

WA'S PARKS, WILDLIFE AND CONSERVATION MAGAZINE

LANDSCOPE

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FINDING FUNGI

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Department of Biodiversity,
Conservation and Attractions



ON THE COVER

Front cover A beautiful species of *Hydropus* recently discovered during surveys at Kings Park. It is considered new to science and awaits naming.

Photo – Neale Bougher

Back cover Kings Park.

Photo – Allan Symon Gerry/Alamy

In Western Australia we are lucky to have a remarkable natural environment. Many factors have the potential to impact the biodiversity of our natural places and some may be surprised to know the extent of how science-based evidence guides the decisions to mitigate those impacts.

This edition of *LANDSCOPE* showcases a range of conservation projects that are all informed by, best-practice science. Community members, scientists, Traditional Owners, other government agencies and volunteers all make a contribution.

Translocation is a valuable conservation tool that can yield significant benefits although it can be costly and high risk (see ‘Constructing a better future for Wirruwana’ on page 22). The approvals process for these projects includes thorough consideration of potential benefits, weighted against the risks and uncertainties of translocations. Translocation approvals involve consideration of evidence-based research and assessment of both source and release locations to ensure that the resulting populations are viable and self-sustaining.

The consideration of threatened species and ecological communities is a large part of the planning process to preserve biodiversity before considering building trails and trail networks (see ‘Trailing ahead’ on page 12). Significant community consultation and scientific research informs decision making in the early stages and throughout the project.

Innovative and science-backed work is often a multi-agency approach to conserve biodiversity and prevent introduced pests such as wasps gaining a stronghold here in WA (see ‘War of the wasp’ on page 43). Again, we see the work of many agencies, volunteers and community members coming together to achieve conservation.

The high-quality scientific work undertaken by volunteers is an important part of improving conservation efforts and volunteers have been instrumental in describing diversity and the discovery of 530 (so far!) species (see ‘A wealth of new fungi in Kings Park and Bold Park’ on page 48).

We take much pride in our scientific work to continuing to provide for such rich variety and beauty in WA.

Ruth Harvey Program Leader, Species and Communities
Department of Biodiversity, Conservation and Attractions



Contributing

Michael Lenane is the host of YouTube show ‘The SUP Show’, which documents his travels in Australia and around the world and provides tutorials and helpful tips on all things stand up paddle. He is also the owner of Sunset Stand Up Paddle in Perth, offering lessons and board rentals

on the beautiful Canning River. Mike is also the writer and director of the acclaimed comedy/nature documentary ‘This is SUP’ that can be seen on YouTube.



Mike Wood is an avid adventurer and has trekked, rafted, kayaked and climbed over the world’s most iconic locations— everywhere from Everest to Kilimanjaro and the Inca Trail. He led treks and expeditions for more than 38 years, was the first Chairman of the Bibbulmun Track Foundation from 1996–2019 and continues to be an advocate for long-distance trails, working on DBCA’s major trail projects.



Emily Ward has always been fascinated by the marine world. Living in places like Cornwall in the UK, and Shark Bay and Exmouth in WA has fuelled her curiosity and passion. She has a special interest in turtles and has volunteered on many projects at Dirk Hartog Island and Ningaloo. She is a keen photographer and illustrator, with her works featured on interpretive signage and DBCA publications. Currently based in Geraldton, Emily produces audio visual materials for the department.



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This page Dirk Hartog Island.

Photo – Kelly Rayner



Department of Biodiversity, Conservation and Attractions

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Greater stick nest rat (*Leporillus conditor*).



**Snap
shot**



READER'S PIC

White-faced heron *(Egretta novaehollandiae)*

Photo and words by Gary Tate

"You never know what you might come across along the wonderful shared-use path from Perth to Fremantle. I looked down on the shoreline at Dundas Point in Applecross just in time to see a majestic white-faced heron (*Egretta novaehollandiae*) endeavoring to swallow a rakali or native water rat (*Hydromys chrysogaster*) distinguished by the white tip on the protruding tail. After many unsuccessful attempts, the rakali was finally swallowed down, a very large breakfast for a heron.

Other birds regularly sighted along the boardwalk were greenshank, oystercatchers, pied stilts, black ducks, swans and pelicans."

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 landscape@dbca.wa.gov.au.

WA Parks Foundation membership

The charity partner for Western Australia's national parks and other conservation reserves, the WA Parks Foundation, is on a mission to connect people with parks. The Foundation has been delivering projects that celebrate, increase understanding of and protect WA's natural assets for future generations since it was launched in 2015.

Their popular *Spring into Parks* program has been a huge success, celebrating spending time in nature to improve mental health and wellbeing, promoting a number of events all around the State. The Foundation has made navigating within WA's national parks easier with the creation of their Smartreka maps, downloaded onto the Avenza map app. There are now nine Smartreka maps for popular WA national parks, with more on the horizon.

While the Foundation offers member benefits such as a complimentary copy of *LANDSCOPE* magazine, 50 per cent discount on annual national park passes and discounts to adventure treks and tours around the State, the real gift is the contribution to the great work the Foundation does to foster and nurture love for WA's natural areas.

The extent of this advocacy is exemplified by the WA Parks Foundation's esteemed ambassadors, who in their individual and unique ways, devote their lives to the betterment of Western Australia's natural environment.

You can become a member today for as little as \$30 by visiting ourwaparks.org.au



**WA PARKS
FOUNDATION**

Targeting cane toads

A new five-year strategy to manage the impact of cane toads in Western Australia has recently been launched.

New scientific research will inform innovative mitigation methods for the invasive species as well as community education and volunteer programs.

Some of the innovative control methods include taste aversion research with the aim of teaching predators, including the northern quoll, floodplain goanna and other reptiles, to avoid eating cane toads.

Cane toads crossed the Northern Territory border into WA in 2009 and are moving across the Kimberley region at a rate of 50 kilometres per year. The frontline is currently 100 kilometres east of Derby, with cane toads expected to reach Derby within two years and then Broome in five years' time.

DBCA staff and Aboriginal ranger groups throughout the Kimberley will continue to collect important information on wildlife ahead of the cane toad front and monitor its progress.

The cane toad is currently listed by the International Union for Conservation of Nature as one of the world's 100 worst invasive species.



Above Cane toad (*Rhinella marina*).

Photo – DBCA

Seeking adoption

If you're passionate about keeping our waterways free of pollution, look out for a *Reel It In* bin next time you're by the water. These bins keep discarded fishing waste out of our oceans and rivers, reducing the risk of wildlife entanglement.

Better still, adopt one! The *Reel It In* program relies on volunteers to help empty these bins on a regular basis, which only takes a few minutes a week.

If you live in or around Quinns Rocks, Mindarie, Jindalee, Burns Beach, Iluka, Ocean Reef, Scarborough or Trigg, we'd love to hear from you via email at community@dbca.wa.gov.au



Above Reel It In bin.
Photo – DBCA



New Thundelarra Conservation Park

Located in the State's Mid-West region within Badimia country, the new Thundelarra Conservation Park spans more than 100,000 hectares and complements a further 114,000 hectares of conservation reserves created in the region in January 2022.

The conservation park supports important ecological communities including threatened flora and vegetation types, and threatened fauna species such as the malleefowl.

With a rich wildflower display in spring, there is significant tourism potential with possible links to nearby lands, which are part of the Yamatji Nation Indigenous Land Use Agreement.

The park also provides a unique opportunity for a variety of camping, four-wheel driving and other recreational experiences within a day's travel from Perth.

Above Emus at Thundelarra.
Photo – Sue Hancock/DBCA

Guest column



Dr Sonya Broughton
*Chief Plant Biosecurity Officer
for Western Australia*

Western Australia has a long history of being free from many exotic pests and diseases. This has helped protect not only our primary industries and their high value export markets, but also our unique natural environments, and even our way of life.

WA's highly effective biosecurity systems have kept our local bush areas safe from devastating diseases such as myrtle rust and have prevented thousands of pests such as red imported fire ants and European wasps (see 'War of the wasp' on page 43) from overtaking our outdoor areas.

However, the risk of exotic plant pest and disease incursions is ever-present.

I often refer to plant biosecurity as the Swiss cheese model of risk—if there are holes in slices of cheese, things can get through, but the more layers of defence there are, then the less likely it is for something to get through.

No single layer of cheese, or defence, is going to be effective on its own so there needs to be multiple layers. Everyone has a part to play contributing to these layers.

The earlier we detect a pest or disease, the faster the response, the better chance we have of eradicating it.

Myrtle rust (*Austropuccinia psidii*) is a high priority plant disease threat to WA that attacks and kills plants in the Myrtaceae family such as bottlebrush, eucalypts and paperbarks. It is not yet in WA but is having devastating impacts on native habitats in other parts of the country.

Early infection symptoms of myrtle rust can include small purple or chlorotic spots on leaves, which are followed by masses of powdery bright yellow or orange-yellow spores.

WA species are particularly vulnerable. More than half of Australia's Myrtaceae species occur in WA, including more than 1800 species in the south-west.

Preparedness to prevent and respond to a myrtle rust incursion can be enhanced through collaboration between government, industry and community.

To this end, a working group was formed in 2019 to bring together industry and stakeholder groups, DPIRD and other government agencies.

Further, new methods of detection, surveillance and diagnostics are being developed through scientific collaborations with DPIRD.

What we still need is that final 'layer', which is the community looking out for and reporting signs of myrtle rust at all times, and ensuring they 'arrive clean, leave clean' in natural areas, to prevent an incursion or potential spread.

These standard practices apply to all invasive plant pests and diseases. They are essential to protect all that you love.



Department of
**Primary Industries and
Regional Development**



Montebello Islands Conservation Estate

The Montebello Islands Conservation Park is a group of small islands sprinkled like jewels among the turquoise waters of the Indian Ocean. The islands are located 120 kilometres west of the town of Dampier in Western Australia and 8000 years ago were once part of mainland Australia. Rising sea levels flooded the coastal plain leaving low-lying limestone remnants—a scattered group of islands consisting of intertidal and subtidal coral reefs and sheltered lagoons.

The Montebello Islands are surrounded by the 58,000-hectare Montebello Islands Marine Park. Collectively, the islands and marine park offer a wealth of opportunities for divers, fishers, snorkellers and anyone

Above Hawksbill turtle hatchlings (*Eretmochelys imbricata*).
Photo – DBCA

Above right Spotted-leaved red mangrove (*Rhizophora stylosa*) at Trimouille Island.
Photo – Suzanne Long

Top right Massive hard coral (*Favites complanata*).
Photo – Marissa Speirs/DBCA

with an interest in natural values, human history and maritime heritage to explore. Fringing reefs, sandy beaches, sheltered coves, isolated mangrove stands and abundant marine life including turtles, dolphins, and dugongs await. The only access to the islands is by boat, making this a truly wild experience.

The islands were named by French explorer Nicolas Baudin in 1801 after the battle of Montebello. The earliest known European shipwreck in Australia occurred in 1622 when the English vessel 'Tryal' was wrecked on what are now known as the Tryal Rocks, north of the marine park. The 46 survivors from the wreck were the first Europeans known to have landed on

the islands and eventually returned safely to Batavia.

BRINGING BACK BIODIVERSITY

The islands were once a popular base for late 19th century pearlers, who, it is believed, may have been responsible for the introduction of feral cats and black rats. This in turn led to the extinction of native fauna like the spectacled hare-wallaby (*Lagorchestes conspicillatus*) and golden bandicoot (*Isoodon auratus*).

This group of remote islands is now a wildlife refuge. Careful work over several years to eliminate feral animals has provided a haven for reintroduced species from the mainland and other islands to



Discover more about the Montebello Islands

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



Clockwise from left to right Fairy tern (*Sternula nereis*). Photo – Jiri Lochman; Dugong (*Dugong dugon*). Photo – Geoff Taylor/Lochman Transparencies; Sooty oystercatcher (*Haematopus fuliginosus*). Photo – Jiri Lochman; Hermite Island. Photo – Col Roberts/Lochman Transparencies

thrive. Spectacled hare-wallabies and golden bandicoots have been returned to Hermite Island, and three other mammal species that have benefited from this conservation work include the mala (a subspecies of rufous hare-wallaby *Lagorchestes hirsutus*) on Trimouille Island, the djoongari or Shark Bay mouse or (*Pseudomys fieldi*) on North West Island, and the boodie or burrowing bettong (*Bettongia lesueur*) on Alpha Island. The spinifex bird (*Poodytes carteri*) and black-and-white fairy-wren (*Malurus leucopterus leucopterus*) have now been introduced to the islands. To protect this unique wildlife, visitors are asked to abide by quarantine guidelines before setting foot on the islands.

AN EXPLOSIVE PAST

In the 1950s, the islands and surrounding waters were used by the British government for atomic weapons testing. Code named 'Operation Hurricane,' in 1952 the first nuclear device was exploded in a ship (HMS Plym) off Cocoa Beach, Trimouille Island. In 1956, another two devices were exploded—one was placed on a tower at the northern end of Trimouille Island and the other on a tower on Alpha Island. Concrete plinths, bunkers,

monitoring stations, scrap metals and other relics of this time can still be found on the islands. Low levels of radiation still exist, and visitors are advised to observe signage and limit their exposure on Alpha and Trimouille Islands to one hour per day and not to disturb the soil or remove any relics.

KNOW YOUR ZONES

The turquoise waters surrounding the islands are alive with an array of fish (more than 450 species), invertebrates (more than 1000 species), marine mammals including turtles and vast coral gardens.

The marine park waters are divided into a series of zones, each allowing for different marine-based activities. Zones include areas for general use, recreational fishing, and sanctuary zones for the protection

of marine diversity. There are two large sanctuary zones, or 'no take' zones, where fishing, including catch and release, is not permitted. It is important to know your zones (see map on page 10).

PLANNING YOUR TRIP

As with all remote parks and reserves, visitors are advised to ensure they undertake appropriate planning,

Camping at the islands

Visitors are encouraged to stay on their vessels overnight. Should you need to camp on the islands, please only camp on the beaches (or within 100 metres of the high tide mark, for a maximum of five nights) of Renewal Island, Hermite Island, Crocus Island, Bluebell Island and Primrose Island.

Camping is also permitted on North West Island but only from April to September to avoid disturbing nesting turtles and emerging hatchlings.

For updated camping arrangements please contact the Karratha Parks and Wildlife Service office on (08) 9182 2000.

Parks for people Montebello Islands Conservation Estate



have effective communication and pack adequate fuel, food, water and first aid supplies to last the duration of your stay. There are no facilities or services on the islands. Charter vessels are available from the coastal towns of Dampier or Exmouth.

Before leaving port, always check your vessel and equipment including footwear and camping gear and remove any soil, seeds and other plant material, or animals including insects to avoid introducing foreign pests to the islands. The introduction of pests (such as mice and rats) could be devastating to the native mammal and bird populations on the islands. Pets and fires are not permitted on the islands.

When you leave, please take all your rubbish with you for disposal at a suitable facility on the mainland.

Above Golden bandicoot (*Isoodon auratus*).
Photo – Colleen Sims/DBCA

Above right Osprey (*Pandion haliaetus*).
Photo – Jiri Lochman

Above far right Australian humpback dolphin (*Sousa sahalensis*).
Photo – Holly Raudino/DBCA



Do it yourself

Where is it? 120 kilometres west of Dampier

Total area: Marine Park 58,331 hectares
Conservation Park 4169 hectares

Recreational activities: Fishing, diving, snorkelling, birdwatching, photography.

Nearest Parks and Wildlife Service office
Lot 3 Anderson Road,
Karratha WA 6714 (08) 9182 2000.

For more information about planning a trip to the Montebello Islands visit the Explore Parks WA website exploreparks.dbca.wa.gov.au/park/montebello-islands, or download the *MarineParksWA* or *Recfishwest* apps.



MY BUSHFIRE PLAN

According to the Department of Fire and Emergency Services (DFES), 90 per cent of Western Australia is bushfire prone. As residents, it's important to have a plan ready in case a fire threatens your life and home.

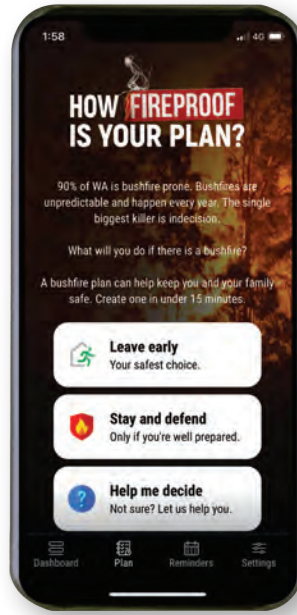
DFES's *My Bushfire Plan* app and website can help you prepare, store, share and update your bushfire plan anytime, from any device.

Creating a plan for my home was quick and easy. The step-by-step approach is easy to navigate with helpful prompts that encourage you to think through what you'll take, when you'll leave and where you'll go if a fire is looming.

The app also provides links to documents including an emergency plan for horses, preparing your property for a bushfire and a list of protective clothing.

Having grown up in the south-west of WA where bushfires are a constant concern over summer, it reassures me that my family and friends have a convenient resource available to help them develop their bushfire plan.

My Bushfire Plan can be downloaded for free on Google Play and the App Store.



BEACHSAFE

If you're a beach lover, it can be reassuring to know which beaches are patrolled by surf lifesavers and at what times.

Surf Life Saving Australia's *Beachsafe* app can tell you this and a whole lot more in one convenient location.

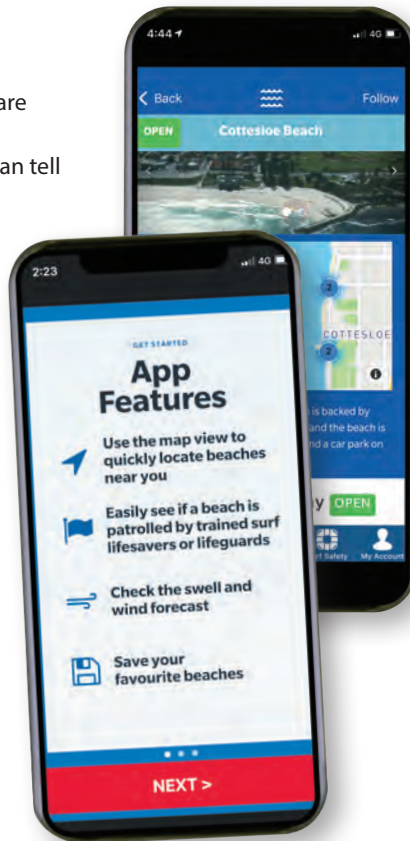
The app provides detailed information about patrol status, facilities, hazards, weather conditions, swell and tides at every beach in Australia.

You can filter beaches based on whether or not they're patrolled, have parking, are accessible by public transport, have toilets or have barbeque and picnic facilities.

You can save beaches to 'My Beaches' by selecting 'Follow' in the top right corner of the screen to easily check conditions at your favourite beach in just a few clicks.

All up, a handy app for finding the perfect beach and checking patrol status. General beach safety information is also provided.

Beachsafe can be downloaded from beachsafe.org.au



BIRDS OF THE PERTH HILLS



As a keen hiker, I often find myself wondering which birds I'm hearing or seeing around Kalamunda and surrounding areas on a weekend.

Birds of the Perth Hills by Perth Hills resident Talitha Huston will undoubtedly help me identify and photograph birds on my hikes.

A self-professed photography and bird lover, Ms Huston published her impressive debut book at just 17 years old. This beautifully photographed and easy-to-follow book introduces almost 50 birds commonly found in and around the Perth Hills, outlining where they're found, their diet, breeding patterns and lifespan, and tips for identification.

She's even developed a 'skittish rating' from 'extremely skittish' to 'quite calm' to indicate how nervous or fearful each bird is around humans.

Birds are identified in the book by their common and scientific names as well as northern Noongar Djiraly northern dialect.

With well-known naturalist and ABC personality Eric 'The Bird Man' McCrum as her editor, a foreword by renowned Perth Hills ornithologist, photographer and filmmaker Simon Cherriman and a back cover endorsement from naturalist and author Ray Garstone, Talitha is clearly already well-regarded within the Perth photography and ornithology communities.

Birds of the Perth Hills can be purchased for \$29.99 (including postage) from talithahuston.com.au as well as bookstores and outlets listed on the website.

TRAILING AHEAD

Intrastate travel has exploded in Western Australia, and people have been exploring every inch of the State in record numbers. There has been a noticeable spike in the popularity of outdoor recreation and the demand has prompted investment in the upgrade and creation of hiking and mountain biking trails.

by Mike Wood







Lately, Western Australians have been out rediscovering their passion for WA's natural places and local attractions (see 'Embracing biophilia: Prescribing nature in a pandemic' *LANDSCOPE*, Spring 2020).

The demand for adventure trails has prompted significant investment and intensive community consultation in the creation of trail networks across WA

“Walkers and cyclists from all over Australia and the world, as well as WA, come to experience their unique offering.”

.....
Previous page

Main Harewood Trail.

Photo – Mike Wood

Inset Munda Biddi Trail.

Photo – Gerhard Sauracker/Lochman Transparencies

Above The Bibbulmun Track between Peaceful Bay and Conspicuous Cliffs.

Photo – Bron Anderson

Above right WOW Trail near Denmark.

Photo – Cheryl Freak

including in Dwellingup and Collie (see 'Trails firing up Dwellingup' *LANDSCOPE* Winter 2021 and 'Not the Collie you know' *LANDSCOPE* Summer 2020–21).

WA tourism and regional businesses were given support in July 2020 as part of the State Government's \$5.5 billion WA Recovery Plan including \$20 million to be allocated over four years to upgrade and build new walking, cycling and paddle trails and associated site facilities.

Torndirrup, Walpole-Nornalup and Porongurup national parks all have trail opportunities under the plan and a number of trail projects have already been completed in the first year. Attention has now turned to the Great Southern Adventure Trails project.

MAKING WAY

The Department of Biodiversity, Conservation and Attractions (DBCA), the Great Southern Development Commission (GSDC) and the City of Albany partnered to move the Bibbulmun Track and the Munda Biddi Trail southern terminus to York Street in the middle of Albany. Both trails now have trail markers leading right into the town centre of Albany, which will bring tourism and have economic benefits for the community.

“It was essential to draw attention to these trails as they are such important

assets for Western Australia,” DBCA's Parks and Visitor Services Assistant Director Rod Annear said.

“Walkers and cyclists from all over Australia and the world, as well as WA, come to experience their unique offering.”

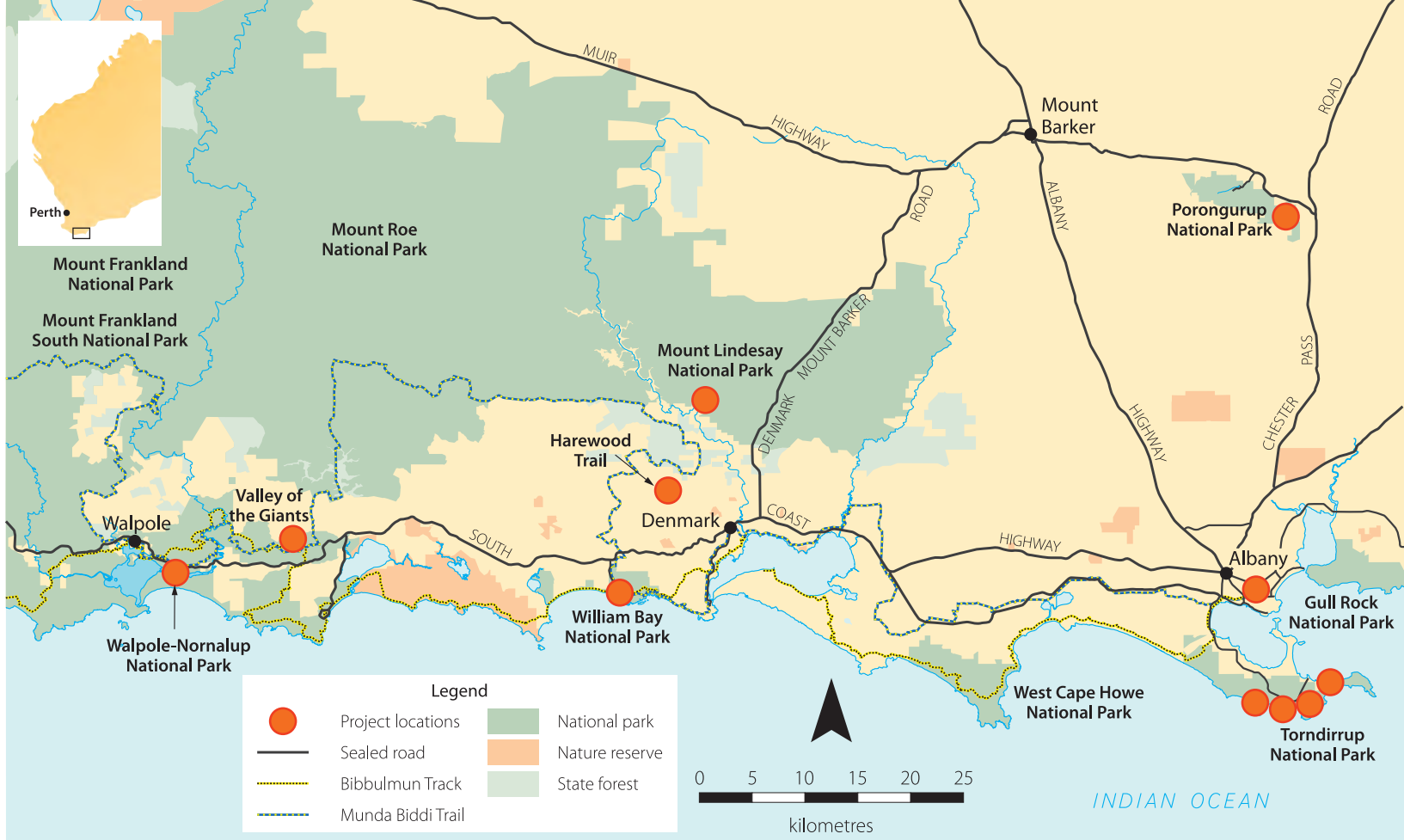
The new southern terminus was officially opened in November 2021.

WILLIAM BAY

A major drawcard of WA's south-west is William Bay National Park, which now has improved road access, a new car park, beach access and amenities (see Parks for people: William Bay National Park, *LANDSCOPE*, Spring 2021).

As part of the Great Southern Adventure Trails project, a new shared-use trail has been added from Elephant Rocks to Waterfall Beach. This 2.6-kilometre surfaced trail includes all-mobility access from the Greens Pool carpark to a new lookout above the spectacular Elephant Rocks, accommodating walkers and cyclists and incorporates the Munda Biddi Trail as it heads towards Denmark.

Planning is underway to link this all-mobility trail to the existing Wilderness Ocean Walk from Lights Beach, through the Denmark Wind Farm and on to Ocean Beach, where cyclists could join the trail to Denmark.



Learn about consultation with Traditional Owners

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



Above New southern terminus in the centre of Albany.

Right Cyclists at the start of the new William Bay Trail.

Photos – Jarred Pedro/DBCA





TRAIL EXTENSIONS

A 2.2-kilometre extension has recently been added to the existing out-and-back Harewood Trail off Scotsdale Road creating a three-kilometre loop. This trail is used extensively by the Denmark community, is dog friendly and creates a more convenient and interesting circuit trail highlighting the fungi that are abundant there.

Significant upgrades are underway at the iconic Bald Head Trail on the Flinders Peninsula within the Torndirrup National Park. The challenging 12.5-kilometre return trail traverses the ridge line of the Peninsula, which provides stunning views of the Southern Ocean, around to King George Sound and of the broader City of Albany.

.....
Above Lights Beach looking east.
Photo – Pippa Engledow

Above right Working on the Harewood Trail.
Photo – Melanie Humphries/DBCA

Left Harewood Trail.
Photo – Bron Anderson/DBCA

Many people travel to Albany specifically to challenge themselves on this spectacular walk trail. However, due to the increased visitation and the exposed nature of the trail, Parks and Wildlife Service staff have noted concerns such as increasing sand blow outs, loss of vegetation caused by wind and water erosion and a widening of the trail surface. These issues have been addressed by the inclusion of low impact stairs and walkway structures to raise the trail above eroded areas and to stabilise its sandy surface.

VALLEY OF THE GIANTS

“One of the most exciting opportunities is a network of trails proposed for the Valley of the Giants, situated in Walpole-Nornalup National Park,” DBCA’s WA Recovery Plan project coordinator, Clinton Hull said.

The trails proposal comprises 38 kilometres of cycling trails and eight kilometres of walking trails. This includes 15 kilometres of shared-use trails which, when combined with the existing Bibbulmun Track and Munda Biddi Trail that pass through the national park, offer a myriad of trail loops and experiences from Walpole, Nornalup and surrounding areas.



“While this project showcases the unique environment of the region, particularly endemic species like the giant tingle trees, it is an opportunity for local tourism businesses to leverage off the trails and sustainably grow the local economy, providing future job opportunities for local families,” Clinton said.

Extensive community consultation has taken place to ensure the Valley of the Giants trail network offers a diverse range of hiking, trail running, cycling and paddling experiences that showcase the beauty and the uniqueness of the valley.

“Ensuring the trail alignment is sensitive to the landscapes, and protecting the natural environment and its values, is extremely important and is the basis for a high-quality trail,” DBCA’s coordinator of the Recreation and Trails Unit, Kerstin Stender said.

The Kapagup paddle trails in the Walpole-Nornalup Inlets Marine Park explore the inlets and rivers systems. The paddle trails will be accessible via a ramp and floating platform in Nornalup and the monastery landing site will include a new landing structure, stairs and improve site layout.

“Walpole is an incredible place, and as an active community member as well

as a trail user, I am really excited to have these trails built in our region,” said Cherie Smith, head of the Walpole Community Resource Centre.

“I see them as a resource for attracting visitors to the region and a means of creating locally sustainable jobs”.

INTO THE FUTURE

DBCA’s Parks and Wildlife Service is currently building new trail networks in other regional centres such as Dwellingup, Collie, Margaret River and John Forrest National Park. Some local governments such as the Shire of Nannup and the Shire of Plantagenet, are building their own trail networks to add to the offering, with some exclusively focusing on mountain bike networks while others are developing

a mixed offering that also includes walking trails.

Trails really have a bright future in WA and they offer the world a very different and uniquely WA experience.

Top left Stone steps on the Harewood Trail.
Photo – Monkey Rock Trail Co

Above left Frankland River.
Photo – Bron Anderson/DBCA

Above Tingle trees, Valley of the Giants.
Photo – Cliff Winfield

Below Monastery landing, Walpole-Nornalup Inlets Marine Park.
Photo – Bron Anderson/DBCA



Mike Wood is a communications and community engagement officer within DBCA’s Parks and Wildlife Service. He is the former Chair of the Bibbulmun Track Foundation, a current Board Member of the foundation and a keen trail user. Mike can be contacted at (08) 9219 8254 or mike.wood@dbca.wa.gov.au

Up to date information on trail projects in WA can be found at projects.trailswa.com.au or exploreparks.dbca.wa.gov.au/connect.

Paddling Poole

With origins in Hawaiian longboard surfing culture, stand-up paddleboards have been growing in popularity in Australia since they were introduced in 2008. Michael Lenane developed an affinity for the boards early on and now spends his days paddleboarding on some of Australia's most scenic waters.

by Michael Lenane





The sound of my alarm, a familiar song enters the end of my dream. It's time to wake up. We are going on an adventure today. My morning officially begins with the smell of brewed coffee, the sizzle of eggs hitting the pan, the crackle of bacon and the golden-brown burn of my hash brown. A quick feed as we pack the car. It is now that the sun decides to peek out from behind the cold hills in the east.

As we pull out of the driveway, we can feel the immediate release from stress that city living can create. Heading down the highway, exciting chats, tunes and good times ensue. Before we know it, we've hit Dwellingup. A slow descent through the cold morning mist, and tall trees that surround us guide our entry into Lane Poole Reserve echo the sound of the tyres crackling on the red gravel road. We are getting close to camp.

SIMPLE ESCAPE

We park up close to the water and there is not an unnatural sound to be heard. The beautiful calls of a flock of stunning red-tailed black cockatoos fill the air. Their sounds filter down from the top of the 20-metre-tall trees that line the banks of the Murray River. We make sure we use the purpose-built river access steps (located at Dwaarlindijiraap and Chuditch for water sports such as stand-up paddleboarding, kayaking and canoeing), our stand-up paddleboards

Previous page

Above Lane Poole Reserve, Dwellingup.

Photo – Tourism WA

Below Paddling is relaxing in national parks.

Photo – Cliff Winfield



Discover more about
Stand Up Paddling in
WA waters

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





(SUPs) enter the water and we take our first strokes upstream. We honestly forget what year it is, what day it is and where we are. Absolutely captivated by the pure beauty of this natural environment, the experience is a true privilege.

It feels like we've stepped back in time hundreds of years and we are now the only people on the planet. Words really do no justice to the raw untouched beauty that we are immersed in.

The reflections on the water make it difficult to tell where the water ends, and the earth begins. Like a pond, these pure mirror-like images of the sky and trees cover our path as we travel further away from our starting point. We must have spent two hours on the water exploring this breathtaking wilderness.

Such a small investment has yielded results far beyond our expectation. To make this trip happen was surprisingly

easy. An hour and a half from the city, this experience only cost us half a day of our time and about a third of a tank of petrol and we return to our hectic city lives in a more relaxed and calm state. We have a deeper appreciation for what makes life rich—nature, the people in your life, and the experiences that you share with them.

SUP HISTORY

In the 1950s a small group of Hawaiian surfers started paddling onto waves using longboards and outrigger paddles. Footage exists of these same Hawaiian surfers paddling tourists onto small crumbling waves with the large boards-and-outrigger paddle combination.

Fast forward almost 50 years to the mid-2000s and a few Hawaiian surfing legends started doing the exact same thing. A few short years later the major windsurfing brands widened the boards

Above Paddling the Murray River in Lane Poole Reserve.

Photo – Drone image by author

Below Stand-up paddleboarding at Black Diamond Lake.

Photo – Michael Lenane

(improving stability) and lengthened the paddles, and we have stand up paddle as we know it today.

Around 2008 windsurfing companies started creating and shipping stand-up paddleboards to Australia and the sport has been growing strong ever since.

BACKYARD BLISS

One thing that touring Australia has taught me is that no matter where you are in this beautiful country, you can always find amazing locations to immerse yourself in.



Types of SUPs:

There is a huge variety of stand-up paddleboards that can be broken up into four categories—surfing, racing, touring and all-round. The easiest boards to use are 'all-round' boards because they are usually the widest, making balance much easier and this is usually what beginners lean towards.

After the beginner stage some people move onto surfing, racing or touring boards based on the direction they want to progress in.



DO IT YOURSELF

Where is it? Lane Poole Reserve, 100 kilometres south of Perth, 7.5 kilometres south of Dwellingup.

Entry fees apply in Lane Poole Reserve. See exploreparcs.dbca.wa.gov.au for details.

Recommended paddle locations in WA: Black Diamond Lake, Stockton Lake, Shelley Beach Park, Yardie Creek and the Cocos (Keeling) Islands.

Best for beginners: Lakes and rivers

It is so wonderful to be a tourist in your own backyard and find new ways to experience nature. The best places to start paddling are lakes and rivers as they can be much safer than the ocean. From picnic spots, day trips, adventure outings to overnights and extended stays, you will find something you like.

My life is based around stand-up paddleboards, so I'll always promote bringing one along with you or hiring one on your travels. It can improve your fitness and core strength, get you closer to nature, create memorable family experiences and give you an excuse to catch up with friends or have some 'you' time.

If stand-up paddle is not for you, a kayak, or a tyre tube, or even a pool noodle will do the trick. Enjoying these beautiful spaces from the water is one of the most relaxing things you will ever do.

Above Wula Gura Nyinda Eco Adventures in Shark Bay World Heritage Area.

Photo – Tourism WA

Right Paddling Big Brook Dam.

Photo – Cliff Winfield

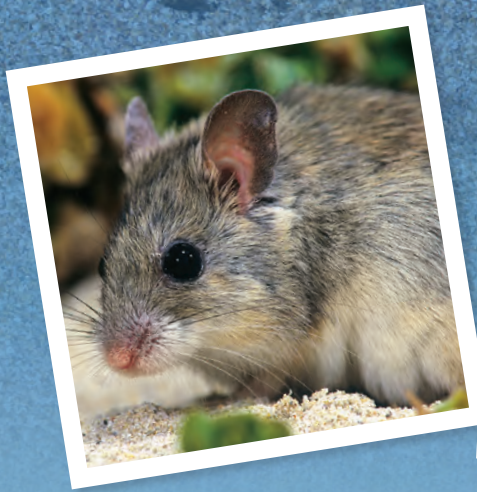
"Absolutely captivated by the pure beauty of this natural environment, this experience is a true privilege."



Michael Lenane is the company director of Sunset Stand-Up Paddleboards and an advocate for the benefits of spending time in nature to relieve stress and improve wellness. He stars in his YouTube channel *The SUP Show* providing tips relating to stand-up paddleboarding. He can be contacted at info@sunsetsup.com.au

CONSTRUCTING A BETTER FUTURE FOR
WIRRUWANA





Conservation efforts on Dirk Hartog Island have been aided by collaboration between members of the community, volunteers, students, contractors, prisoners and even a retired woodworker, all leading to the improvement of prospects for people and animals on the island.

by Sean Garretson, Kim Branch, Kelly Rayner,
Colleen Sims and Saul Cowen





Between its jagged western cliffs and shallow eastern bays, only ghostly whispers of Dirk Hartog Island’s former feral inhabitants blow in the wind. With goats, sheep and feral cats eradicated from the island by the end of 2017, the only mammals to survive the feral onslaught were two native rodent species, two bats, a dunnart and the introduced house mouse (see ‘De-stocking Dirk Hartog,’ *LANDSCOPE*, Spring 2019).

As the heavily degraded vegetation begins to rejuvenate following removal of feral herbivores, threatened fauna are now returning to Western Australia’s largest island, known as *Wirruwana* to the local Malgana people. The island is once again hosting the tracks, diggings, squeaks and scats of the species that were present

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Main East coast of Wirruwana.

Photo – Janine Guenther

Top Greater stick-nest rat tracks.

Photo – Kelly Rayner

Inset left Shark Bay mouse (*Pseudomys gouldii*).

Inset right Greater stick-nest rat (*Leporillus conditor*).

Photos – Jiri Lochman

Above UWA masters student Rebecca Quah radio tracking Shark Bay mice.

Above right Shark Bay mice released on Wirruwana in April 2021.

Photos – Fiona Knox

when Dutch sailor and explorer Dirk Hartog and his crew landed there in 1616.

The aim of the Dirk Hartog Island Ecological Restoration Project, *Return to 1616*, is to return the 633-square-kilometre island to an ecological state similar to what it was before European influence.

SHARKIES AND STICKIES

In 2018, the project entered Stage II (see ‘Welcoming Wallabies to Wirruwana,’ *LANDSCOPE*, Winter 2018). This current fauna reconstruction phase aims to re-establish 13 species of native fauna on the island and return many of the ecological processes to the island.

These natural services include increased nutrient turnover and soil permeability through animal digging, pruning of vegetation, seed dispersal, insect control and fertilisation through their droppings. The aim of the project is to contribute toward improving the worldwide conservation status of a number of these species through the establishment of additional genetically representative, and potentially large, subpopulations.

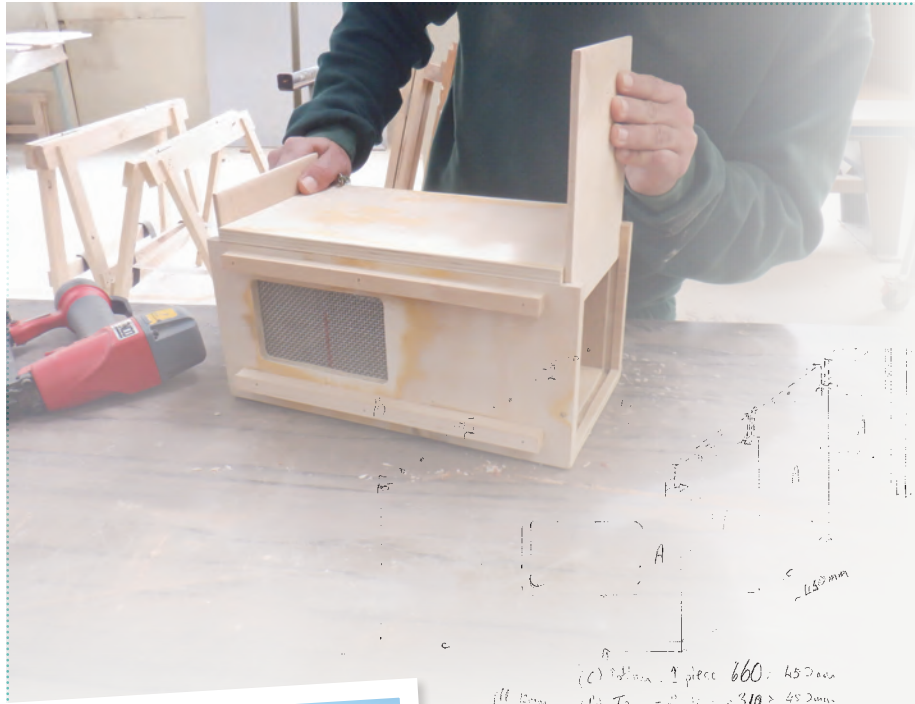
So far, six species have been released on the island—the rufous hare-wallaby (*Lagorchestes hirsutus*), banded hare-wallaby (*Lagostrophus fasciatus*), Shark Bay bandicoot (*Perameles bougainville*), which is the smallest species of bandicoot, and the dibbler (*Parantechinus apicalis*), a small carnivorous marsupial related to quolls and Tasmanian devils.



The Shark Bay mouse (*Pseudomys gouldii*) and wopilkara or greater stick-nest rat (*Leporillus conditor*), affectionately known as ‘sharkies’ and ‘stickies,’ are the most recent additions to Wirruwana with 80 sharkies translocated from Northwest Island in the Montebello Island group (see ‘Montebello Island Conservation Estate’ on page 8) and 62 stickies arriving from Salutation Island in Shark Bay.

In the months of April and May 2021, a team of DBCA animal science researchers, locally-based nature conservation staff and volunteers spent several early mornings checking traps for their quarry. Captured animals were implanted with a unique Passive Integrated Transponder (PIT) tag to enable life-long identification and were carefully selected for health, size and sexual maturity to maximize breeding potential and survivability at their new island home.

While the sharkies underwent an initial one-hour helicopter transfer from Northwest Island to Onslow, followed by a three-and-a-half-hour light plane transit to Wirruwana, the stickies faced a relatively



Stickie boxes

The stickie box project owes its ongoing success to the enormous support received from the local community, volunteers, students, contractors and other collaborators. In early 2021, a retired wood-working hobbyist and volunteer, Graeme Branch, and a team of inmates from the Albany Regional Prison's Cabinet Shop constructed animal transport boxes for the stickies.

Graeme provided his prototype box and design plans to Cabinet Shop instructor, Nathan Gligorevic, and the team spent several months thoughtfully constructing 66 custom wooden transport boxes that were used to temporarily house the stickies during their translocation from Salutation Island to Wirruwana in May 2021.

"The prisoners were proud to be involved in the work," Nathan said.

Not only was it a valuable contribution to biodiversity conservation work, but the experience also counted toward the fulfilment of traineeships and a Certificate II in furniture making, contributing to their rehabilitation and reintegration.



Top Custom-made wooden transport boxes.
Photo – Nathan Gligorevic/Albany Regional Prison

Above Detail of design plans of transport box.
Photo – Colleen Sims

Left A helicopter was used to translocate greater stick-nest rats within transport boxes from Salutation Island to Wirruwana.
Photo – Kelly Rayner



Above Murdoch veterinary resident Fiona Knox and senior project officer Colleen Sims fitting a Shark Bay mouse with a radio collar.
Photo – Kelly Rayner

Right Drivers on Wirruwana must now consider the newest furry road users and slow down between dawn and dusk.
Photo – Janine Guenther



Discover more about returning stick-nest rats to Wirruwana

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





speedy 40-minute helicopter ride from Salutation Island to Wirruwana. A subset of 12 sharkies and 15 stickies was fitted with radio-telemetry collars to track post-release survival and habitat use for up to 29 days and 35 days, respectively.

PROTO-NESTS

Small mammals such as sharkies and stickies are vulnerable to Wirruwana's native predators like bungarra or sand goannas (*Varanus gouldii*), snakes and raptors.

To help the stickies settle into their new home, DBCA staff and volunteers gathered natural materials and pre-constructed nests (referred to as 'proto-nests') at release sites. It was hoped that having artificial refuges early in the translocation would help to encourage stickies to remain close to the release area and provide protection from predators.

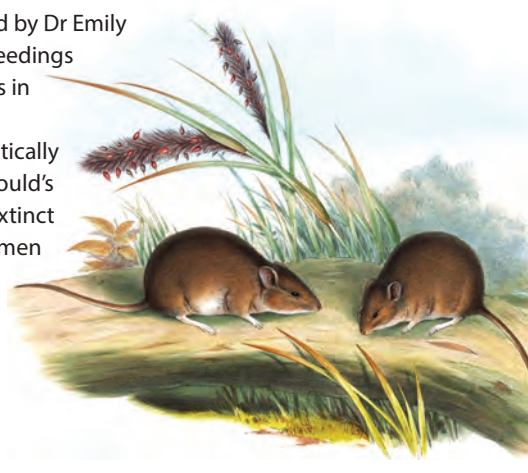
Upon arrival at site, the transport boxes containing their furry inhabitants were permanently situated under these proto-nests and doors removed to allow

the stickies to come and go freely. In the longer term, the team hopes that some stickies may continue construction of the nests and build themselves some prime coastal real estate.

Initial monitoring including radio tracking, camera trapping and live animal trapping suggested that the proto-nests performed their role in helping the stickies settle following translocation. Early signs indicate they are adjusting nicely, and some have been busy reinforcing and expanding their nests.

Resurrected from extinction

Recent genetic analysis published by Dr Emily Roycroft and colleagues in the Proceedings of the National Academy of Sciences in 2021 confirms the Shark Bay mouse (previously *Pseudomys fieldi*) is genetically identical to the presumed extinct Gould's mouse (*P. gouldii*), resurrecting an extinct species last known from a live specimen collected along the Victoria-New South Wales border in 1857. Potentially securing another population of this highly restricted species highlights the significance of this project.



“Early signs indicate [the stickies] are adjusting nicely, and some have been busy reinforcing and expanding their nests.”

Above left Colleen Sims releasing translocated greater stick-nest rats within a pre-constructed proto-nest.
Photo – Fiona Knox

Above Sand monitor (*Varanus gouldii*).
Photo – Janine Guenther

Left Elizabeth Gould's illustration of *Pseudomys gouldii* from John Gould's *The Mammals of Australia*, 1863.
Photo – Commons Wikimedia



Sticking to it

True to their name, stickies live communally within multigenerational stick nests that are primarily constructed by the dominant female interweaving sticks. These industrious matriarchs combine their urine and faeces into a resin-like material that solidifies and strengthens the bonds between sticks with rat 'bitumen'. Nests are sturdy—towering up to one metre high and 1.5 metres wide—and are known to repel the hungriest of predators while safely accommodating up to 20 individuals within an interior lined with grasses and other soft vegetation. Matrilineal inheritance of nests ensures the hard work is not wasted as future generations of this exceptionally gentle species are provided protection and a chance to renovate to their liking.



MONITORING SUCCESS

There are also early indications of success for sharkies, with many quickly establishing refuges in the dense coastal spinifex (*Spinifex longifolius*) into which they were released. Nearly 70 per cent of the radio-collared animals surviving the post-release radio-tracking period. Additional trapping undertaken in September 2021 also resulted in the capture of 33 individuals, including 25 recruits born on the island, and most of the adult females showing signs of recent breeding.

Preliminary results are also encouraging for the stickies too. More than 85 per cent of the collared animals surviving the post-release radio-tracking period, and were in excellent condition coming into spring, with evidence that they too had been busy producing offspring.

Given the abundance of suitable habitat on Wirruwana, the successful establishment of sharkies and stickies is expected to be a highly beneficial outcome for both species. This is yet another example of how Wirruwana continues to show its incredible value for conservation

and its potential to support the largest feral-predator-free populations of many threatened species.

With each new success, the project and the diverse group of individuals involved are improving the outlook for Wirruwana's ecosystem and the numerous species destined to call it home.

Top left Artificial refuges, known as 'pseud-homys', were used as release sites for Shark Bay mice.

Photo – Kelly Rayner

Above left Camera trap image showing a greater stick-nest rat working to incorporate a transport box into its proto-nest.

Photo – DBCA

Top right Greater stick-nest rat nest.

Above Beach spinifex (*Spinifex longifolius*) is an important source of habitat for Shark Bay mice.

Photos – Kelly Rayner

Above right New island-born Shark Bay mouse captured in September 2021.

Photo – Rebecca Quah/UWA

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The Dirk Hartog Island Ecological Restoration Project is funded by the Gorgon Barrow Island Net Conservation Benefits Fund with additional funding from DBCA. Find out more at sharkbay.org/restoration/dirk-hartog-island-return-1616

*Remarkable
mountain
bells*





Several fires burnt through ecological communities in Stirling Range National Park and there were grave concerns for a number of plant species, in particularly the mountain bells. A dedicated team of scientists and volunteers is determined to ensure that the park's unique flora, including the mountain bells, recovers and thrives following these fires.

**by Leonie Monks, Andrew Crawford,
Rebecca Dillon and Sarah Barrett**



The Stirling Range is a unique feature in the south-west of Western Australia, a series of peaks that are in sharp contrast to the flat plains that surround them. The national park surrounding these peaks contains a staggering 1500 plant species, many restricted to a few of the mountain peaks.

On Boxing Day 2019, lightning started bushfires that burnt through large parts of the park. Following another that burnt through other areas of the park in autumn 2018 (see map on page 31). The combined impact was that more than two thirds of the park was burnt in the space of two years. Twenty-six threatened plant species and three threatened ecological communities were impacted and there were concerns that some of the unique flora of the Stirling Range may never recover. Helping species regenerate from these fires involves a focused,



multi-faceted, multi-year approach (see ‘Recovering from fire in a biodiversity hotspot’, *LANDSCOPE*, Spring 2020).

BELL OF THE MOUNTAIN

In particular, there were grave concerns for a group of species—the mountain bells, nine species of *Darwinia* that grow in the Stirling Range National Park. The distribution of all but one is restricted to the confines of the park and several only occur on one or two of the mountain peaks.

While the impact of the recent fires was of concern for the ongoing survival of some of these species, it was the cumulative impact of previous fires that had conservation managers worried. These concerns were based on the knowledge that many species grow slowly in the montane habitat and can take many years

to flower and produce enough seed to replenish the seed bank. If fires occur too frequently, the seed bank can be depleted.

Grazing of the regenerating seedlings by herbivores such as the western grey kangaroo (*Macropus fuliginosus*), rabbit (*Oryctolagus cuniculus*) and WA’s iconic and much-loved quokka (*Setonix brachyurus*) can severely reduce flowering, seed production and plant survival.

Phytophthora Dieback disease caused by *Phytophthora cinnamomi* has also had a devastating impact on the flora of the park, having spread through several peaks, reducing the numbers of many species, including some *Darwinias*, or eliminating them from areas altogether.

Several populations of the yellow mountain bell (*Darwinia collina*) had become extinct prior to the mid-1990s

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Main Yellow mountain bell (*Darwinia collina*).

Photo – Marie Lochman

Top *Darwinia squarrosa* habitat.

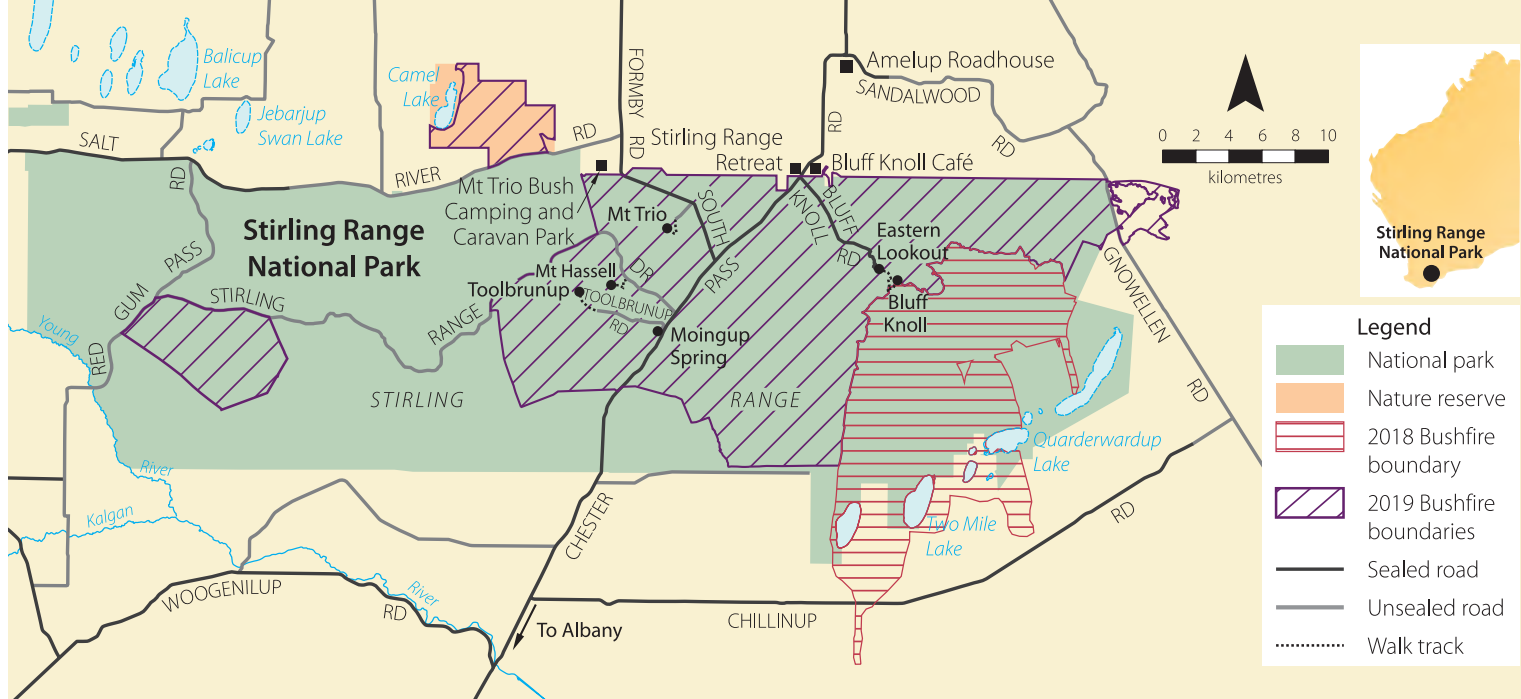
Photo – Andrew Crawford/DBCA

Above left Planting *Darwinia collina*.

Photo – Leonie Monks/DBCA

Above right Wedge Hill after the 2019 bushfire.

Photo – Rebecca Dillon/DBCA



“In particular, there were grave concerns for a group of species—the mountain bells, nine species of *Darwinia* that grow in the Stirling Range National Park.”

for reasons that are not fully understood. This does not appear to be because of any of the aforementioned threats in isolation. However, the drying climate appears to be a contributing factor with several populations now contracting to wetter, south-facing habitat.

FIGHTING BACK

Over the past few decades there has been a concerted effort to ensure the mountain bells do not become extinct. The Department of Biodiversity, Conservation and Attractions (DBCA) has used the fungicide phosphite to mitigate the impact of *Phytophthora* dieback and enhance plant survival.

Some areas containing threatened mountain bell populations have been fenced to protect them from herbivores, allowing the plants the chance to grow and flower. Ongoing monitoring is

providing the data needed to understand how the number of plants and the health of the plants are changing over time and to quantify the impact of management actions.

In addition to this on-site management, DBCA's Western Australian Seed Centre (WASC) has been collecting seed of the mountain bells since the mid-1990s and

storing the seed in the vault at Kensington under conditions aimed to keep the seed alive long-term.

AFTER THE FIRE

After the 2018 and 2019 bushfires, the conservation effort had to be stepped up to ensure affected species persist. DBCA received funding through the Australian Government's Bushfire Wildlife and Habitat Recovery program to implement recovery actions for threatened plant species in the Stirling Range National Park including the mountain bells.



Above Map showing bushfires in Stirling Range National Park.

Right Helicopter dropping off fencing material in the Stirling Range.
Photo – Andrew Crawford/DBCA



Top left Monitoring quadrats for Stirling Range flora, including yellow mountain bell (*Darwinia collina*).
Photo – Damien Rathbone

Top right Planted *Darwinia collina*.
Photo – Leonie Monks/DBCA

Above left Gillam's bell (*Darwinia oxylepis*).
Photo – Andrew Crawford/DBCA

Above right Planting *Darwinia collina* at one of the new translocation sites.
Photo – Leonie Monks/DBCA

The first step to recovery was to undertake detailed post-fire surveys of all populations to understand their response to the fires and allow managers to prioritise recovery actions. These surveys are logistically challenging. The teams had to hike into remote locations, scale the mountain habitats or, where necessary, use helicopter access to quantify plant numbers. Repeat visits are needed to see how plants are surviving and growing over time.

The survey teams were often accompanied by WASC staff to undertake further seed collections. Seed has been collected from all species of mountain bells across their range and stored in the secure vault at the WASC. Aerial phosphite spraying was undertaken over 40 hectares to protect the regenerating habitat and delicate seedlings.

While the helicopter was dropping off the survey teams, building material for fences was also delivered. Patches of



regenerating seedlings have been fenced to protect them from grazing. Repeat survey visits will help assess the benefit of the fences to the mountain bells.

REMARKABLY RESILIENT

Despite some dire predictions of large-scale loss of plant species in the Stirling Range National Park, the mountain bells are proving remarkably resilient. Recent monitoring has recorded good germination and, while grazing impacts are apparent, plants in areas that were fenced have shown better growth. However, germination has been sparser in the small areas that burnt in both 2018 and 2019.

While some mountain bell species are recovering well after the bushfires, others need a helping hand. In early 2020, DBCA staff began planning a large-scale translocation project for species affected by the bushfires including the yellow mountain bell and the pink mountain bell (*Darwinia squarrosa*).

The presence of *Phytophthora* dieback throughout much of the range of these species meant some lateral thinking was required to find suitable translocation sites. A decision was made to locate the translocation sites outside of Stirling Range National Park and focus on maximising

seed production so seeds could be collected and used in recovery efforts within the natural habitat in the future.

Seed that had been safely stored at the WASC for up to 25 years was germinated to produce seedlings for planting at the two new, carefully selected *Phytophthora* dieback-free translocation sites. After the sites were fenced, and watering systems installed, seedlings were planted into their new homes in winter 2021.

DBCA staff will continue to monitor the translocation sites and when the plants start to produce seed WASC staff will be there to start collecting and banking the

seed ready to use and ensure these species are not lost from the Stirling Range.

.....
Top left Cleaning boots to prevent the spread of *Phytophthora* dieback.
 Photo – Leonie Monks/DBCA

Above left Gillam's bell (*Darwinia oxylepis*).

Above right Wittwer's pink mountain bell (*Darwinia wittwerorum*).
 Photos – Andrew Crawford/DBCA

Below *Darwinia collina* seedling.
 Photo – DBCA



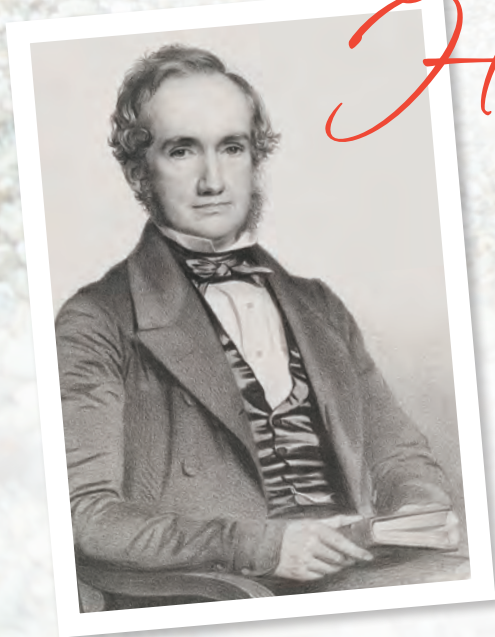
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William Henry Harvey



Father of Australian phycology

In the mid-nineteenth century, a curious scientist explored the underwater world off Western Australia's coast. The beloved, congenial William Harvey came to contribute an enormous amount to our understanding of Australian seaweeds. His extensive knowledge of the marine plants he loved so much continues to be a pleasure to read.

story and photos by Dr John Huisman

Touched by nature



Anyone with even a passing interest in seaweeds will have come across the name William Henry Harvey—a passionate Irish phycologist (a person who studies algae, or ‘seaweeds’) with contagious enthusiasm who visited Australia in the mid-nineteenth century for the purpose of “exploring the natural history of the southern coasts of that continent ... and for extensively collecting Marine Algae”.

Harvey arrived at Albany on 7 January 1854, but his first days were disappointing. The calm summer seas cast up very little in the way of drift plants and his dredging yielded little other than a few seagrasses. Towards the end of his stay however, a storm cast up numerous plants and Harvey busily collected and pressed some 700 specimens in a single day.

After a relatively fruitless trip to Cape Riche, Harvey set out for the Swan River Colony, arriving on 13 April. He stayed in Perth for a few days before moving to Fremantle, where he was able to dredge offshore and make three excursions to Garden Island.

He then visited Rottnest Island for six weeks, collecting numerous specimens. Harvey returned to Albany at the end of July, before setting out for Melbourne in



late August, 1854. While at sea he wrote his paper, ‘Some account of the marine botany of the colony of Western Australia’, in which 352 species were catalogued, including 132 that were new to science.

STUDYING SEAWEED

Harvey’s visit to Western Australia not only resulted in one of the more extensive collections of marine plants, but his enthusiasm also inspired others to collect algae for him. William Ayshford Sanford was the Colonial Secretary of Western Australia at the time of Harvey’s visit and accompanied him on several trips to Fremantle.

Sanford subsequently sent specimens to Harvey in Dublin, and, in his honour, Harvey named the red alga *Asparagopsis sanfordiana* (now known as *Asparagopsis taxiformis*).

Sanford also arranged for Harvey to be assisted by George Clifton, then Superintendent of Water Police, during his stay in Fremantle. Clifton supplied boats for Harvey’s trips to Garden and Rottnest islands and became so interested in Harvey’s work that for the next nine years Clifton sent thousands of specimens to Harvey in Dublin. Clifton’s collections included many plants new to science,

and the genus *Cliftonaea* was named by Harvey in his honour.

PHYCOLOGIA AUSTRALICA

After leaving Western Australia, Harvey’s journey took him to Victoria, Tasmania and New South Wales, before returning to Dublin in October 1856. During his travels he had collected more than 10,000 specimens, which formed the basis of what was to become his most significant contribution to the study of Australian seaweeds, the five-volume ‘Phycologia Australica’ (1858–63).

These lavish volumes include colour plates of 300 species of Australian algae, and to this day they remain important references for students of Australian marine algae. Harvey was both the artist and lithographer of the plates included in these volumes. The accuracy, detail and sheer beauty of his illustrations has meant their appreciation endures to this day, and they have been reproduced in numerous books.

WRITING REEFS

Harvey’s scientific writing is a joy to read. Unlike much of today’s dry prose, Harvey was a master at creating a vivid picture of the seaweeds he so obviously

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Main *Anotrichium tenue* growing on the seagrass *Posidonia australis*.

Right *Betaphycus speciosus* as illustrated by Harvey in *Phycologia Australica*, as *Eucheuma speciosum*.

Inset William Henry Harvey.

Photo – c.1840 by Thomas Herbert Macquire (1821–1895), lithograph collection/National Portrait Gallery Canberra

Above A variety of red, green and brown seaweeds at Cape Peron, WA, including the kelp *Ecklonia radiata*.



Hear more about seaweeds

Scan this QR code or visit Parks and Wildlife Service’s podcast.





Top The brown seaweed *Encyothalia cliftonii*, named for George Clifton, at Gnarabup, WA.

Above William Ayshford Sanford.
Photo – c.1900 by ECA Sanford/State Library of WA Image 262B

Right *Encyothalia cliftonii*, as illustrated by Harvey in *Phycologia Australica*.



loved. Take for example this passage describing the reefs of Rottneest Island, taken from Harvey's 1855 paper, which was written at sea after he left what was then the Swan River Colony and was en route to Melbourne.

"Almost all of them offer good harvests to the algologist; and beautiful pictures to anyone who can appreciate the loveliness of living vegetable forms. The surfaces of most are well clothed with the smaller Rhodospirameae and thickly studded with a Caulerpa with

short stems, clothed with brilliant club-shaped leaves, resembling miniature clusters of grapes.

At every few yards, deep basin-like hollows, of greater or lesser size, break the surface of the reef, and afford well-sheltered nooks for a variety of beautiful Algae. The water in these basins is always intensely transparent; the bottom frequently of white sand; and the steep and craggy sides clothed with algae vegetation, in which the brightest tints of green, purple, carmine, and olive, and the

most graceful waving forms, are mingled in rich variety.

*There is the favourite locality of some eight or ten species of Caulerpa, of several very distinct forms, and every one a beautiful object. All these are green; but the tints vary from the darkest bottle-green to the pale, fresh green of an opening beech leaf. Some resemble soft ostrich feathers; others, branches of the Norfolk Island pine; others, strings of beads; others, squirrels' or cats' tails; and *C. scalpelliformis* is like a double saw.*

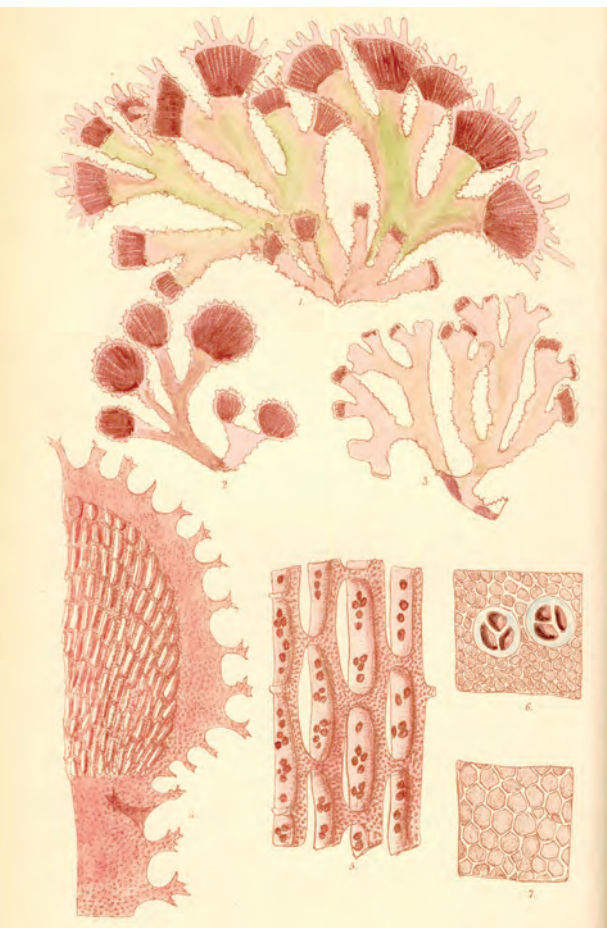


PLATE CXXVII.
MARTENSIA DENTICULATA, Harv.

GEN. CHAR. Frond substipitate or sessile, membranous, nerveless, fringed (at maturity) with an open network, formed of vertical and horizontal anastomosing bars and cross-bars. Fructification: 1, *ceramidia*, containing, within a membranous pericarp, a dense tuft of pear-shaped spores; 2, *tetraspores*, usually lodged in the cross-bars of the network.—*Martensia* (*Harvey*), in honour of Professor Martens, of Brussels.

Frond substipitata v. sessilis, membranacea, nervosa, areolata, infra marginem (in etate majori) elatrate-fenestrata; reticulo ex triloculis verticillis et horizontalibus formato. Fruct.: 1, *ceramidia*; 2, *tetraspores* triangulae distinctae, in laticulis verticillis reticuli inclusae.

MARTENSIA denticulata; fronds sessile, tufted, delicately membranaceous, repeatedly dichotomous; segments cuneate, the uppermost very often flabelliform; margin curled and denticulate; upper margin of the network ciliate, dentate or lobulate, the lobules at length elongate and fenestrate.

M. denticulata; frondibus sessilibus cespitosis tenuissime membranaceis repetite dichotomis, loculis cuneatis siliatis non raro flabelliformibus, margine crispato denticulato, reticulo apice ciliato, denticulato v. lobato, lobulis demum elongatis fenestratis.

MARTENSIA denticulata, Harv. in *Trans. R. I. Acad.* v. 22, p. 537. Harv. *Alg. Austr. Esic.* n. 113.

HAB. On rocks and Algae, at extreme low-water mark, Garden Island, Rottnest Island, Fremantle; frequently cast ashore in winter, W. H. H. G. Clifton.

GEORG. DISTR. Western Australia.

DESCR. Ecod discoid. Fronds densely tufted, quite sessile, 2-3 inches long, as much in expansion, repeatedly forked, with rounded but narrow axils, fastigate; the segments linear-cuneate, the uppermost often obovate or orbicular. Margin wavy, irregularly but sharply denticulate, rarely subentire or remotely toothed. Network gradually formed at the end of the branches, finally extending about $\frac{1}{2}$ or $\frac{3}{4}$ down their length, composed of very slender vertical and horizontal bars; the uppermost margin toothed or ciliate; the teeth, in old specimens, frequently lengthen into small linear lobes, which sometimes bear secondary networks at their apices. The ramification of the frond is very variable, and so is the proportion of the divisions to each other. *Ceramidia* (very rare) sessile on the network, ovate-

Various Fucoidae and Ecklonia radiata are scattered here and there through the deeper pools, and on the sides of the reef. Some of the shallower reefs, near high-water mark, are partially covered with sand: and this is the habitat of *Penicillus arbuscula*, a little green alga, which may be compared either to a miniature tree, or to a shaving brush. *Struvea plumosa* abounds on all the reefs, at about half tide level, generally growing on the very edges of the rock-pools and border-reefs."

THE CONTENTED BOTANIST

Harvey was also a prolific letter writer and his correspondence concerning his

Top left *Struvea plumosa*, as illustrated by Harvey in *Phycologia Australica*.

Top right *Struvea plumosa* at Cape Peron.

Far left *Martensia denticulata*, as illustrated by Harvey in *Phycologia Australica*.

Above left *Martensia denticulata* at Cape Peron.

Left Harvey's description of *Martensia denticulata* in *Phycologia Australica*.



travels to Australia and the Pacific was collated by University of Melbourne botanist and historian Sophie Ducker in the book 'The Contented Botanist'. The book gives an insight into Harvey's extensive knowledge of all plants, not just seaweeds.

In a letter to botanist W.J. Hooker in 1854, regarding the Western Australian Christmas tree *Nuytsia* he writes that it is 'highly probable that there is underground attachment to the roots of other plants', correctly appreciating the species. He noted its hemiparasitic nature well before this was conclusively demonstrated by the botanist Desmond Herbert in 1919.

A more complete account of his life and letters is included in the 'Memoir of W.H. Harvey, M.D., FR.S.', collated and edited by his cousin Lydia Fisher. In the preface, Fisher wrote 'The following Memoir was originally intended for Dr. Harvey's personal friends only; but the number of these was so large, he was

himself so universally beloved, and his character—as exhibited in his letters—as so peculiar, and in many ways so interesting to the ordinary student of biography, that it has been decided to publish it'.

Here you can read about Harvey's early life, and his uncanny ability to relate even the most mundane to his beloved seaweeds, such as when describing insect bites while in Ceylon (now Sri Lanka), "You should see my forehead. Since I came to dear Belligam, it looks, from mosquito bites, like the frond of *Iridaea radula* in full fruit". Harvey's correspondence continued until his premature death from tuberculosis on 15 May 1866, aged just 55, on the day prior dictating a letter to Thomas Fisher that sadly included, "I do not think that I shall last very much longer" and signed in pencil, faintly.

In his short lifetime Harvey named more than 800 species of marine algae, and he has been commemorated in

the names of numerous genera (e.g., *Harveyella*) and species. For his enormous contribution to our understanding of Australian seaweeds, in 1990 Sophie Ducker bestowed on him the well-deserved title, the 'father of Australian phycology'.

.....
Above left The *Mucilaginosa Helminthocladia australis* at Cape Peron.

Above *Helminthocladia australis*, as illustrated by Harvey in *Phycologia Australica*.

Inset *The Contented Botanist*, edited by Sophie Ducker, collected Harvey's letters.

"In his short lifetime Harvey named over 800 species of marine algae, and he has been commemorated in the names of numerous genera (e.g., *Harveyella*) and species."

John Huisman is the curator of the Western Australian Herbarium and a seaweed specialist. He is a regular contributor to *LANDSCOPE* and can be contacted at (08) 9219 9137 or john.huisman@dbca.wa.gov.au

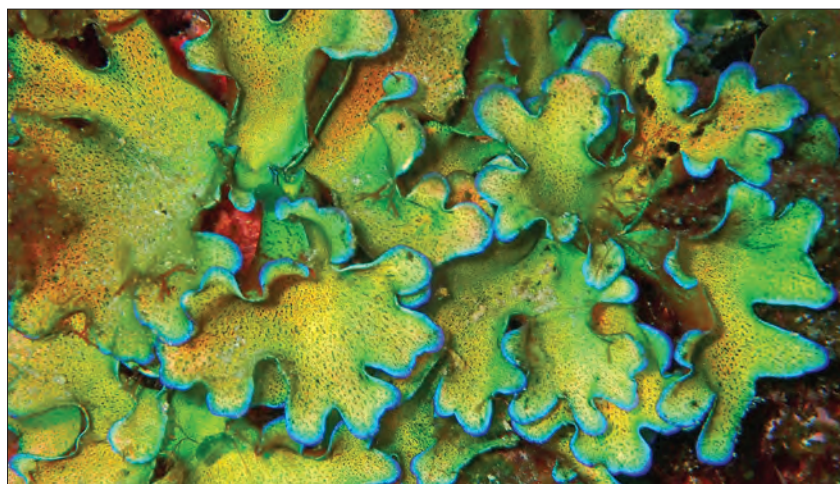
Editors notes: William Harvey uses the term 'algologist' which is an older term for 'phycologist'.

Scans from Phycologia Australica used in this article were kindly provided by Frederik Leliaert and Olivier De Clerck.

Taxonomy is an evolving science, often in parallel with technological advances that enable a more detailed appreciation of a species' ancestry and relationships, and therefore its 'proper' place in any taxonomic scheme. Historically, taxonomic schemes were based on what was observable, initially by eye, then magnified using microscopes, at each step the additional techniques allowing the assessment of more features, and ideally this accumulated knowledge leading to a taxonomic consensus. This process can be convoluted, and the seaweeds provide an excellent example. When Linnaeus first proposed his binomial scheme for naming species in 1735 (the 'Genus species' system), he grouped together organisms with shared physical traits. He included only four genera of algae: *Fucus* included all the large species, *Ulva* the smaller membranous species, *Conferva* the filamentous species, and *Chara*, the reasonably well-known freshwater genus. Of these only the first three are indeed seaweeds as we now know them, however none are presently defined according to the Linnaean concept.

Since Linnaeus, the basis for seaweed taxonomy has changed considerably. Colour, essentially a biochemical character, was elevated in importance and it remains the primary character on which seaweeds are segregated. Many more genera of seaweeds have been described and they now number in the thousands, with more being added on a regular basis. In recent years, the recognition of new genera and species has been greatly accelerated by the adoption of DNA sequencing techniques, which allow us to view the 'blueprints' by which organisms are constructed and compare them for slight or major changes. Species are now being defined by their DNA 'barcodes' in addition to the more traditional morphology, and indeed many genetically recognisable organisms are often morphologically indistinguishable.

Which brings us to the subject of this article. The spectacular, iridescent red alga genus *Asteromenia* was described in 1996, based on a study of specimens collected from the Houtman Abrolhos Islands in Western



Asteromenia

Australia that were thought to be the same as a Venezuelan species known as *Halichrysis peltata*. The recognition of a pantropical species was not unusual, so the name *Asteromenia peltata* was proposed. That this was not the case was first demonstrated in 2006, in a study incorporating DNA sequences by Canadian phycologist Gary Saunders and colleagues. It was shown that, although belonging to the same genus, *A. peltata* from Venezuela was a different species from the Abrolhos taxon, which was given the new name *Asteromenia exanimans*. One problem solved, but inadvertently another was introduced.

As there was no fresh material of the Abrolhos entity, the DNA sequence for *A. exanimans* was derived from a specimen from the mainland coast at Green Head in WA, which in all aspects conformed to the species as known from the Abrolhos. However, the 'type' specimen, the one to which the name *A. exanimans* is permanently attached, was an older collection from Suomi Island in the Abrolhos. At the time it was thought that only one species of *Asteromenia* occurred on the WA coast. However in 2018 two species from the north-west were added to the genus. These later discoveries sowed the seeds of doubt. Was the Green Head specimen (the source of the DNA) the same species as the Suomi

Above A new species of *Asteromenia* as yet unnamed.

Photo – Ann Gunness

Island type specimen? This could only be solved by sequencing fresh material from the Abrolhos, but with no trips to the islands planned, this was not feasible.

Enter citizen science. Avid diver Ann Gunness from Geraldton regularly visits the Abrolhos and has developed an interest in photographing seaweeds, which she often forwards to the WA Herbarium to have their identities confirmed. One of Ann's images was of *Asteromenia*, and she kindly agreed to collect specimens for DNA analysis. These were passed to Gary Saunders, their DNA sequenced, and the results confirmed our suspicions, that the Abrolhos *A. exanimans* is not the same and the Green Head entity is a new species that requires a new name. The naming is yet to happen formally, but it will acknowledge both Ann's contribution and that of Julia Phillips, the former CSIRO phycologist who collected the Green Head specimens. With eight of these species found in Australian seas, this region appears to be the centre of diversity for this stunning genus, which cannot help but invite attention from professional and citizen scientists alike.

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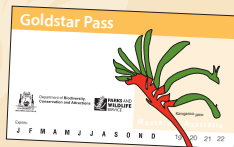
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WAR OF THE WASP

by Jodie Gysen



Since the European wasp (*Vespula germanica*) first arrived in Western Australia in 1977, the Department of Primary Industries and Regional Development has been in constant combat with the pest. In the 2020–21 season, the wasp surveillance team had their most successful win yet, with the help of other government agencies and the local community playing an essential role.



Each year, fertilised European wasp (*Vespula germanica*) queens arrive in Western Australia aboard freight and cargo from the eastern states, where they are well established. For 45 years, the Department of Primary Industries and Regional Development (DPIRD) has been waging a war on the species in an effort to prevent it from establishing in WA.

If established, European wasps could potentially have a harmful impact on ecosystems, beehives, grape and stone fruit crops, and the enjoyment of an outdoor lifestyle.

In 2018–19, DPIRD’s annual European wasp surveillance program faced its greatest challenge when the season ended with 166 nests detected. This was the largest number of nests found in one season during the life of the program.

Over three years, DPIRD’s surveillance team deployed more than 9000 surveillance traps, and staff traversed thousands of hectares, resulting in just 14 European wasp nests detected and destroyed during the 2020–21 season—the lowest number in 12 years.

What is even more incredible was that all 14 nests were new wasp incursions, meaning the team had managed to find and kill every nest in 2019–20. Without

detection and control, one European wasp nest can lead to 10 or more new nests in the next season.

This is a big win for the program.

“When we saw the huge spike of nests in early 2019, particularly in and close to bushland along the Darling Scarp, the department ramped up its surveillance program and committed three years of additional resourcing and sustained effort to detect, delineate and extinguish wasp hotspots,” DPIRD technical manager John van Schagen said.

“This included strong collaboration from local government, other departments and the community, as well as increased reporting of suspected European wasp sightings from the public.”

Additional resourcing in 2018–19 led to a 30 per cent reduction in nests. However the battle was not yet won, as European wasps continued to spread the next season into inaccessible bushland areas, making traditional lure, search and destroy methods almost impossible.

“It was for this reason we piloted a baiting program in 2019–20. Officers drew on information from the eastern states, New Zealand and Israel to implement the program, and installed 257 baiting stations across more than 2500 hectares of continuous bushland,

ranging from Lesmurdie to Martin,” Mr van Schagen said.

“The baiting program, which posed negligible risk to non-target species, contributed hugely to the success of the 2020–21 campaign.”

The result was unprecedented. In 2020–21 there were no nests detected in the prior hotspot areas across the Perth Hills, including Martin, Orange Grove, Kalamunda, and Mundaring.

European wasps have been driven back from the brink of establishment.

“We will continue to carry out surveillance in these areas to ensure localised eradication.

“The effectiveness and application of the baiting program will be evaluated to determine future use as part of a European wasp integrated pest management strategy.”

Previous page

Main European wasp (*Vespula germanica*).
Photo – Holger T.K./Adobe Stock

Above The Darling Scarp, free from European wasps after three years of intensive surveillance and control efforts.
Photo – Jiri Lochman

Ecological disaster

The ecological threat posed by European wasps is more severe than a lot of people realise. Being meat eaters, they actively predate on invertebrates such as spiders, caterpillars, bees and flies, and interrupt ecosystems by usurping and monopolising food resources. They have even been seen killing chicks in the nest.

“One wasp colony during a single 12-month season can collect up to 100kg of insect prey to feed the growing larvae. This equates to 3.5 million big blowflies or many more if they collect smaller insects—and this is one reason why they are such an ecological disaster when they become established in new localities.” (Dr P Spradbery, Canberra Times September 2012).

European wasps can quickly and exponentially colonise new areas. For example, in 1945 an infestation of seven nests in New Zealand multiplied over six years to infest more than 80,000 square kilometres.

In WA, more than a million square kilometres have been infested in less than 50 years, now reduced by successful collaboration between government, industry and the public.

European wasp colonies commonly surpass 5000 wasps per nest, and if left unchecked one nest can lead to populations of more than 10 nests per hectare, equating to at least 50,000 hungry wasps per hectare. If European wasp became established in WA it is estimated that within ten years there could be tens of thousands of nests in metropolitan Perth alone.



“If established, European wasps could potentially have a devastating impact, disrupting whole ecosystems...”

Top European wasps are attracted to human food, including meat.

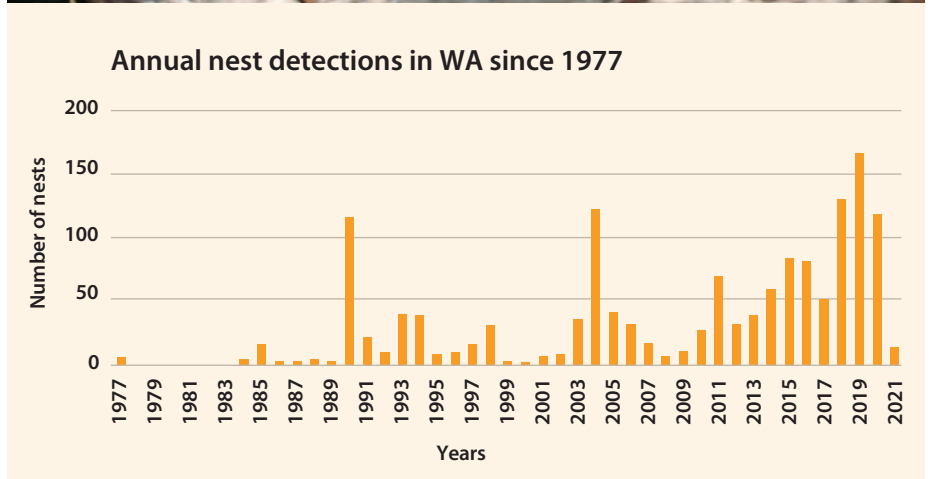
Photo – DPIRD

Above European wasp has put its 'stamp' on many Australian states, but not WA. Featured here on an Australian stamp in 2014 as part of the 'things that sting' collection.

Photo – Peregrine/Alamy

Right European wasp nests can be large and house thousands of wasps.

Photo – DPIRD





MANY HANDS

Mr van Schagen thanked local governments, the Department of Biodiversity, Conservation and Attractions (DBCA), the Water Corporation, and community groups and residents for their continued support and assistance.

“This included deploying and maintaining traps and helping the team get access to bushland areas,” Mr van Schagen said.

“In particular, the support of the City of Kalamunda ‘firies’ was crucial,

.....
Above European wasps have tell-tale black antennae and are attracted to crops with sweet, soft flesh like stone fruit.

Photo – Paul Zborowski/Lochman Transparencies

Above right Searching for nests in the Perth hills was challenging.

Left European wasp nest entrances appear as a hole in the ground.

Photos – DPIRD

as they joined us in the hunt for nests in areas we would never have been able to access alone.”

The public has also played an important role. Over the years there have been thousands of public enquiries and reports leading to the discovery of nests, and sometimes even pinpointing the exact location.

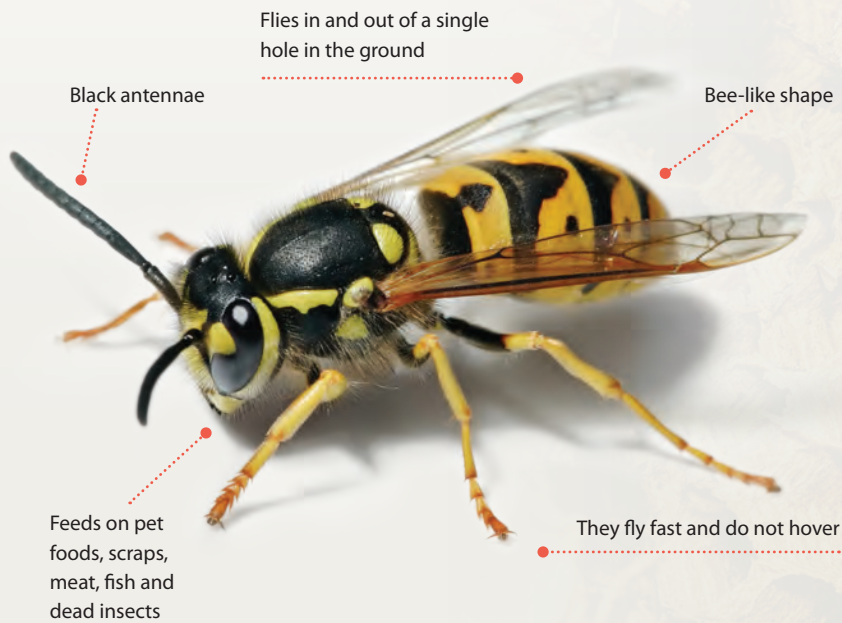
NO MEAN FEAT

Mr van Schagen said finding nests involved some adventuring and detective work by personnel, who trekked through thick bushland and over rough terrain on foot and in four-wheel-drives.

“Locating nests is more difficult than most people realise. Once the wasps are detected through traps and lures, they must be tracked back to their nest, which are usually underground and hidden, with entrances the size of a 20-cent piece.

“Finding these nests in dense scrub is a real achievement.”

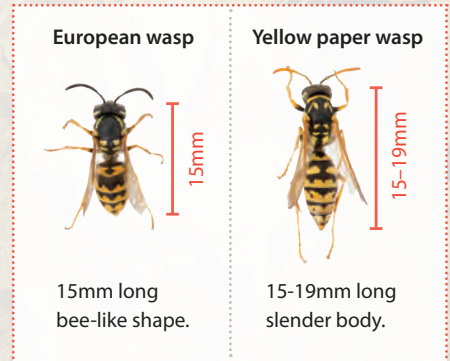
How to spot a European wasp



Nests are usually underground, but can also be found in roof or wall cavities, or hollow trees, and can be basketball-sized or bigger.



European wasp
Raises its legs during flight.



European wasp

15mm long
bee-like shape.

Yellow paper wasp

15-19mm long
slender body.

Reports of suspect European wasp sightings can be made via DPIRD's **MyPestGuide™ Reporter** app, mypestguide.agric.wa.gov.au or by contacting the Pest and Disease Information Service on **08 9368 3080** or padis@dpird.wa.gov.au.

THE BATTLE CONTINUES

While the battle over the past few years had been won, the war would never be over.

European wasp queens will continue to arrive in WA during the warmer months from the Eastern States, mainly on vehicles and freight, and will continue to seed new nests.

“This season, as of the beginning of March 2022, we have found 40 nests which is already higher than the 14 nests found in 2020–21.”

Maintaining an effective surveillance program will ensure the continued detection and eradication of these new incursions.

European wasps look like yellow paper wasps but are distinguished by their completely black antennae and they don't dangle their rear legs when they fly.

They also have distinct behaviours such as scavenging on dead insects or animals, human and pet food, and drinks, and build underground nests.



Identification guide

Above European wasp.

Photo – Fir0002/Flagstaffotos

Background Abandoned European wasp nest.

Photo – rdonar /Adobe Stock

Inset top Legs up in flight.

Inset middle European and paper wasps.

Above Wasp nests are difficult to identify among ground vegetation.

Right Once nests are detected they are sprayed by DPIRD officers.

Photos – DPIRD



Jodie Gysen is a strategic communications advisor with DPIRD, with experience in communicating the biosecurity risks of plant and environmental pests and diseases, and the work being undertaken to protect WA from their impacts. She can be contacted at jodie.gysen@dpird.wa.gov.au or (08) 9368 3194.

For more information on European wasps visit agric.wa.gov.au/wasps.

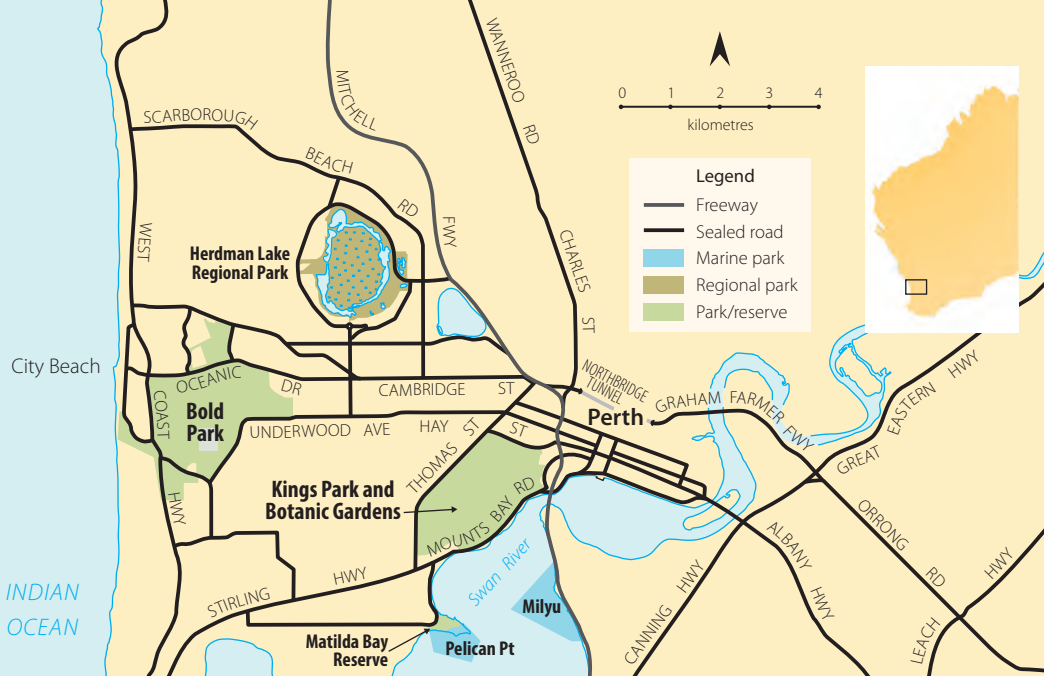


A wealth of new fungi in **Kings Park** and **Bold Park**

story and photos by Dr Neale Bougher

An incredible array of fungi accompanies the plants and animals in two of Perth's most prominent urban bushlands—Kings Park and Bold Park. Though always active, the fungi are mostly hidden from view until their fruit bodies adorn Perth's autumn and winter with a diverse and colourful show. Long-term fungi surveys in the parks are revealing a previously unrecognised diversity.





The Perth area is the traditional lands of the Whadjuk people of the Noongar nation who have names for some local fungi. For example, *Gyroporus occidentalis*, which instantly turns vivid purple when cut, is said to have been known as a Gnucho. Since European settlement, the flora and fauna of Kings Park and Bold Park have been well documented but little was known about the fungi in the parks until very recently.

The Botanic Gardens and Park Authority (BGPA) commissioned annual fungi surveys at Bold Park from 1999 and at Kings Park from 2009 to discover more about the fungi of these parks. A sharp-eyed team of more than 50 volunteers helped me survey bushland representing a range of different vegetation types. Descriptive features of the fungi were

recorded and photographed, and samples lodged at the Western Australian Herbarium for perpetual reference. The fungi were identified by studying their microscopic features and by comparing their DNA fingerprints against a world-wide database.

MORE TO COME

Each successive year of surveys revealed many more previously unseen fungi. This indicates that the surveys to date have captured only a fraction of the fungi species present at the parks. Nevertheless, a total of more than 530 fungi have been identified from the surveys at the parks so far. Many more fungi from the parks await detailed taxonomic studies required to identify them.

Kings Park and Bold Park have some different plants and vegetation types from each other and may be expected to harbour different fungi. Indeed, so far only about one-third of the fungi species recorded have been found at both parks. This proportion is likely to increase when more records of fungi are gained from further years of survey.

Most of the fungi recorded from the surveys are considered to be native to the parks, but there is no doubt that some have been introduced from elsewhere. For example, some exotic fungi were introduced into WA in the early 1900s to enable pine plantations to flourish. *Suillus granulatus* is one such species, and at Kings Park in autumn and winter it can

Previous page

Main Orange leaves fallen at the base of a fig tree in Kings Park, Perth, Western Australia. Photo – beau/Adobe Stock
Inset *Coprinopsis* aff. *stangliana*; *Leucocoprinus cretaceus*.

Above left Location of Kings Park and Bold Park in Perth.

Above *Hohenbuehelia petaloides* proliferating along Lovekin Drive in Kings Park in 2016.

Below left *Pseudosperma fissuratum* from Kings Park is one of about 100 new species of the fibre-cap fungi that have recently been discovered and named in Australia.

be seen fruiting in abundance on the lawns near the pine trees at Saw Avenue. Some of the fungi proliferating in woodchip beds and gardens at the parks also are possibly introduced, for example, mushroom-like fungi such as *Parasola conopilea*, the bird's nest fungus *Cyathus olla*, and less conspicuous skin-like fungi such as *Leucogyrophana pseudomollusca*.

FUNGI AND FIRE

During the surveys at Kings Park and Bold Park particular fungi were seen proliferating on burnt ground within a week or two after bushfires in the parks, including brightly-coloured species in stark contrast to the blackened earth such as *Pyronema omphalodes*. Such species are specialised fire-responsive fungi, and they





Do it yourself

A good way to see and learn about local fungi in these parks is to join fungi guided walks in autumn and winter by the Kings Park Guides and by the Friends of Bold Park (see 'Kings Parks Yorga's tour', *LANDSCOPE*, Summer 2019–20). For more information or to book a tour visit bgpa.wa.gov.au

Top The finding of *Leucogyrophana pseudomollusca* during the surveys was only the second record of this fungus in Australia.

Above *Gyroporus occidentalis* instantly turns vivid purple when cut. This species was only formally scientifically named in 2019, but is said to have been known much longer as a Gnucho by the local Whadjuk people of the Noongar nation.

Above right Carpets of *Parasola conopilea* appear in wood-chipped areas at the parks.

Right *Cyathus olla*—a bird's nest fungus—abounds in garden areas.





may have roles in re-establishing nutrient cycling pathways after bushfires.

Many remarkable fungi previously not known to occur in Australia and/or Western Australia have been discovered by the surveys at Kings Park and Bold Park. These first records range from tiny inconspicuous species such as *Coprinellus pyrhanthes*, to some larger and more conspicuous fungi that are quite well known elsewhere, for example *Leucocoprinus cretaceus*.

The surveys have also revealed some new species that were previously unknown to science. Recently, some of those have been formally described and named for the first time, for example *Gyroporus occidentalis*, and several species of fibre-cap fungi e.g., *Pseudosperma fissuratum*.

DISCOVERY AWAITS

The surveys undertaken at Kings Park and Bold Park so far have captured an incredible diversity of fungi, and it is likely

that many more await discovery at the parks. It makes good sense to learn more about the fungi, particularly about how they help to keep ecosystems healthy by ferrying nutrients across soil, litter and wood via networks of microscopic threads, and by linking intricate interdependencies between plants, animals and fungi. Such knowledge may be able to help fine-tune bushland management practices aimed at nurturing flora, fauna and fungi, and in turn help to keep Perth's bushlands healthy for the long-term.



Top *Leucocoprinus cretaceus* is well known in other parts of the world but had not been known to occur in WA before it was found recently at Kings Park.

Above right *Pyronema omphalodes* briefly proliferates very soon after fire, and is followed soon after by several other fire-responsive fungi.

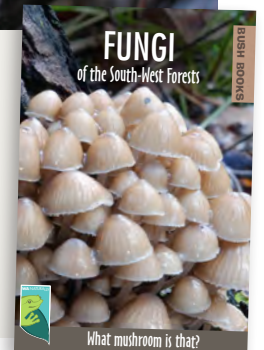
Right Crowded long spines on a fruit body of *Auriscalpium barbatum*, which has been found near sheoaks at the parks.

Dr Neale Bougher is a fungi specialist, formerly at CSIRO and DBCA, and currently an Honorary Research Associate with DBCA's WA Herbarium. He can be contacted via the Western Australian Herbarium.

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Numerous volunteers participated in fungi surveys and helped to discover the fungi. Analyses of DNA by Dr Matt Barrett expedited many of the identifications. The staff at the Botanic Gardens and Parks Authority and the WA Herbarium supported the survey work.

WA's beloved Bush Book series features a publication about fungi of the south-west forests. You can purchase one for \$6.95 from shop.dbca.wa.gov.au.



by Naomi Adamczyk



Dolphins in the Swan River

Did you know there are about 20–25 Indo-pacific bottlenose dolphins living in the Swan Canning Riverpark all-year-round?

Each dolphin can be identified by their unique dorsal fin. Look through the FinBook online to get to know the dolphins of the Swan Canning Riverpark, at riverguardians.com.



Guess who?

Use the FinBook to match the names of the dolphins to their fins.



Top left Dolphins playing in the river.
Photo – River Guardians/DBCA
Above left Mother and calf.
Photo – Dr. Delphine Chabanne
Inset FinBook fins.
Photo – DBCA

Below left Dolphin calf entangled in rope.
Photo – Sally and Harry Kirby
Below Collecting discarded fishing line.
Photo – DBCA

Scientific name: *Tursiops aduncus*
Life span: 30–40 years
Size: 2.4 metres long

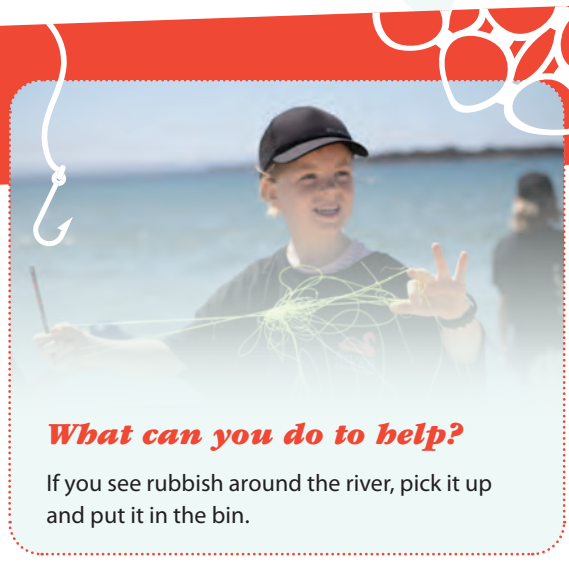
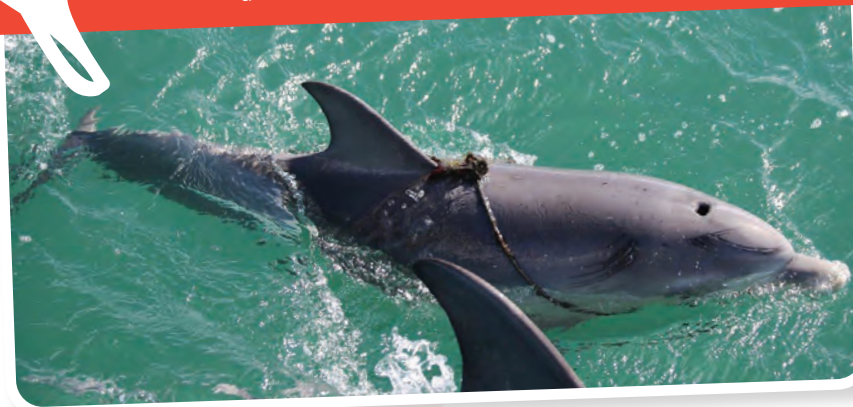


Did you know?

- Dolphins eat up to 15 kilograms of fish a day!
- A calf (baby dolphin) will stay with its mother for 3–5 years.
- Males bond closely to each other and form a long-term partnership known as an 'alliance'.

Threats to dolphins

Dolphins can get entangled in discarded fishing line and other rubbish.



What can you do to help?

If you see rubbish around the river, pick it up and put it in the bin.

1. Moon, 2. Extreme, 3. Bottomslice.
Answers

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



Greater stick-nest rat (*Leporillus conditor*)

The wopilkara or greater stick-nest rat (*Leporillus conditor*) is a passive and gentle species of native rodent about the size of a small rabbit or guinea pig. They are also known as the house-building rat and construct large nests out of interwoven sticks and stones. They are largely active at night and feed on a herbivorous diet of mostly succulent leaves. Populations have reduced since European colonisation, driven almost to extinction by intensive predation from feral cats and foxes.

Illustration by Gooitzen van der Meer

Reference photo by Jiri Lochman

Nature's pin-ups

PRINT COLLECTION

Artwork featured in *LANDSCOPE* magazine



Artwork by Gooitzen van der Meer and Gwendolen Monteiro, as featured in *Nature's pin-ups* on page 54 in each issue of *LANDSCOPE*, is available for purchase.

Using a watercolour technique or acrylics, the pieces depict species featured in the magazine.

Prints of these beautiful pieces of artwork can now be purchased in A3 size (\$35), A4 size (\$25) or A5 size (\$15) plus \$3.30 postage for domestic large letters up to 250g. Printed on high quality art paper and delivered to your door, ready to be framed and hung somewhere special.

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