luke Baker

Above The Point Walter sandbar walk is a favourite with Perth families.
Photo – Danny Dellaca

Left River Guardians.
Photo – Miranda Jackson/Parks and Wildlife

RIVER GUARDIANS

River Guardians is Parks and Wildlife's overarching community engagement program for the Riverpark. It involves a variety of popular citizen science and community behaviour change projects including *RiverWise*, *Dolphin Watch* and *Prawn Watch*. It provides volunteers with training, workshops, special events and presentations from leading scientific and behaviour change experts about how we can all help to keep the river system healthy.

The program now has 2,478 members and works with more than 40 stakeholder groups. *River Guardians* are also actively involved in more than 10 major environmental education events per year including river festivals and the Kings Park Festival. Most volunteers register to become a *River Guardians* member before volunteering for the department's citizen science and behaviour change projects.

River Guardians connects members of the community with educational river programs and projects that cater to individuals, schools, community groups and corporations. Membership is free and includes access to cultural, environmental and historical presentations, volunteering opportunities, educational river cruises plus fun discounted river activities and events. Projects can be carried out by people in their homes and gardens or while walking their dog.

For more information, including boating, fishing, gardening, and household tips, visit www.riverguardians.com.




Prawn Watch. Photo – Stewart Allen


Dolphin Watch. Photo – Wayne Theobold

Legend

- Swan Estuary Marine Park
- Swan Canning Riverpark
- *Reel It In* Fishing Line Bins
- Prawing locations
- Dolphin watching hotspots

Perth

0 1 2 3 4
kilometres

INDIAN OCEAN

Perth

Fremantle

Pt Currie

Matilda Bay

Milyu

Pelican Point

Melville W

Swan

Lucky Bay

Pt Walter

Alfred Cove

Pt Waylen

Pt Dundas

River

Canning

MITCHELL FWY

THOMAS ST

HWY

STIRLING

HACKETT DR

CANNING

KWINANA

SHEPPERTON RD

ALBANY

EASTERN

GREAT

CANNING

STOCK RD

NORMA RD

LEACH

FWY



Reel It In Fishing Line Bin project. Photo – Miranda Jackson/Parks and Wildlife


Sustainable gardening workshops.


Swan Alcoa Landcare Program

Opposite page
Left Pelican and black swans on the Swan River.
Photo – Matt Kleczkowski

DOLPHIN WATCH

Dolphin Watch focuses on identifying, monitoring and protecting the resident population of 20-25 Indo-Pacific bottlenose dolphins that frequent the Swan and Canning rivers. Another 20 dolphins regularly visit the Riverpark from Cockburn Sound.

Parks and Wildlife, together with Murdoch and Curtin universities, developed *Dolphin Watch* as a collaborative, citizen science research and education project which integrates scientific research and community involvement with management efforts of industry and government.

The project recognises the importance of protecting the dolphins in the river system and their value as potential indicators of river health. It helps provide a better understanding of dolphin ecology and their interactions with human activities.

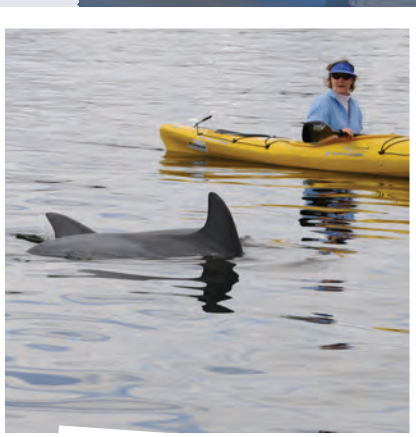
More than 900 trained *Dolphin Watch* volunteers are involved in providing observations and help assist with responding to dolphin births, entanglements and boat strikes.

These citizen science observations are uploaded as texts, photos and videos in real time via a customised *Dolphin Watch* smartphone application. This data is then shared with scientists to inform research and is accessed by the relevant stakeholders when responding to a critical dolphin incident.

Dolphin Watch has captured the hearts and minds of Perth's community and has the patronage of former Chief Scientist of Western Australia Professor Lyn Beazley. It is regarded as one of the world's leading citizen science projects and is the only citizen science cetacean research project in a major capital city.

To date, more than 1,200 students from 25 metropolitan schools have engaged with *Junior Dolphin Watch.* This fun project offers young students the chance to participate in field trips to observe and identify Riverpark dolphins through a specialised FinBook.

For more information, visit www.riverguardians.com/projects/dolphin-watch.



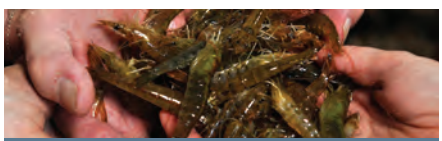


Far above right An Indo-Pacific bottlenose dolphin in the Riverpark.
Photo – Wayne Theobold

Inset above right *Dolphin Watch* volunteer Jenny Hunt records another sighting.
Photo – Delphine Chabanne

Inset right *Prawn Watch* training and logbook.
Photo – Miranda Jackson/Parks and Wildlife

Below Prawning was a big part of river culture and the community is now helping to bring back the western school prawn.
Photo – Stewart Allen



Hear more about Prawn Watch

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

PRAWN WATCH

Prawning on a hot summer's night was once an integral part of Perth's river culture until a decline in the river prawn population gradually saw this popular recreational pastime taper away.

In 2013 the community's passion for prawning in the rivers was reignited after the Western School Prawn Restocking and Monitoring project achieved a world first and cultured 'schoolies' or western school prawn (*Metapenaeus dalli*). Since then scientists have introduced more than 4.5 million juvenile western school prawns back into the river system as part of a multi-agency project to increase the species' population.

Preliminary information suggests that the restocking has had a positive impact on prawn populations with monitoring extended into the 2016–17 breeding season.

Prawn Watch engages the community to monitor prawns in the Riverpark while educating them about river prawns and sustainable fishing practices.

In 2015–16, *Prawn Watch* volunteers assisted with the release of two million western school prawns as part of the wider program to restock the Swan and Canning rivers. This year also saw the 4.5 millionth western school prawn released into the Swan Canning Riverpark.

The project has involved 179 community volunteers with university students also contributing more than 3,000 hours to support prawn monitoring.

Project partners include Murdoch University, the Department of Fisheries, the WA Fish Foundation, Recfishwest, South Metropolitan TAFE, and the Fisheries Research and Development Corporation.

For more information, visit www.riverguardians.com/projects/prawn-watch.

REEL IT IN

Fishing Line Bin project



The *Reel It In* Fishing Line Bin project works to educate the community on reducing fishing line entanglements of dolphins, waterbirds and other wildlife in the Riverpark by binning unwanted fishing line.

Birds and marine life can drown, lose limbs, starve or die if they become entangled in fishing line or when fishing tackle injuries become infected.

There are now 57 fishing line bins at popular Riverpark jetties, fishing platforms, traffic bridges and foreshores.

Made of 100 per cent recycled materials, the bins provide an easy way to dispose of unwanted fishing line, tackle and bait bags and are supported by 10 riverfront governments.

Since the project was launched, more than 44 kilometres of fishing line, 7,600 hooks and sinkers and 6,600 bait bags have been removed from the Riverpark. Emptied weekly by Native Animal Rescue or River Guardians volunteers, the bins now collect more than 20 kilometres of fishing line per year.

Community members can participate by disposing of unwanted fishing line or tackle in the bins, adopting a Fishing Line Bin site and emptying the bin on a regular basis.

The project has also been adopted by the Fremantle Port Authority and City of Cockburn and bins can be found at Victoria Quay, the North and South moles and popular fishing locations throughout Cockburn Sound (see map on page 31). The recruitment and involvement of volunteers will enable the project to be expanded across the State to popular fishing locations such as Exmouth, Shark Bay, Albany, Rottnest Island and Busselton.

The Fishing Line Bin project is delivered in partnership with Recfishwest, Native Animal Rescue, Keep Australia Beautiful Clean Marine program and the Wildcare Helpline.

Bin locations are available from the *River Guardians* website at www.riverguardians.com.

In February 2016 Parks and Wildlife started recruiting and training volunteers to help service the bins. To date, 20 volunteers have adopted 28 fishing line bin sites across the Riverpark.

For more information, visit www.riverguardians.com/projects/fishing-line-bins.



Riverpark facts and figures

358km
of combined shoreline
(Swan and Canning rivers)

21m
deepest point of the Swan River
(near Mosman Bay)

130–160 gigalitres
amount of water in the
Swan Canning river system

41
Landcare projects underway through the
Swan Alcoa Landcare Program

4.5 million
western school prawns released into
the Swan and Canning rivers since 2014

23.5km
of fishing line safely disposed in 2015–16
and over 44km collected since 2013

Left Fishing is a popular Riverpark pastime where fishers can catch black bream, flathead, tailor and mulloway.

Above The tasty blue swimmer crab is a prized catch.
Photos – Matt Kleczkowski

Inset above left Fishers help protect waterbirds and dolphins by discarding unwanted line and tackle into the fishing line bins.
Photo – Stewart Allen









SUSTAINABLE GARDENING WORKSHOPS

Parks and Wildlife continues to provide free community RiverWise Gardening and behaviour change workshops hosted by a variety of expert providers including the Forever Project and Josh Byrne and Associates – well-known for his work on ABC TV's *Gardening Australia* program.

These fun, informative and interactive workshops run for two hours and are designed to share information on how sustainable gardening practices can save you time, money, water and angst, while attracting birds and other wildlife to your gardens.

Josh helps participants understand the impact of excessive nutrients such as phosphorus and nitrogen on the Swan Canning river system and the role that 'RiverWise Gardeners' can play in preserving the rivers' water quality.

Workshop participants learn about garden design including soil and nutrient zoning, plant selection and irrigation design and management. They also gain a sound understanding of soil testing, improving soil, responsible fertiliser use and the best application to create river-friendly and waterwise gardens and turn Perth's sand into fertile soil to grow amazing food gardens.

It's easy to help keep our rivers healthy. Small changes made at home or in your garden, or while you are out and about enjoying the rivers, can make a big difference to the health of our precious rivers and waterways.

For more information, visit www.riverguardians.com/projects/riverwise.gardening.

Above left Ospreys can be found in the Riverpark.

Above Brown jellyfish.
Photos – Matt Klezckowski

Left and inset left RiverWise Gardening workshops inform the public about fertiliser alternatives.
Photos – Miranda Jackson/Parks and Wildlife

SWAN ALCOA LANDCARE PROGRAM

The *Swan Alcoa Landcare Program* (SALP) is an outlet for community volunteers and corporate staff to help protect the Riverpark.

One of Australia's longest running and successful landcare programs, SALP provides funding to community groups to complete small on-ground restoration projects in the Swan Coastal Plain such as weed control, revegetation, native animal habitat and fencing projects.

Since 1998 SALP has funded 1,030 projects delivered by more than 200 community groups throughout the Swan Canning Catchment.

SALP's community-led projects help create, rehabilitate and protect habitat for native flora and fauna in an urban environment. They also provide ecological corridors between remnant bush and wetlands

During the past 18 years SALP volunteers have cleared more than 4,000 hectares of weeds, revegetated 1,763 hectares of degraded land, planted more than two million trees, spread 1,200 tonnes of mulch and built and maintained 6,000 kilometres of fencing. The program also educates Riverpark residents and industry about the use of native plants in their gardens to help reduce phosphorus and nitrogen loads entering the river system

A joint program funded by Parks and Wildlife and Alcoa Australia, SALP is administered by Perth Natural Resource Management (Perth NRM) and recently celebrated 18 years of delivering funding to community groups.

Applications for SALP funding are sought from the community between February and April each year.





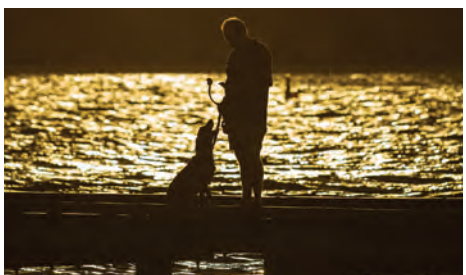
Above right River Guardians volunteers planting along the Swan River foreshore.
Photo – Parks and Wildlife

Inset right SALP planting on Milyu Nature Reserve foreshore.
Photo – Mark Thornley/Parks and Wildlife

Right The rivers are full of strange and unusual creatures like the flounder.
Photo – John Huisman/Parks and Wildlife

Below The Swan Canning Riverpark is at the heart of Perth.
Photo – Matt Klezckowski





Mark Thornley is a Parks and Wildlife senior policy officer. He can be contacted on (08) 9278 0984 or by email (mark.thornley@dpaw.wa.gov.au).



Walking with the GIANTS

Twenty years after it was built, the Valley of the Giants Tree Top Walk in the heart of the Walpole Wilderness continues to delight its visitors with a unique view of the magnificent tingle forest and surrounding area. Lauren Emmerson explores what makes this attraction so special, and why it is more popular than ever.





by Lauren Emmerson





Previous page
Main The spectacular Tree Top Walk.
Photo – Marie Lochman
Inset left Picture opportunities of yesteryear.
Inset right Tree Top Walk construction.
Photos – Parks and Wildlife

Above left The Tree Top Walk guides vistors through the canopy of the Valley of the Giants.
Photo – Marie Lochman

Above Winches were used to hoist the spans into place.
Photo – Parks and Wildlife

As the walkway of the Tree Top Walk gently sways under my feet, the towering red and yellow tingle trees (*Eucalyptus jacksonii* and *E. guilfoylei*) seem to envelope me reassuringly, despite the fact I'm 40 metres above the forest floor looking at the ground through the mesh steel decking. It's a special moment as the quiet of the tingle forest softens the noise in my busy brain, and the clean, forest air fills my lungs. Let's walk.

The giant tingle trees look like a child's interpretation – with their long, tall trunks and a burst of branches and leaves at the top. The knots on their trunks look like old facial features and one tree – commonly known as 'Grandma Tingle' – has such a distinctive 'face' you'd swear it was straight from the pages of a children's fiction book. There's something undeniably magical about this place and, as one of WA's favourite tourist destinations, I'm not the only one who feels it.



● Valley of the Giants Tree Top Walk, Walpole-Nornalup National Park

A LOCAL TREASURE

Located in the popular Walpole-Nornalup National Park, the Tree Top Walk was completed in 1996. It was designed to protect the fragile tingle forest while encouraging visitors, including those with mobility aids, to enjoy it. The red tingle tree is different to most eucalypts because it has a shallow root system and no tap root, causing the centre of the trunk to dry out over time. Each time a fire passes through the area, the fire burns the centre of the tingle tree but bark continues to grow on the outside of the base, sometimes creating a hollow big enough to walk through. Fungal and insect attacks also contribute to the hollowing of the base. Tingle trees are also sensitive to compaction of soil from people walking or driving around their bases. For many years, people would drive their cars right inside giant tingle trees for a photo opportunity. After 100,000 visitors each year, one particularly giant tree was 'loved to death' and fell down in 1990.

DESIGNING AN ICON

The Tree Top Walk was designed after an Australia-wide competition. The design was inspired by the understorey plants of the tingle forest with spans of the walk long and slightly rounded like the sword grass (*Lepidosperma effusum*). When you look up from the base of one of the pylons to the platform, the structure spikes out like the leaves of the tassel flower (*Leucopogon verticillatus*).

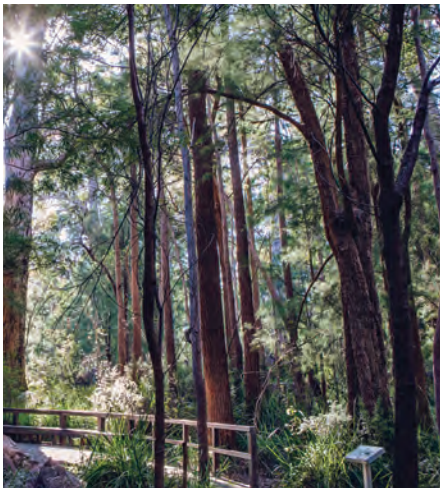
Minimal machinery was used in the construction to avoid compaction of the soil; no helicopters or cranes. Riggers used scaffolding to erect the tall pylons, which were built first. The spans were then built in between pylons at ground level with winches used to hoist the spans into

Something special about the tingle trees

The Tree Top Walk is located in an ancient tingle forest with tingle trees that don't grow anywhere else in the world. The trees grow in the almost untouched 6,000-hectare forest between the Deep and Bow rivers along with some plants that exist nowhere else in the world. Although Australia has experienced significant environmental change over the last few hundred years, much less change has occurred in the south-west of Western Australia.

Many species in the tingle forest have origins that can be traced back 65 million years to the super continent Gondwana when Australia was joined to what are now Africa, India, Antarctica and South America.





place. Six lightweight bridge spans, each 60 metres long between seven pylons, made of see-through steel decking create the structure. The spans were specially designed to sway slightly as you walk, in order to enhance the sensation of being in the forest canopy.

The Ancient Empire Walk, which gives visitors a 'ground-up' view of the tingle forest, was built at the same time as the Tree Top Walk. Built to protect the fragile forest floor, the jarrah decking and bitumen paths lead visitors around, and even through, the giant tingle trees. Viewing platforms and seats provide people with the opportunity to rest and observe the forest, and maybe even spot some of the local birdlife. Interpretive signs around the walk tell the story of the tingle forest and its inhabitants.

PART OF THE FAMILY

It's little wonder that since it opened, the Tree Top Walk has attracted more than 3.4 million visitors and it continues to be a big part of the local community. Locals were involved in the construction of the Tree Top Walk, in laying the paths and building the infrastructure of the Ancient Empire Walk. Since then, it is estimated that tourists who come to the area to visit the attraction have invested about $50 million into the local community through tourism, hospitality and other services. It also provides job opportunities for those who work at the attraction, as well as those who provide its ongoing maintenance and upgrades. And, for a team of dedicated volunteers, the attraction provides a beautiful setting for their meaningful contribution.

Visitors often leave with a soft spot in their hearts for the place. At different times of the year, you get a markedly different experience – when it's cooler you experience misty moist forest smells, and when it's warmer you get to enjoy the beautiful wildflowers. People keep coming back because there's always something to see.

So, as I reach the end of my walk through the canopy, reinvigorated by spending time in this beautiful place, it strikes me I just immersed myself in the canopy of an ancient forest. Now I'm going to jump back in my car and continue on my way to another amazing park in the area.

Above *'Grandma Tingle'.*
Photo – Damon Annison

Above right The Ancient Empire Walk.
Photo – Nic Duncan

Do it yourself

Where is it?: Valley of the Giants Tree Top Walk is located in Walpole-Nornalup National Park, 18km drive from Walpole and 52km from Denmark.

What to do: Bushwalking, birdwatching, nature observation, guided tours, holiday programs and picnicking.

Facilities: Walk trails, Discovery Centre – featuring a great range of visitor information and displays, gift shop, bike racks, toilets, free wheelchair and stroller hire, car park.

Opening times: Daily 9am to 5pm (extended hours 26 December to 26 January 8am to 6pm). Closed Christmas day and during hazardous conditions.

Free guided tours: Plan your trip to include a fabulous guided walk of the Ancient Empire. Guided walks are offered daily outside the school holidays. Guided walks are free of charge, but may be subject to weather conditions.

Holiday and school programs: Enrich your experience of the Tree Top Walk by joining in one of the many fun-filled activities held each school holiday period (excluding winter). *Nearer to Nature* programs can be tailored to suit your school group requirements.

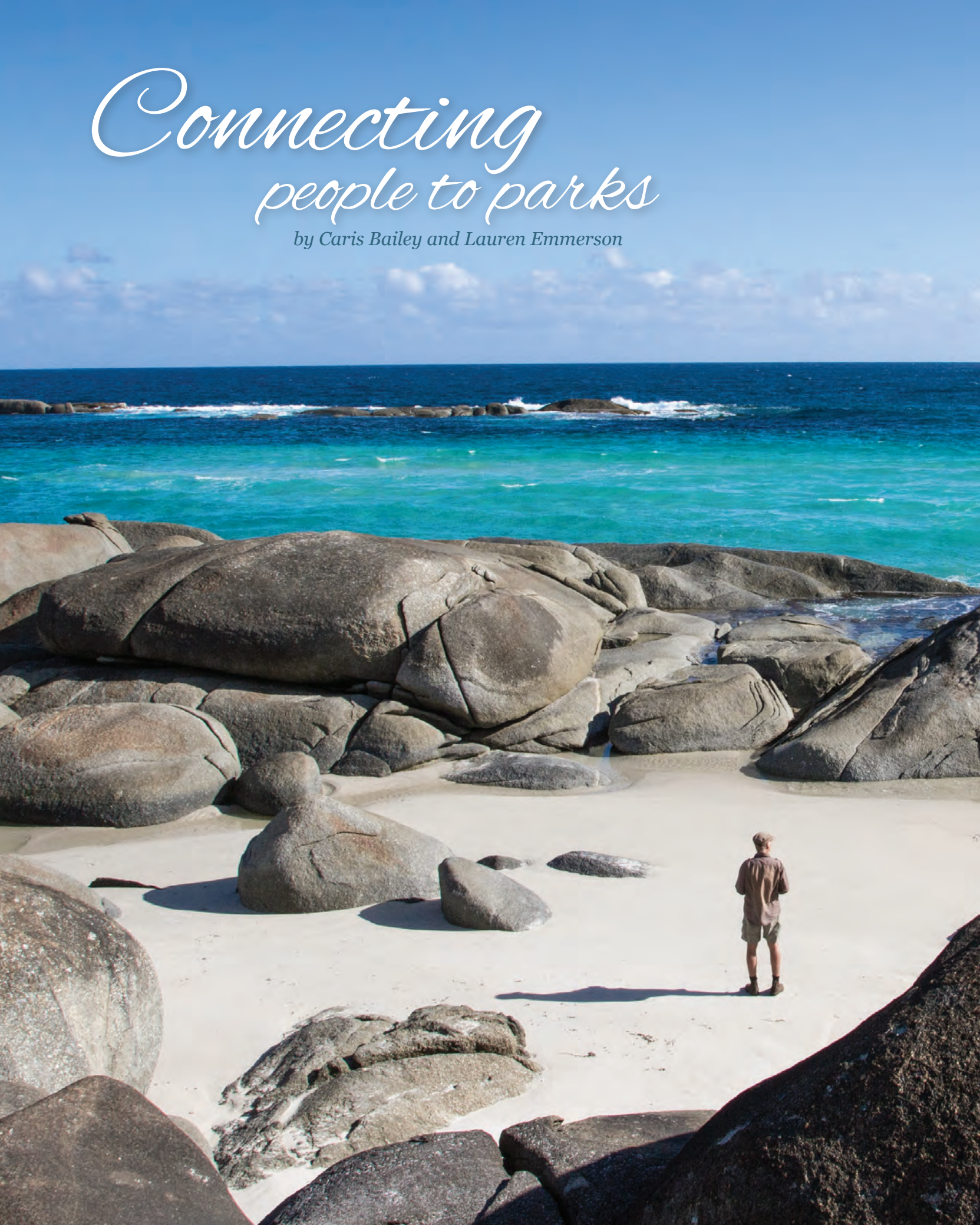
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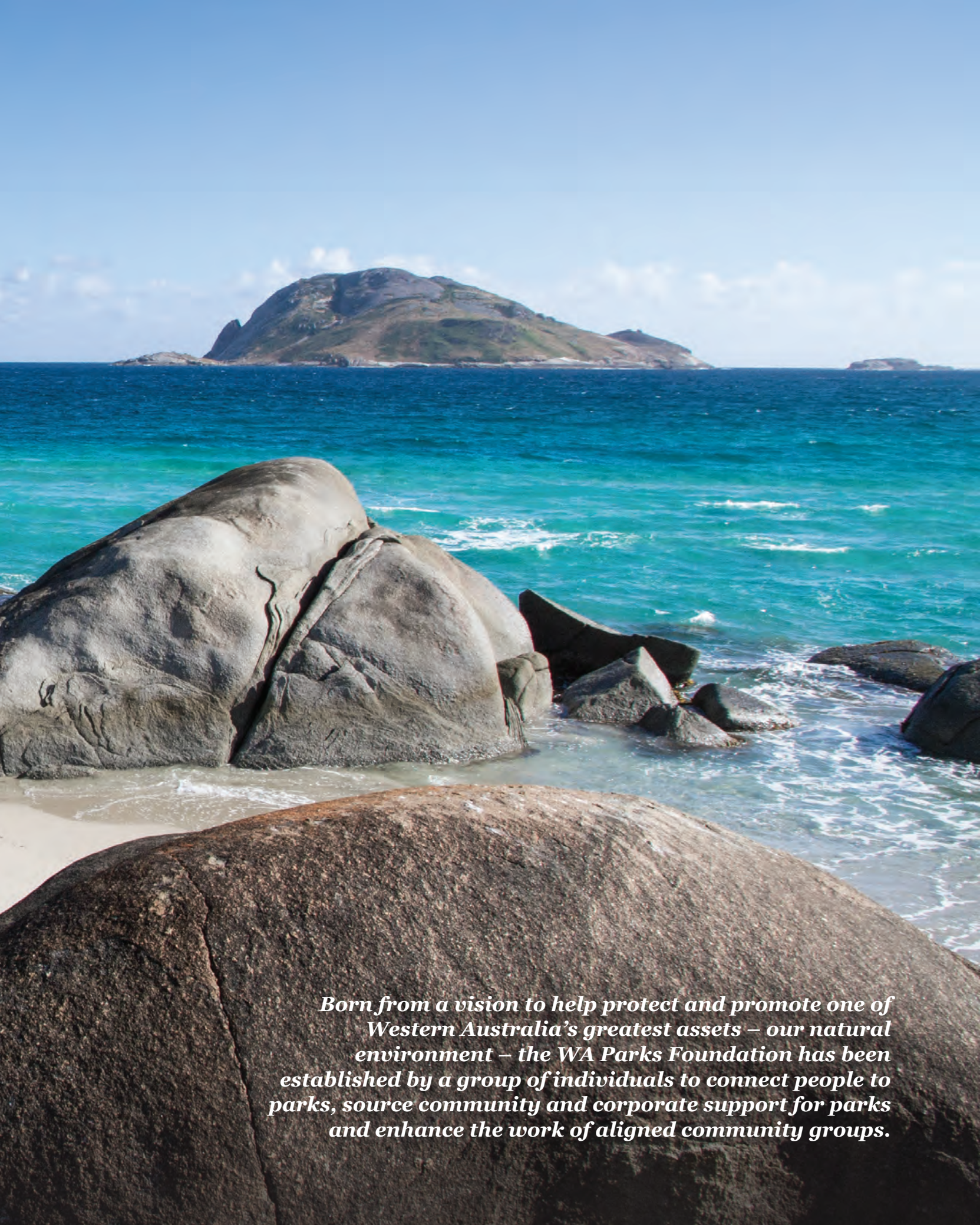
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Lauren Emmerson is a project officer – editorial. She can be contacted on (08) 9219 9814 or by email (lauren.emmerson@dpaw.wa.gov.au).

Connecting people to parks

by Caris Bailey and Lauren Emmerson





Born from a vision to help protect and promote one of Western Australia's greatest assets – our natural environment – the WA Parks Foundation has been established by a group of individuals to connect people to parks, source community and corporate support for parks and enhance the work of aligned community groups.



Previous page
Main The stunning D'Entrecasteaux National Park is one of WA's most popular areas.
Photo – Janine Guenther

Above Elephant Rocks, William Bay National Park.
Photo – David Bettini

Summer holidays by the beach, weekends down south and camping by the gorges are some of the experiences that define us as Western Australians and become highlights for visitors. Many of these experiences happen in Western Australia's vast and spectacular parks network, which boasts three World Heritage areas and Australia's only internationally recognised biodiversity hotspot.

This network of conservation lands and waters covers more than 29 million hectares – an area nearly five million hectares bigger than Victoria – and attracts nearly 20 million visits a year. Visitors come from the other side of the world for a major adventure, or live nearby and take in the natural areas as part of their daily lives. Others volunteer their time (see also 'Caring for our rivers' on page 28) to help protect the natural environment while, for some, these areas are a source of income through eco-tourism and regional economies. Many locals and visitors identify with having a deep spiritual connection to the State's lands and waters and some areas provide cultural insights. These lands are also sacred to Aboriginal people who have lived there for up to 40,000 years. Despite their diverse origins and motivations, the users of these natural areas are bonded by the significant benefits brought by spending time in nature and the opportunity to enjoy WA's unique plants and animals.

A BIG IDEA FOR A BIG JOB

Over the past decade, the conservation estate has increased by 2.8 million hectares, to more than 29 million hectares in total, the number of visits has risen from 11.8 million to 19.7 million, while the number of national park rangers went from 104 to 119.

The concept for the WA Parks Foundation was developed to support the management of these areas. It is not the intention of the foundation to replace Government funding, nor replace the work currently being carried out by 'friends of' groups, but to add to what's being done, especially to connect people to parks and involve people in conservation. Similar foundations have operated around Australia and the world for decades with the first, the US National Parks Foundation, established in 1967. This organisation enriches America's national parks and programs through private support and has generated (US$42 million per annum) in recent





Left Research shows the benefits of spending time in nature, in a variety of weather conditions.
Photo – Wendy Elby

Above Her Excellency The Honourable Kerry Sanderson AC, Kanyana founder June Butcher and 'Henry' at the launch of the WA Parks Foundation.
Photo – Parks and Wildlife

Discover more about the WA Parks Foundation

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

years. Locally, organisations such as the Friends of Kings Park and the Bibbulmun Track Foundation have demonstrated how much can be achieved by the efforts of committed individuals, greatly enhancing the work of statutory bodies managing particular areas.

TAILOR MADE

The WA Parks Foundation is a big idea, extending the concept of a 'friends of group' to all WA parks. It has been established as a not-for-profit organisation with a board, and staff that will include paid members and volunteers. The group is led by Her Excellency The Honourable Kerry Sanderson AC, the Governor of Western Australia.

The foundation's aim is to provide a community voice to promote the benefits of spending time in parks, to raise money for projects and programs that wouldn't otherwise be possible, to recruit volunteers and to facilitate collaborations. "Parks" in its title has been adopted to mean all lands and waters set aside for conservation of the natural environment.

An initial investment of $250,000 and in-kind support was committed by supporters, including Bellanhouse Legal, key2creative, Nature Play WA, Government House, WA Tourism Council, Marketforce, FACET, Bankwest and the Department of Parks and Wildlife, during the start-up phase. Foundation members are now being sought and fundraising activities such as events and the sale of merchandise will be carried out to support the organisation. Going forward, the foundation's primary revenue source will be donations, grants and partnerships.

DOWN TO BUSINESS

A strategic plan has been prepared, which breaks down the foundation's priorities into three target areas – protecting our parks; connecting people to parks; and doing more through collaboration.

The WA Parks Foundation will focus its efforts on parks in Perth's peri-urban area, where the greatest numbers of visits are made and parks are therefore under the greatest pressure. Perth parks have a unique position in the State's conservation estate, they represent less than three per cent of the area of the whole conservation estate, and are located on the doorstep of 79 per cent of the State's total population. Perhaps not surprisingly, 45 per cent of the visits recorded across all WA parks in 2014–15 were made to Perth's parks.







Above Mitchell River National Park.
Photo – Colin Ingram/Parks and Wildlife

Left Visitors connect to nature in a range of iconic places such as at Nature's Window, Kalbarri National Park.
Photo – Marc Russo

Below left Mountain biking is an increasingly popular pastime in WA parks, including at Bramley National Park near Margaret River.
Photo – Eerik Sandstrom

Subject to funding, one of the foundation's first projects will be in WA's first national park – John Forrest National Park. The proposed John Forrest renewal project will be the foundation's template for other ventures working with Parks and Wildlife, non-government organisations and sponsors to provide a raft of improvements for conservation and recreation. The plan is to raise funds and enlist volunteers to renew and develop walk and cycle trails, including 20–30 kilometres of mountain bike trails, potentially a new lookout, and an upgrade to the picnic area.

Walyunga National Park has also been identified as a priority for upgrades that will showcase its Aboriginal values. New walking tracks and associated signage are planned to guide visitors through the area and share Aboriginal stories. Extra resources will be used to control weeds, which have developed since a bushfire burnt through the area in 2013.

Another aim is to support the roll-out of new interpretation nodes in the



Swan Canning Riverpark. Visual, audio and artistic mediums are being used together to deliver stories to help visitors learn about and appreciate the Nyoongar cultural values of the area (see also 'River Journeys', *LANDSCOPE*, Autumn 2016). The foundation is also keen to use technology to make it easier for people to access information, and to plan and enjoy their park experience. One proposed project is the development of digital maps to help visitors maximise technology to navigate around parks across the State, as well as read comments from other visitors.

The foundation will also focus efforts on the Pilbara, where improvement opportunities have been identified. Indeed, as the foundation grows, all areas of the State will benefit.

ONWARDS AND UPWARDS

The WA Parks Foundation has developed a memoranda of understanding with Parks and Wildlife, Nature Play WA and Conservation Volunteers Australia.

A number of Park Ambassadors, including Fremantle Football Club legend Nat Fyfe, and local Nyoongar man and environmental engineer Ezra Jacob-Smith (see his 'Guest column' on page 7) have also come on board to help increase awareness of our unique parks.

These developments are the first steps towards the WA Parks Foundation making a real difference in ensuring all Western Australians and visitors enjoy our parks now and into the future.

Above It is planned that John Forrest National Park will be the focus of the WA Park's Foundation's early work.
Photo – Jane van der Meer/Parks and Wildlife

How to get involved

Applying to join the WA Parks Foundation is easy. Visit www.ourwaparks.com.au to fill out the membership application.

Individuals and businesses can contribute through:

- donations (the foundation is seeking tax-deductibility status – subscribe to their newsletter or follow them on social media to find out when this has been achieved)
- legacy bequests
- in-kind support by providing services and materials
- time and skills by working as a volunteer, or as a team of volunteers, to deliver projects funded by the foundation.

Corporate donors may elect to sponsor particular projects or a series of programs, or become one of the foundation's supporting partners, or to engage in corporate volunteering.

WA PARKS FOUNDATION

Western Australia is known around the world for the great variety of its plant and animal life. The honey possum and Baxter's banksia, both species native to the State, were chosen for the foundation's logo to showcase WA's rich biodiversity and the connections found in nature.

The theme of connections runs through the WA Parks foundation's goals, including people's connection to the natural environment and the foundation's connection with its partners, collaborators and the community.

Caris Bailey was involved in establishing the WA Parks Foundation after working with Parks and Wildlife and its predecessors for many years.

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

For more information about the WA Parks Foundation visit www.ourparks.com.au. Or you can follow the foundation on Facebook, Twitter and Instagram (@OurWAParks).



Peacock spiders – dancers of the forest

Above The magnificent *Maratus hortorum*.
Inset *Maratus spicatus*.
Photos – Jean and Fred Hort

Jumping spiders are the most diverse group of spiders in the world and comprise nearly 13 per cent of named species. They occur on all major landmasses, except Antarctica, and have even colonised islands far out to sea, as juveniles are able to disperse long-distances by floating through the air on silken threads, a technique called ballooning. If they land on a habitable island, they occasionally survive long enough to establish a viable population.

As their name implies, jumping spiders can leap long distances, often many times their own body length. Indeed, the scientific name of the first genus to be described in the family Salticidae was *Salticus*, which is a Latin word for leaping. They are also unusual for the arrangement of their eyes which comprise four large anterior eyes located at the front of the carapace, and four smaller eyes on the top of the carapace. This characteristic eye arrangement defines the family. Not surprisingly, their four large eyes provide them with excellent vision, enabling them to locate and leap towards prey from remarkable distances. Many jumping spiders have colour vision, a rare trait among spiders, allowing the evolution of colour patterns on the body and/or legs of many different species. Some have evolved brilliant colouring that rivals birds for their complexity and beauty.

Among the most beautiful of all jumping spiders are the peacock spiders of the genus *Maratus*, but only the males are brightly coloured, as the females tend to be dull brown. Indeed, one of the first named species is called *Maratus pavonis*, which comes from the Latin word for peacock. A fitting appellation, indeed.

Maratus is restricted to Australia and now comprises more than 70 named species, with new species found and described each year.

Apart from their bright colouration, the males of most peacock spider species have flaps or fringes of setae on the sides of their abdomens, and long third legs with brushes of setae or white tips. These features are also lacking in the females, and there are few points for guessing their purpose – sex. When courting females, the male uses all of his wares to beguile the female. The routine varies between species, but there are some common elements. The abdomen is raised so that it faces the female, amply displaying his gaudy colours. The flaps or setae, if present, are expanded, and the third legs are lifted in the air. Then the fun begins – he dances for his consort, wiggling himself backwards and forwards, moving his abdomen and legs. Each species has its own special dance, but they all put on a impressive show. For many years, these spiders were thought to glide, using the abdominal flaps to ease their fall when jumping. Indeed, *Maratus volans* was named in the 19th century for this supposed behaviour, which was suggested by the collector H.H.B. Bradley who noted that he had observed them elevating and depressing the flaps, and also actually using them as wings or supporters to sustain the length of their leaps. The British taxonomist who named the species correctly suspected that the flaps "are sexual".

Many different species have been described in the genus over the past few years, and there are now more than 30 species recorded from southern Western Australia. Some are widespread, but others are known to be highly restricted, with Sarah's peacock spider (*Maratus sarahae*), which was named in 2013, known only from the peaks of the eastern side of the Stirling Range. Due to its very small range and the possibility that their montane habitat will be badly affected by climate change, Sarah's peacock spider has been added to Western Australia's threatened species list.

If you haven't seen a peacock spider in real life, don't despair, as they are not uncommon in south-western Australia. Indeed, *Maratus pavonis* is found in suburban gardens in southern Australia where the males can be seen jumping around on lawns on sunny spring days. And where there's a male, there is bound to be a female, but they are really hard to spot due to their dull colours.

A search of the internet for peacock spider videos, will also provide some entertaining viewing.

Discover more about Peacock spiders

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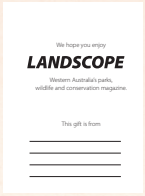


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The UNDERWATER WORLD of the Kimberley

Renowned for its extreme tides, the waters of the Kimberley host seagrasses and macroalgae that thrive against the odds. A three-year study combined science and traditional knowledge to uncover some of the secrets of these fascinating species, and the herbivores that feed on them.

by Mat Vanderklift and Gary Kendrick



The Kimberley region, occupying the far north-western corner of Australia, is renowned for its wildness, extreme tides and majestic landforms. Saltwater crocodiles patrol the rivers and coasts, humpback whales give birth in its calm bays, green turtles nest on the sandy beaches, and its waters teem with fish that anglers dream of. But what sustains such richness?

AGAINST THE ODDS

Researchers from CSIRO and The University of Western Australia teamed up with the Bardi Jawi Rangers – who look after more than 250 kilometres of coast and the 340,700-hectare Bardi Jawi Indigenous Protected Area – to answer this question. Under the auspices of the Western Australian Marine Science Institution (WAMSI) which includes Parks and Wildlife, the team spent three years studying the seagrasses and macroalgae (large seaweed) that grow on the seafloor abutting the coast and islands around One Arm Point.

What they found was remarkable – the seagrasses and seaweed grow in extreme conditions that would normally pose problems. Yet not only do they survive, they thrive.

The islands off One Arm Point experience some of the largest tidal ranges in the world – at certain times of year when the moon is full the difference between high and low tide can be up to 12 metres. When the tide drops, at some places in the islands it leaves behind lagoons perched up to several metres above the water level, which are held in place by a hard reef of coralline algae (a hard, pink type of algae that uniquely takes the place of reef-building corals in the area). Water remains impounded within these lagoons for several hours, and without the cool flushing effects of the currents that twist in and out of the channels, the water gradually heats up. In the height of summer, when air temperatures regularly exceed 40°C, the team recorded water temperatures over 35°C – soaring five degrees celsius or more in the span of a few hours. But that's not all; not only do the plants in these lagoons face extreme temperatures, through their own respiration at night time they use the oxygen in the water, causing the amount of dissolved oxygen to plummet, and the water to become more anoxic.

Facing such extremes of high temperature, low oxygen and low pH water, most plants would give up, but not the seagrasses and seaweed of the Kimberley lagoons. Instead, the team found quite the opposite. The seagrasses that they measured were growing an astounding several centimetres each day – among the highest plant growth rates observed anywhere in the world. The growth rates for seaweed were similarly impressive. The team focused on one common species of large brown algae – rough-stemmed sargassum (*Sargassum polycystum*). Unlike seagrass, which tend to grow at a relatively constant rate all year, *Sargassum* has a distinct pattern of growth; for much of the year it barely grows at all, but during early summer the growth rates accelerate rapidly exceeding a centimetre each day.

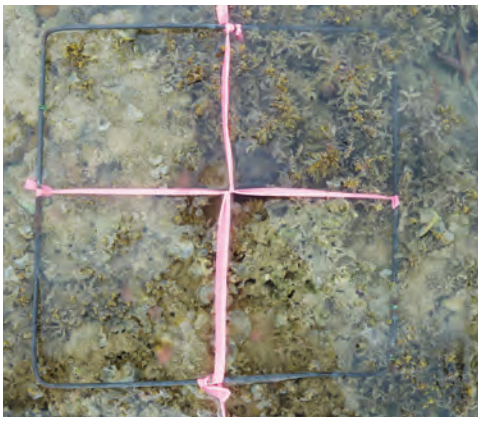


Previous page
Main Surveying the diets of green turtles revealed some secrets of the area.
Photo – Alex Steffe/Lochman Transparencies
Inset *Enhalus acoroides* was one of the species studied.

Above Bardi Jawi ranger Dwayne George and researcher Monique Grol measuring seagrass growth.
Photos – Monique Grol/CSIRO









Top left The seagrass *Enhalus acoroides*, one of the species studied, often grows adjacent to mangroves.
Photo – Mat Vanderklift/CSIRO

Top A quadrat, used during the study of growth, in a meadow of the seagrass *Thalassia hemprichii*.

Above The brown seaweed *Sargassum* in a quadrat.
Photos – Monique Grol/CSIRO

Left A Bardi Jawi ranger gently brings a turtle to the surface after capture.
Photo – Mat Vanderklift/CSIRO

"What they found was remarkable – the seagrasses and macroalgae grow in extreme conditions that would normally pose problems. Yet not only do they survive, they thrive."

MEASURING GROWTH

With so much growth – a square metre of these seagrass meadows produces about a kilogram of new biomass each year – the research team set out to work out where it all goes. They used a simple but effective technique to ascertain whether it was simply getting eaten or whether something else was happening to it. They would locate an intact shoot, photograph it to digitally measure its surface area, place it back in the meadow, and return the next day to re-photograph it. This was done for two species: *Thalassia hemprichii* (otherwise known as turtlegrass), and *Enhalus acoroides*. The team found that the amount being eaten depended somewhat on where and when they did the experiment, but mostly it depended on which species of seagrass they used. Consumption of *Thalassia* was as high as 60 per cent of the shoot, and almost always higher than five per cent. In contrast, consumption of *Enhalus* was almost always less than five per cent, and sometimes did not occur at all.

These disparate rates of consumption of the two species of seagrasses contrast with their relatively similar rates of growth, which implies that they might play different ecological roles. The evidence that a large proportion of the production of *Thalassia* is directly consumed by herbivores led the team to wonder what those herbivores were. To unravel this mystery, the exchange of traditional ecological knowledge with the Bardi Jawi Rangers proved invaluable.

As they walked the lagoons together and considered the options, including green turtles and a number of different fish, one species they observed darting around them emerged as a likely candidate:





Left One Arm Point is part of the Buccaneer Archipelago.
Photo – Col Roberts/Lochman Transparencies

Above Evidence has been found that the golden-lined rabbitfish or *barrbal* is consuming vast amounts of the seagrass.
Photo – Mat Vanderklift/CSIRO

the *barrbal* – or golden-lined rabbitfish (*Siganus lineatus*). The species is highly prized by the locals for its white flesh and the fat that lines its stomach cavity. One of the rangers speared a *barrbal*, and looked inside its stomach, sure enough, it was full of *Thalassia*. Thus the next stage in the research was born. Over the next year, the team systematically collected *barrbal* from different places and during different seasons. No matter where or when they were collected, one result stood out: their stomachs almost always contained large amounts of *Thalassia*.

Yet, the team also knew that there was another prominent herbivore – the green turtle (*Chelonia mydas*), also called *goorlil* in the Bardi language. Green turtles are typically vegetarian, and in many places of the world consume primarily seagrass. Even the common name for *Thalassia* – turtlegrass – gives a clue as to the green turtle's potential role as a herbivore. Examining the diet of green turtles was not so straightforward as it was for *barrbal* – a few stomachs donated by traditional hunters showed that some had large quantities of *Thalassia*, but not all. Instead, once again the value of the partnership between the scientists and the rangers was demonstrated. The team captured turtles using a method known as 'rodeo', in which an experienced handler leaps into the water from a boat and captures it by hand – the local knowledge and proficiency of the rangers in turtle capture meant that 60 turtles were captured in this way during two expeditions. On board the boat, the research team took blood samples from the turtles before releasing them back into the wild. The blood samples were immediately placed into a centrifuge to separate red blood cells from plasma and other components of the blood. Those samples were then frozen and transported to the research laboratories in Perth. There, the researchers measured the ratios of stable isotopes – different types of atom of the same element (say, carbon) that have different numbers of neutrons, and so have infinitesimal differences in mass. This process takes advantage of the fact that different types of plants have different ways of collecting and storing energy and nutrients, and so have different stable isotope ratios. By comparing the data from the blood of turtles with those obtained from the plants, the team was able to get insights into what those turtles had been eating. What they found was intriguing. There was no single consistent diet common to all turtles, but instead they appeared to have a variety of diets. Some turtles, as the team expected, did indeed eat *Thalassia*, but others did not, and were more likely to eat macroalgae.

Three years on, the team has made great strides. The surveys have revealed that the seagrasses and seaweed of the Kimberley are living on the edge – thriving in extreme conditions that push the limits of what they can cope with – and that they support a food web that has profound cultural significance. Perhaps above all, they have shown how partnerships between researchers and Indigenous rangers can yield outcomes that neither can achieve on their own and produce enduring friendships forged during the shared experience of discovery.

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The $30 million Kimberley Marine Research Program *is funded through major investment supported by $12 million from the* Kimberley Science and Conservation Strategy *co-invested by the WAMSI partners and supported by the traditional owners of the Kimberley.*

by Grace Milne

kaleidoscope
connecting kids with nature



The **Big Kids Campout**

The Big Kids Campout is a school holiday event held at Beelu Campground at the Perth Hills Discovery Centre as part of Parks and Wildlife's *Nearer to Nature* school holiday activity program. This program contributes information helpful to conservation, while giving campers a trip to remember.

Twenty campers, ranging from eight to 12 years old, experienced the forest after dark. The highlight of the evening was the wildlife trapping and release session – an activity exclusive to this camp. Just before dusk the campers mixed baits and each set cage traps along the Hills Forest transect. The next morning they checked the traps and found a brush-tailed phascogale, a brushtail possum as well as traces of a kangaroo and small cat in the sand pad trap. They measured and weighed the animals they'd trapped and recorded the information to be used later for school group analysis.

This activity was an opportunity for the campers to learn about the work that Parks and Wildlife carries out through its native wildlife recovery program *Western Shield*.

Did you know?

- Brush-tailed phascogales are fantastic climbers, often spotted 25 metres from the ground.
- The females weigh up to 140 grams and males 200 grams. That's about the weight of the average mobile phone!
- They are nocturnal animals which means they sleep through the day and come out at night.



My last campout

"Since I found the Big Kids Campout, I have gone every time. The Campout is based around one big activity: trapping, recording and releasing wild animals.

The last nine camps I did not trap any animals so I came back on my tenth camp thinking the same thing would happen. But this time, to my excitement, stirring in the cage, was a brush-tailed phascogale. It was one of the best things that had ever happened to me on the camps. I was so excited!

I measured and weighed the phascogale and recorded all the information. This information goes back to *Western Shield* – Parks and Wildlife's native wildlife recovery program. The rest of the camp was much more fun after I had caught something. We got to set up our own tents, cook our own food and sit around a campfire. Sadly, I have become too old to go on the camp and I will miss the fun times I had."

By Corey Rynvis, 13

Nearer to Nature *is an educational and community engagement program provided by Parks and Wildlife. It provides opportunities for the public to interact positively with the WA environment. Activites are held in a variety of environments, including forest, bushland, wetland, river, beach and marine areas.*

Nearer to Nature *publishes a calendar of school holiday activities which details the activities on offer, dates, locations and prices. For more information visit nearertonature.dpaw.wa.gov.au. or facebook.com/dpawn2n.*

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



Red-tailed black cockatoo *(Calyptorhynchus banksii naso)*

The loud and raucous calls of the red-tailed black cockatoos make them one of Australia's most spectacular, and conspicuous, birds. The males and females can be distinguished by the colour of the bands on their tails. The males sport crimson tail features while the females have light yellow to orange, which contrast magnificently against their dark body feathers. Adult birds can grow to between 50 and 61 centimetres and lay their eggs between March and April and July to October.

Illustration by Gooitzen van der Meer

Reference photo by Jiri Lochman

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