# Science
## for saving species

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# Indigenous partnerships:
## Changing how research is driven

## Karajarri investigate fire and biodiversity

Larrakia action on far eastern curlews

Arakwal's unique orchid and heath

Culturally important species on the Tiwi Islands

Stories written in the sand

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Martu mankarr monitoring

IMAGE: KARAJARRI IPA

Threatened Species Recovery Hub

National Environmental Science Programme

# Editorial...
# Changing the way research is driven

**Cissy Gore-Birch** is a member of the Threatened Species Recovery Hub's steering committee and the Chair of its Indigenous Reference Group. The Indigenous Reference Group was established to assist hub leaders and project teams to strengthen the engagement and participation of Indigenous people in the hub's activities and research projects. Cissy recently attended the **Species of the Desert Festival** on the Paruku Indigenous Protected Area, where she spoke about both threatened and culturally important species, and increasing the voice of Indigenous people in environmental policies and research.

Cissy Gore-Birch on Arrernte Country this year.

The Threatened Species Recovery Hub's Indigenous Reference Group aims to make an impact in the field and on the ground and educate the groups we work with and broader society.

I believe we all have a role in managing Country and taking care of the environment. It is vital for threatened species programs to work with Indigenous people and for everyone to work collectively and in collaboration. Three-quarters of Australia's threatened species have all or part of their distribution on Indigenous land and almost half of Australia's land area is managed by Indigenous people.

I am passionate about research. But we need to look again at the way research is driven and to work together with Aboriginal people in new ways to address the big issues of threatened and other culturally important species.

In the past, the researcher's point of view has been the driver – and the researchers have generally been university graduates who have devised a research question, come out to Country, taken information from Traditional Owners, and haven't really given anything back. But now our people are starting to develop the research questions. We can present our own projects, access research funding and work closely in partnership with the universities, who are really interested in creating an impact from the kind of research questions that our people are raising on the ground.

Indigenous rangers are a further example of how partnerships between Traditional Owners, governments, universities, industry and NGOs can produce positive outcomes for both people and Country. There are now over 700 Indigenous rangers across Australia. These jobs are producing positive environmental, social, cultural and economic outcomes. And it's really important for our funders to understand that Aboriginal people know where the threatened species are that are found on Aboriginal-held land and to work closely with us in programs to protect them.

IMAGE: BENJAMINT444 CC BY-SA 3.0 WIKIMEDIA COMMONS

ABOVE: Emus may not be threatened but they are culturally important to many Aboriginal people.

## Inside the Winter 2019 issue of *Science for Saving Species*



Threatened Species Recovery Hub

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RIGHT: Sally Box and Simon Nally at the Species of the Desert Festival. Behind them Indigenous rangers map potential night parrot habitat on their countries.

# Indigenous people
## critical for threatened species

**Dr Sally Box**, the Australian Government's Threatened Species Commissioner, talks about the importance of working with Indigenous groups to conserve Australia's threatened species.

A cultural perspective is vitally important. People are concerned about biodiversity losses in Australia, but threatened species are not the only things that are important. One of the priorities of the Indigenous Reference Group is looking into how we can gain more attention and funding for species of cultural significance to Aboriginal people. Often, we don't have the resources to manage them effectively. I think we need to change that mindset, and change the views of people in policy and research. We need to care for these species that are important to communities.

The role we play as the Indigenous Reference Group is to guide the research of the Threatened Species Recovery Hub. We can make a difference by getting our people on board and letting them know that we're able to share that message with governments and universities.

*Cissy Gore-Birch is a Jaru/Kija woman with connection to Balanggarra, Nyikina and Bunuba Country. She grew up on Balanggarra Country in the East Kimberley. She has worked in the natural resource management, Aboriginal land management and community development sectors for the past 20 years, including as the Chairperson of Balanggarra Aboriginal Corporation for nearly five years. Cissy has and continues to hold many leadership positions in the Kimberley and nationally. She is passionate about Country, people and sustainable livelihoods.*

The knowledge, skills and dedication of Aboriginal and Torres Strait Islander people are critical to the effective management of Australia's environment and heritage. A large number of threatened species in Australia occur almost exclusively on Indigenous-owned and -managed land. Indigenous rangers and Traditional Owners maintain strong connections to their land and their ongoing participation in threatened species recovery is essential. A unique understanding of the landscape and species on their Country as well as the application of traditional management practices benefit the recovery of many species that have their strongholds on these lands.

In June, I attended the **Species of the Desert Festival** along with over 200 Indigenous rangers on the Paruku Indigenous Protected Area, where the night parrot was recently discovered. It was a great honour for me to be at this event to learn from the Traditional Owners and Indigenous rangers about the cultural significances of species that occur on their Country, what habitats they occupy and what they do to protect and manage them. Ensuring there are opportunities for Indigenous ecological knowledge to inform recovery planning, and continuing to collaborate with and learn from Traditional Owners will be important to protecting many of Australia's threatened species into the future.

**Dr Sally Box**
The Australian Government's
Threatened Species Commissioner

BELOW: Over 200 Indigenous rangers and Traditional Owners met to discuss threatened and culturally significant desert species and landscapes at the **Species of the Desert Festival** in Mulan, Western Australia in June 2019.


IMAGE: JAANA DIELENBERG / INDIGENOUS DESERT ALLIANCE

IMAGE: GARY LIENERT

# Appeasing Bluetongue
## Managing fire in the Great Sandy Desert

Karajarri Rangers are leading a Threatened Species Recovery Hub research project to investigate how different fire management approaches affect biodiversity. The first field trip took place in April this year, when a team of 16 rangers, support staff and scientists journeyed to the Edgar Ranges for eight days of wildlife monitoring. Hub researcher **Sarah Legge** worked with the rangers to compile this report from the field.

ABOVE: The Edgar Ranges Field Crew included Karajarri Rangers, Environs Kimberley, TAFE and the Threatened Species Recovery Hub.

IMAGE: SARAH LEGGE

ABOVE: Beno and Marissa set up a drift fence.

The Karajarri Indigenous Protected Area (IPA) covers 2.4 million hectares in north-west Australia, south of Broome. It is bounded to the west by 80 Mile Beach, seasonal home to spectacular aggregations of migratory shorebirds. Travelling inland, the coastal pindan woodlands grade slowly into the 'pirra' (shrublands) and 'marangurru' (spinifex country) of the Great Sandy Desert, home to threatened and culturally important species including bilbies, emus, bush turkeys and goannas.

Although the IPA is largely desert, most Karajarri people live on the coast at Bidyadanga. The Karrajarri Rangers initially worked in coastal habitats, but they are extending their program into the pirra and marangurru. This management focus is an opportunity to reinvigorate the stories, cultural practices and connections between people and desert Country. Managing fire is a key component of this program.

Sam Bayley, the IPA coordinator, notes, "There has been good work demonstrating the social benefits of investing in ranger programs. We want to also document the biodiversity benefits, including of our fire management."

### Where are we going?

After leaving Broome and crossing the Roebuck plains, our convoy travelled south-east along station tracks and disused mining exploration tracks, eventually reaching the Edgar Ranges. Gulu, the head ranger, selected the campsite on the desert sandplain near the edge of a scarp that falls away sharply to form the headwaters of the north-flowing Geegully drainage. Gulu and Jacko, senior rangers with family connections to this area, formally introduced the team to their Country, smoking us with jima (conkerberry) wood.

### Why are we here?

Mervyn Mulardy, a Karajarri cultural leader, gave us the Pukarri (Dreaming) story for the area (Yilpi). The Pukarri highlights the potential for huge desert wildfires: "Bluetongue was told that his son will be going

*This project is a collaboration between Karajarri Traditional Lands Association, Kimberley Land Council, the Threatened Species Recovery Hub and Environs Kimberley, with additional support from The Nature Conservancy, Bush Heritage Australia, Western Australian Government's State NRM Program and the Western Australia Department of Biodiversity, Conservation and Attractions*

through the sacred ceremony, so he said to the tribe, 'Wait, I will get more food'. So he went hunting. When he came back he saw that they had already put his son through the ceremony without him being there. Bluetongue was really angry, so he started a fire at this Yilpi. He made a huge fire that burnt the whole country, burning the people who had disrespected him."

When Karajarri still lived in the pirra and maranguru, they used fire intensively for many purposes, creating fine-scale patchworks of different-aged vegetation, which discouraged large fires. As people moved out of the deserts, fuel loads became more continuous, and sweeping fires that burn extensive areas of country became common. This new fire pattern has contributed to biodiversity losses in these remote deserts. Jacko told us, "My grandmother used to travel through here. She's really old. She told us lots of stories from these places, and she can remember animals that are gone now."

Managing fire across vast areas of depopulated deserts is a logistical challenge, which Karajarri are solving by adopting the aerial burning approaches used extensively further north, in the tropical savannas.

Bayo: "In this desert Country, my grandfather's Country, we have lots of story places, but it's been hard to get to these areas in the last years to look after things. Now, with helicopters for fire management we can reach places we can't get to with the vehicle. We've been opening up jilas [waterholes] that haven't been looked after for 60 to 70 years.

"I went to Botswana this year, representing the rangers, talking about our fire work – how we carry it out, and how we know if it is doing a good job. That's where this monitoring program comes in – it will help us know if our fire management is succeeding."

Sheen: "We are doing this work to see what animals are here, check out if the country is in good shape, and if the fire management is working."

## What are we doing?

Tracking change in the deserts as a result of fire management will take years. We can learn some things more quickly by comparing the vegetation and wildlife at sites that were recently burnt in a monster 2018 wildfire with sites in areas that escaped that fire due to sudden wind changes. We're also going to trial some standardised searches for bush tucker, and we have some bilby burrows to check on.

### *Setting up*

We spend the first two days setting up the sampling sites, digging in 800 metres of drift fences to direct small animals towards 80 pitfall traps, 32 funnel traps and 32 camera traps. It's hot (40°C in the shade) and the humidity ranges between 50 and 90%. By midday on day 2, we are shovelling dirt in a slow, headachy trance. Ewan and Jackie, the coordinators for the men and women rangers respectively, keep us toiling in good spirits with their buoyant humour and excellent organisation.

### *Checking traps*

The first morning we check traps, we are rewarded with a lovely range of small reptiles and clusters of frogs. Marissa, the newest recruit to the women rangers, says that her favourite animal is "these little toads, I've never seen them before". She's carefully giving each desert spadefoot toad and every west Kimberley toadlet its own fresh water spa before releasing them into a burrow that Sheen has dug and moistened.

Kamahl votes: "I like this desert rainbow skink." Bayo wants an emu (although they generally don't fit into pitfall buckets). "Nice choices", I think to myself. At that point, the sighting of a mulga snake sends most of us hurtling back to the car.

Scrabbling around at the bottom of a bucket, Jess evades scorpions to fish out a western two-toed slider. Jess and Nigel are Environs Kimberley ecologists who are here to support the rangers. Sheen coaxes Marissa to hold the slider. It's a skink, but with no forelimbs, tiny back limbs and a powerful wiggle, its slippery pinkish body is too reminiscent of a snake for her liking. Sheen: "These are amazing little animals; they can burrow through the sand really fast. They can also drop their tails if a predator catches them, to get away." Jacko and Gulu tell us that "the old people used to put sliders in their hair, to eat head lice". We discuss how I could smuggle some home to deal with the lice my daughter regularly brings back from school, but the logistics of containing these slippery little beasts on the head defeat us.

Jackie and Ewan start checking the camera trap SD cards mid-survey. The camera traps have picked up native mice climbing over the drift fence. That's okay, we knew they would, and that's why we set the cameras up. But Jackie also hoots at a prowling tabby cat onscreen. By the end of the week we have seen cat tracks at every trapping site, and at one site a camera detects a fox. Foxes are rare in these northern deserts; perhaps he'll head south again as the dry season wears on and water becomes scarce.

We wonder if cats and foxes are responsible for the emptiness of the bilby burrows that we check. The bilbies were here last year, before the huge wildfire, but they're not at home now. Bayo reckons "bilbies like areas that are burnt two to five years ago". Paddy: "This is why we need to get fire under control; we want to make sure those bilbies stick around."

The week rolls by in an enjoyable daily routine that starts with pre-dawn campfire coffee as we watch the eastern sky turn orange and pink. The flies are watching the same sunrise, and we leave to check traps when their numbers become unbearable.

*continued over...*

BELOW LEFT: Sheen with a northern shovel-nosed snake; CENTRE: Bayo checks a funnel trap; RIGHT: Kamahl with a desert rainbow skink.


IMAGE: SARAH LEGGE


IMAGE: SARAH LEGGE


IMAGE: SARAH LEGGE


IMAGE: SARAH LEGGE

*continued...*

After trap-checks, bird surveys and an obligatory second breakfast, some of the team stay at camp to enter data with Gary and Gareth, TAFE teachers who have accompanied the team to provide literacy and numeracy support. The rest of us head back out to do vegetation surveys, and to trial bush tucker searches.

### *Bush tucker searches*

We decide to trial the bush tucker searches in vegetation of different post-fire ages "to see if there is good bush tucker in each spot" (Jacko). We start off well, finding food and medicine plants including jilarlgka (bush tomato), yukurli (dodder), wutarr (gardenia), jima (conkerberry), kumanu (sandalwood) and kurlulu (cornwood) in patches of vegetation that recently burnt. Jacko and Gulu tutor the group on language names and uses.

Our sampling design gets a reality check when Sheen, Jacko and I pull up next to a patch of wattle shrubland that last burnt many years ago – it is thick, impenetrable and unappealing. Sheen's not keen. I look at Jacko; her face is shaded with apprehension. I ask, "Jacko, you reckon those old people would go in places like that for bush tucker?" Jacko, with relief: "No. They might burn it, come back later." We realise our sampling design for bush tucker might be scientifically sound but it's asking the wrong question. We better go and think about this over a cuppa. The cuppa is an infusion of supplejack bark and native lemongrass that Gulu and Jacko have prepared because some of the team have come down with colds.

## What's next?

Over the week, we catch 750 animals from 35 reptile species, four frog species, and 13 mammal species (including seven bats). Our bird surveys count 1907 birds from 38 species, with another 19 species recorded incidentally.

We are already starting to notice some patterns. For example, delicate mice seem more common at recently burnt sites, but lesser hairy-footed dunnarts and sandy inland mice only popped up at long-unburnt sites. Diurnal, surface-dwelling skinks (e.g. *Ctentous* spp.) are rarer on recently burnt sites, but the sliders, which spend most of their time underground, turn up across sites regardless of fire history. Some interesting analyses beckon!

We want to figure out which species, from bilbies to skinks, might be declining because of wildfire, and make sure the fire management looks after them.

Although we've done only our first fieldtrip, Sheen and Beno already reckon that "the data we've collected will help us understand how animals are affected by fire, and that will help us manage fire". Bayo: "We can see that bilbies don't like those big, hot fires, but there are more emus around than we thought, and quite a few turkeys." Paddy: "There are too many cats here, and foxes too now."

Our next fieldtrip, to a different part of the desert (Kalkarra), is planned for October. We'll have a similar monitoring method, and with that extra data, we'll be able to tell more about how fire affects different species. We'll also have a solid baseline to allow Karajarri to track changes over time.

Last, but most deeply, by being here together and sharing our knowledge, by reaching back in time through stories that senior rangers heard from their grandparents, we begin to connect with each other, and the story for this country.

*This project receives support from the Australian Government's National Environmental Science Program through the Threatened Species Recovery Hub.*

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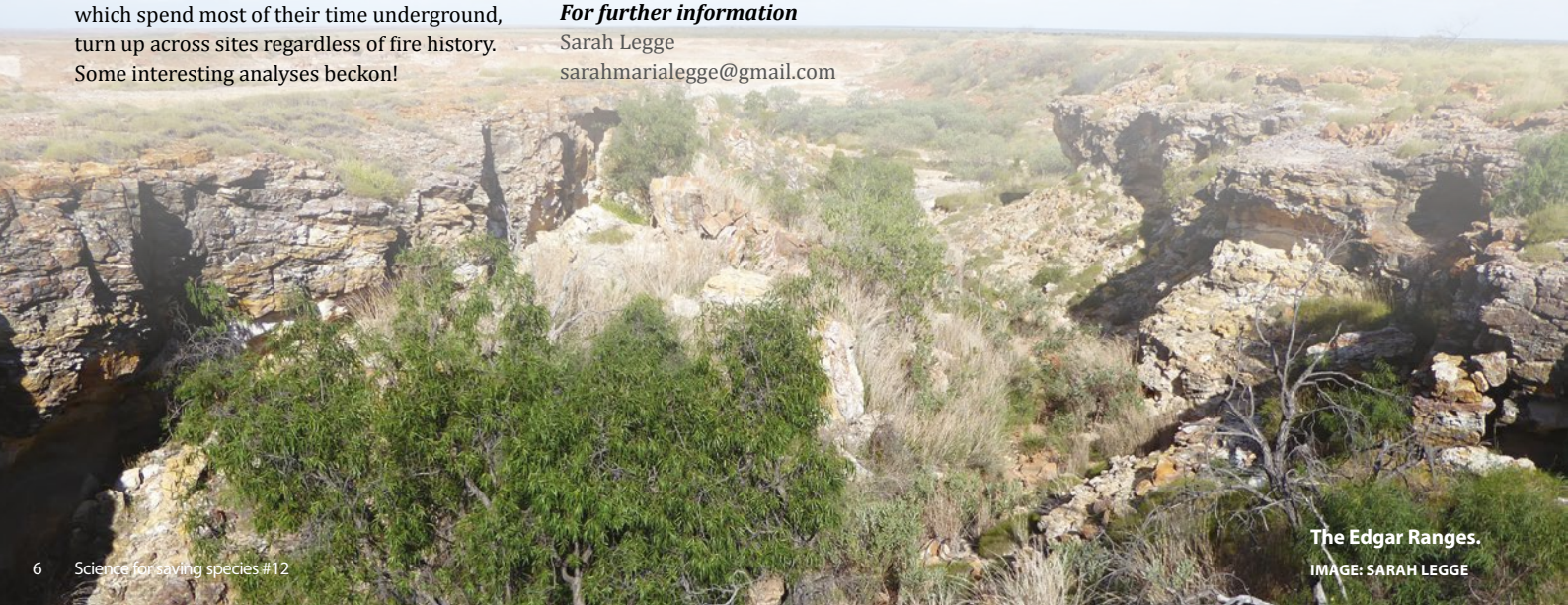
ABOVE: Sheen, Moonie, Gulu and Ewan enter data back at camp.

BELOW: Lesser hairy-footed dunnart.


IMAGE: SARAH LEGGE


IMAGE: JACKY WEMYSS

ABOVE: Jacko and Sarah doing a vegetation survey.


**The Edgar Ranges.**
IMAGE: SARAH LEGGE

Researcher profile

IMAGE: AUSTRALIAN CATHOLIC UNIVERSITY

# Bradley J. Moggridge

I am a proud Murri from the Kamilaroi Nation in north-west New South Wales. I grew up in western Sydney on Darug land and now live in Canberra on Ngunnawal land.

I completed a Bachelor of Science (Environmental Science) at the Australian Catholic University (ACU) and a Masters of Science (Hydrogeology and Groundwater Management) from the University of Technology, Sydney. As a scientist, my expertise is in water. Water is always going to be a key topic for Australia as it is the driest inhabited continent on earth. But much of our water policy was developed without consultation with Indigenous people or our Traditional Knowledge.

I am currently a PhD candidate at the University of Canberra. My PhD topic is: Incorporating cultural values and perspectives of Aboriginal people into water planning and environmental water management. I decided a research-based study was needed to show credible evidence of the value of water for Aboriginal peoples, and how modern-day water planning can accommodate these values.

I have an ambition of leading in my area of expertise and promoting Aboriginal Traditional Knowledge (culturally appropriately) and finding commonalities between Traditional Knowledge and traditional science and Western science, so this can influence policy and the way we manage the Australian landscape.

I am also the Indigenous Liaison Officer for the Threatened Species Recovery Hub. In this role I work with threatened species researchers, hub leadership and Aboriginal communities on culturally informed research for threatened species recovery. I get to see and hear some of the most current and effective threatened species recovery research in the world, which can include Traditional Knowledge.

I am guided by the hub's Indigenous Engagement and Participation Strategy and by the hub's Indigenous Reference Group – an amazing group of Indigenous people with diverse expertise from across the country. Our aim is to promote respectful and meaningful engagement with Indigenous people about the hub's research, and to support Indigenous engagement with projects – co-led projects are one part of the spectrum.

Some of the highlights of my work with the hub have included assisting with a submission for the Senate inquiry into species extinctions and then presenting it at a Senate hearing, and collaborating on scientific journal and *Conversation* articles with the hub's leadership team.

I have been lucky enough to travel and tell my story at many conferences in Australia and overseas, including presenting a paper at the 2019 NAISA Conference at Waikato University, New Zealand and giving keynote presentations at the 2018 Ecological Society of Australia conference and the 2017 Alliance for Water Stewardship Global Forum in Edinburgh, Scotland.

I was recently awarded the 2019 NAIDOC ACT Scholar of the Year, and it was a great honour to be recognised by my peers and mob. I was further humbled to be awarded the inaugural Academy of Science's Aboriginal and Torres Strait Islander Travel Award for 2018, which allowed me to travel overseas to engage with Indigenous people of New Zealand. Further, I was awarded by ACU the Aboriginal and Torres Strait Islander Alumni Award for 2017.

ABOVE and RIGHT: Bradley Moggridge at work at Ginninderra Creek in the Capital Country region.

IMAGE: KAREN MOGGRIDGE

IMAGE: JAANA DIELENBERG

# Larrakia action for the far eastern curlew on their saltwater country

For the Larrakia Land and Sea Rangers, the sight of a shell midden in coastal saltpans tells a long history of culture and how their ancestors are connected with the intertidal and mangrove environment. Through a different lens, the Larrakia Rangers also see these shell middens as areas where their culture overlaps with the habitat used by the Critically Endangered migratory shorebird the far eastern curlew. The Larrakia Rangers are working with hub researchers from Charles Darwin University **Amanda Lilleyman** and **Stephen Garnett** to help protect the curlew and the coastal habitat it uses.

ABOVE: Larrakia Rangers Gabrial Millar, Stephen Dawson, Jessica Puntoriero and Tanisha Caibbidu and researcher Amanda Lilleyman working together at Lee Point, Darwin.

Fifteen young Indigenous rangers from the urban-based Aboriginal ranger group Larrakia Nation Aboriginal Corporation have been working in the coastal landscape around Darwin Harbour to help protect this migratory shorebird that visits their land every year. The far eastern curlew is a large shorebird that breeds in the northern hemisphere before moving through eastern Asia and then onto Australia and New Zealand, where it spends the southern summer in intertidal habitats feeding on crabs and shellfish.

The species faces many threats throughout its lifecycle, including during the time it spends in Australia. Chief among these are loss or degradation of habitat due to development, and disturbances, like people and dogs on the beach, that reduce the amount of time the bird spends feeding and resting.

The Larrakia Rangers are working with researchers Amanda Lilleyman and Stephen Garnett to help protect this imperilled curlew and the coastal habitat it uses. The Darwin Port is also a major partner on the project, and has worked alongside the rangers and researchers to help catch and track curlews in Darwin Harbour. From the tracking, the rangers and researchers have identified that the species uses saltpans and mangroves along with mudflats during low tides, and then prefers nearby roost sites on higher ground when the tide is high.

## From tracking to site protection

"We're taking action in locating and understanding the birds from tracking them throughout the years and throughout various environmental conditions, such as the monsoon season, and alongside development. From this we can look at how birds might respond to larger changes in their habitat," ranger Tanisha Cabbidu said.

Larrakia Ranger manager Ben Smith explains that successful management of the far eastern curlew depends on ensuring that there is suitable feeding and resting habitat available for all individuals in the population.

BELOW: Larrakia Ranger Kyle Lew-Fatt recording micro-climate on saltpan habitat.

IMAGE: AMANDA LILLEYMAN

"The curlew is protected in the national park areas, but the bird uses a lot of land that has been converted to industrial uses. And now that we know where the bird goes, we can protect multiple sites," he said.

Identifying areas where this threatened bird occurs will be important in maintaining coastal habitat for the species and other coastal-dependent species or communities. And conversely, the protection of culturally important coastal sites will help protect the wildlife that inhabit those areas.

## Larrakia presence on country

The Larrakia people have a strong connection with saltwater. Working in Darwin Harbour strengthens this connection with the coastal environment. The numerous shell middens on Larrakia Country are evidence that the Larrakia people have been custodians of the Darwin Harbour region for millennia. Working on the water to undertake curlew surveys has other benefits for the Larrakia Rangers, as while they are out on the boat they can also monitor culturally important places and patrol the harbour for compliance amongst harbour users.

"Having a presence on the water is important to us as it allows us to be present on country and maintain a connection with Larrakia culture," ranger Gabrial Millar said.

The rangers are also interested in sharing their work with other Indigenous groups in northern Australia, as this kind of work with the curlew has crossover.

Ranger Jimmy Que-Noy would like to see the Darwin community getting onboard with good management practices that will improve conservation outcomes for the threatened curlew.

"We need to get information out there, improve public awareness that there's curlews out there – and engaging with the community is important. If people know about the curlew and that it uses beaches like Casuarina Beach then they might not let the dogs out," Jimmy said.

IMAGE: AMANDA LILLEYMAN

Larrakia Rangers (L-R) Jessica Puntoriero, Kyle Lew-Fatt, Nelson Williams-Browne and Jimmy Que-Noy in front of a shell midden. The middens show that Larrakia people have been custodians of Darwin Harbour for millennia.

The Larrakia people play an important role in the ongoing health of Darwin Harbour and the species that use it. The far eastern curlew, for one, will be better off as a result of the work of these dedicated local Indigenous rangers.

*This Threatened Species Recovery Hub project is a collaboration between Darwin Port, Charles Darwin University, The University of Queensland and the Larrakia Rangers. It is supported by the Australian Government's National Environmental Science Program.*

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BELOW: Larrakia Rangers looking for far eastern curlews.

IMAGE: MICHAEL LAWRENCE-TAYLOR


Attaching a GPS tracker to a far eastern curlew.

IMAGE: GAVIN O'BRIEN

Flowers of the Byron Bay orchid.

# Working together to care for the **Byron Bay orchid**

IMAGE: NORMAN GRAHAM

The Arakwal People of Byron Bay have recently undertaken their first cultural burn in over 30 years on the clay heaths of Arakwal National Park. They are also now more actively guiding decisions about the care of the rare Byron Bay orchid and its clay heath habitat, both of which are listed as Endangered under New South Wales environmental law. **Cathy Robinson** and **Josie Carwardine** from CSIRO and **Norman Graham**, an Arakwal and New South Wales National Parks and Wildlife Service Ranger, talk about their research collaboration, which is supporting Arakwal people to incorporate Indigenous knowledge and values into decision-making and evaluation for the orchid and its habitat.

## Arakwal National Park's unique values

Arakwal people are the Traditional Owners of Arakwal National Park and co-manage the park with the New South Wales National Parks and Wildlife Service (NPWS) under an Indigenous Land Use Agreement. The park contains a vegetation community and an orchid that are both unique to the Byron Bay area and are listed as Endangered under New South Wales environmental law. These are the shrubby low-growing 'dwarf graminoid clay heath' vegetation community and the Byron Bay orchid, which is found in the clay heath. The orchid and heath are also significant for Arkawal people, who are concerned about the health of the species and its habitat, which are threatened by wildfires, weeds, feral animals, urban development and the impact of the thousands of tourists who visit this region throughout the year.

## A cross-cultural approach

A key aim of the project has been developing effective cross-cultural approaches to co-manage the Byron Bay orchid and its clay heath habitat in the park. Arakwal National Park was the first park in the world to be listed under the IUCN Green List, a standard that recognises protected and conserved areas that are effectively managed, fairly governed and achieving successful conservation outcomes.

Both planning and evaluating are important parts of the adaptive co-management approach for the park. Together we adapted IUCN Green List planning and evaluation frameworks to define the purpose, scope, timing and approaches for activities. This involved sharing and using Arakwal, Western science and park management knowledge to understand the health of the orchid and clay heath habitat, what pressures are impacting on this landscape and the activities needed to make things better in the future.

Negotiating a co-research agreement was an important element of this task. The agreement outlined the support that would be offered to Arakwal Traditional Owners to participate in this process and the kinds of knowledge and decision-making that would be important for Arakwal people to jointly manage the park.

The Arakwal vision for the orchid and its habitat is that this species and place are healthy into the future, and that the areas and values are cared for, learned about and used by the Arakwal people.

IMAGE: CATHY ROBINSON

Working together to identify the key actions that would be needed to care for Byron Bay habitat.

We organised goals according to the three important pillars that underpin the Arakwal National Park management plan:

- looking after Country
- using Country
- knowing about Country.


IMAGE: NORMAN GRAHAM

RIGHT: Researchers Josie Carwardine and Cathy Robinson appreciating the spectacular scenery of the park.

BELOW: Aniba Kay, Senior Field Officer, NPWS, pausing to rest during the heath burn.

IMAGE: NORMAN GRAHAM

We used the existing park management plan as a starting point to discuss and negotiate priority actions, such as bringing people on country, managing weeds and encroaching trees, harvesting bush tucker, communicating to reduce the impacts of neighbours and visitors, maintaining tracks and, importantly, doing a cultural burn. The final list of priority actions was incorporated into a seasonal planning calendar to ensure the Arakwal community could understand, plan for and support the actions in a given year.

## Landscape burning

There was much to celebrate when Arakwal joint managers undertook the first landscape burning in the clay heath habitat in over 30 years in 2018. Traditional Owners, park managers and neighbours were all involved in decisions about when and where to burn. The Threatened Species Recovery Hub also supported Arakwal Rangers to attend the National Indigenous Fire workshop in 2018 to learn about other cultural burning partnerships and approaches happening around the country and to share their experiences.

## A successful collaboration

The partners in this collaboration feel that it has been a success that is delivering improved care for the orchid and heath and successful cross-cultural conservation outcomes like getting people on Country to undertake an ecological and cultural burn. Some of the reasons for this success are:

**Strong governance**, which allows Arakwal people a strong voice to guide decision-making for the orchid and heath.

**Collaborative planning**, which involves Traditional Owners, NPWS staff and scientists.

**Effective and appropriate management**, which includes monitoring and evaluation to ensure actions were working.

Senior Arakwal Traditional Owner Norman Graham aptly described the benefits this work had for Arakwal people and joint managers of this unique protected area when accepting a CSIRO medal for these efforts in 2018: "We worked together to build the knowledge, agree on the actions and assess how we want to care for the Byron Bay orchid and our country."

*This Threatened Species Recovery Hub project is a collaboration between the Arakwal people of Byron Bay, the New South Wales National Parks and Wildlife Service and CSIRO. It is supported by the Australian Government's National Environmental Science Program.*

***For further information***

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**ABOVE: Arakwal Traditional Owners and joint managers of Arakwal National Park celebrating their CSIRO medal. The medal recognises the effective cross-cultural approach taken to care for the Endangered Byron Bay orchid and its clay heath habitat at the park.**

**Clay heath at Arakwal National Park.**

IMAGE: CATHY ROBINSON

Researcher Tom Duncan and Traditional Owner Connell Tipiloura discussing species management priorities.

IMAGE: WILLY ROBERTS

# Looking after culturally significant and threatened species on the **Tiwi Islands**

Threatened species on Indigenous land may be of prime interest to scientists and ecologists, but they are often not the species of greatest importance to the Indigenous landowners. Understanding local priorities for biodiversity is an essential step in ensuring that conservation projects are locally beneficial and supported. Researcher **Tom Duncan** from Charles Darwin University has been collaborating with the Tiwi Land Council and Tiwi Land Rangers to explore this issue on the Tiwi Islands, and fills us in on what he discovered.

The Tiwi Islands are a place where exceptional natural values occur in conjunction with a unique and enduring culture. Some 2500 Tiwi people call the islands home and continue to look after their ancestral estates as they have done for thousands of years. At the same time, they are adapting natural resource management to novel ecological and social circumstances.

Scientists and threatened species conservation managers often want to work on the Tiwi Islands because of the threatened species that live there, and because the islands act as a refuge from some of the threatening processes implicated in wildlife declines on the mainland. Any proposed threatened species management actions need to take place with the support of Tiwi people, because they have cultural rights and responsibilities to look after their Country, and they continue to depend on the islands for their economic and cultural livelihoods.

Tiwi people and threatened species managers value the biodiversity of the islands for different reasons. However, there is potential for conservation actions to deliver outcomes that provide benefits to both the Tiwi community and threatened species populations.

## Tiwi species and Country values

Identifying Tiwi priorities for natural resource management is essential to planning conservation actions and ensuring that the Tiwi community benefits from partnerships with external conservation managers. As part of the research for my PhD, I talked with Tiwi landowners to identify their priorities. We discussed which plant and animal species are important and why, whether they were worried about any particular plants or animals, and what are the most important threats to Country, plants and animals.

The Tiwi Land Rangers, a group that carries out and facilitates land management activities on the islands, were integral to the research process. They identified appropriate landowners to talk to, helped explain the project objectives and purpose to Tiwi participants, and translated between Tiwi and English where necessary. The discussions took place in the communities of Wurrumiyanga, Milikapiti and Pirlangimpi and during trips out to Country on the islands.

The discussions revealed differences in the ways that Tiwi landowners and threatened species managers perceive species to be significant and how these species should be looked after. Many of the species that are of most concern to threatened species managers on the islands are small, nocturnal mammals like Butler's dunnart and the brush-tailed rabbit-rat. These animals are not hunted and do not have specific Tiwi names, and were not mentioned during discussions by most Tiwi landowners. However, the Tiwi Land Rangers are familiar with these species, because they have collaborated with scientists and conservation managers in research and monitoring projects focusing on them.

IMAGE: TOM DUNCAN

ABOVE: Tiwi Land Ranger Colin Kerinaiua looking for muranga, a culturally important yam that used to be a staple Tiwi food.

## Important plants and animals

The species that Tiwi landowners identified as important during discussions were diverse, but some of the most commonly mentioned were kitirika (green turtle), yuwala (buffalo), mantuwujini (dugong), minta (cycads) and

muranga (long yam). These species, along with many others, are integral to looking after Tiwi culture and identity. They are important to Tiwi people as a focus of hunting, trips to collect bush tucker and other Country-based activities, and they appear in stories and dances, and are central to Tiwi ceremonies. In many instances, people emphasised the importance of looking after the cultural values that were associated with species rather than focusing on their management through ecological interventions. For example, these cultural values can include transferring knowledge to younger generations about particular species, and continuing to use Tiwi names for plants and animals in preference to English names.

Priorities for species management varied significantly between the people I talked to as part of the research. This was partly because Tiwi landowners are responsible for particular Countries within the islands that have different cultural and ecological values – for example, buffalo occur on some Tiwi Countries but not on others. It was also because priorities are context-specific within Countries, which means that a certain species might simultaneously be valued, but also negatively impact Tiwi cultural values in some situations. For example, crocodiles have cultural significance because they are a totem for some Tiwi people, but in some areas they can impact cultural activities, because they inhibit access to Country or compete for important food sources like turtle eggs.

## Aligning priorities, bridging worldviews

The results of the research suggest that there may be agreement between Tiwi landowners and threatened species managers about which threatening processes are priorities to manage. Cats have been implicated in the declines of many of the threatened species on the Tiwi Islands. Many Tiwi landowners also identified cats as a significant problem, because they prey on species like bandicoots and possums that have important cultural values.


ABOVE: Carpet snakes are a focus of hunting for Tiwi people.

This research has potential value to Tiwi natural resource management planning and decision-making processes because it identifies a range of landowner priorities, and articulates some of the differences between the ways Tiwi landowners think about significant species and the approach of threatened species managers. The research also highlights the importance of the Tiwi Land Rangers in bridging different worldviews, because the rangers act as intermediaries between traditional Tiwi approaches to conservation management and Western conservation approaches. Tiwi Land Ranger Coordinator Willie Rioli cites this as one of the benefits of the research:

*"Nobody has done this work before, asking Traditional Owners what's important. It's good to work with scientists to look after Country, but we've also got to make sure we listen to our elders."*

Benefits to threatened species managers include recognition that Tiwi species values might not only be different to their own, but can vary considerably within the Tiwi community, and may also change across time and space.

Negotiating priorities about species management in context-specific ways with appropriate landowners is therefore likely to be important in planning future collaborations. Including actions designed to support and strengthen culture and language is also likely to lead to benefits to Tiwi landowners. These factors need to be considered in the planning stages of threatened species collaborations and funded and resourced appropriately if such collaborations are to be effective.

*This Threatened Species Recovery Hub project was a collaboration between Charles Darwin University, the Tiwi Land Council, the Tiwi Land Rangers and CSIRO, and is part of a broader hub project which is exploring Indigenous engagement in threatened species management. It is supported by the Australian Government's National Environmental Science Program.*

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BELOW LEFT: Buffalo are a culturally important animal but can cause negative impacts in some areas.

BELOW RIGHT: Eating minta (*Cycas armstrongii)* requires a comprehensive knowledge of how to prepare seeds.

# Reading the story written in **Australia's desert sands**

IMAGE: WIKIMEDIA COMMONS

RIGHT: Emu footprints on the edge of a salt lake.

For over 10 years groups covering almost two-thirds of Australia have been using traditional Indigenous tracking skills to survey wildlife and their threats, usually at a local scale. A Threatened Species Recovery Hub project is working with over 40 groups to collate and analyse this wealth of information and to answer questions that the groups on the ground want answered to help them manage Country. **Professor Sarah Legge** and **Dr Anja Skroblin** take up the plot.

As animals move across desert sands, they leave a record of who they are and what they are doing in their tracks, diggings and scats. People with the right skills can read these animal signs like words on a page. Many Indigenous Australians use this language expertly, to know where the goannas are fat and abundant, when bilby burrows are occupied, and where the emus are heading.

Over 10 years ago, arid zone ecologists saw the potential to blend Indigenous tracking skills with ecological science: if the tracking information was collected in a standardised way, that data could be used to monitor the presence of animals across large areas, track changes over time, and identify important environmental conditions for key species. The core method they developed was the '2-hectare sandplot' survey (also called trackplot surveys, sign surveys, cybertrack surveys, or Tracks App surveys). The method involves searching a 2-hectare area for a standard amount of time (or effort), recording all identifiable animal signs, and describing habitat characteristics.

Sandplot surveys have become very popular. They are used by many ranger groups, non-government organisations, government agencies, natural resource management groups and consultants across Australia. Some groups have surveyed with a rigorous sampling design to answer specific questions; other groups have used sandplot surveys for other reasons, such as an incentive for getting to long-unvisited parts of country, or to provide opportunities for people to share knowledge.

To date, sandplot surveys have been used from the Dampier Peninsula in north-west Australia all the way to the South Australia–New South Wales border. We estimate that well over 7000 surveys have been carried out across almost two-thirds of Australia. These data are held by over 40 different groups and individuals, and represent an incredible collective effort over vast parts of remote Australia. The data can be a valuable resource for understanding the ecology of these regions.

## An opportunity to work together

This is where the Arid Zone Monitoring project comes in. The project is an opportunity to gather data into a single database, which can then be used to create regional and national distribution maps of desert species and their threats, to look for the drivers influencing where key species occur, and to help to identify important areas for management interventions. In some regions, the data could also be used to understand how the desert has changed over time, or how animals have responded to threat management.

This project belongs to all the groups and people who have been collecting sandplot data. We are working with representatives from almost 40 Indigenous ranger groups and Indigenous organisations, eight non-government organisations and natural resource management groups, four state and federal government agencies, institutions like the Atlas of Living Australia and the Northern Australian Environmental Resources Hub, as well as individual experts. From our consultations, we know that partners also want guidance on the design of their ongoing sandplot monitoring so that it can answer questions that are important to them locally, as well as at regional and national scales.

## Overcoming technical challenges

Combining and analysing data from a large number of sources presents many technical challenges. We will need to find ways of dealing with variation in faunal communities across such a large area, differences in the methods used and the types of data collected, and variability in the skill of the trackers and the quality of the data. Working through these challenges will help shape guidance to groups about ways to improve future data collection.

As we continue to collaborate with our many project partners to gather the national data, we meanwhile have access to sandplot survey data from South Australia, covering more than 4000 surveys, much of which had already been collated into state government databases. This is allowing us to begin to identify and solve potential technical hurdles and to

generate examples of the types of outputs the project can deliver at a regional scale. These examples will help partners think through the questions they would like to ask of their own data, and of the project.

Some of the key questions people are identifying include species inventory (*See what animals are there*); identifying species declines (*Are the animals finishing?*); understanding relationships between species and resources (*Know if animals have enough food*); can sandplot surveys guide management intervention (*To know where to hunt cats; See if we should burn*); can sandplot surveys monitor rare species (*How about sensitive species?*); and guidance on method (*What about not writing everything down; How many surveys have we got to do?*).

## Showcasing Indigenous land management

Collating and analysing this enormous dataset will fill many knowledge gaps about the distribution, trends and ecology of desert species. The project will also showcase and celebrate the management and monitoring work being carried out by many groups, especially Indigenous groups, across vast areas of Australia. Towards the end of the project, in 2020, we will also scope the options and potential for transforming this two-year pilot project into an ongoing monitoring program for desert species.

*continued over...*



TOP: Sarah discusses the project with Eric Moora at a night parrot workshop hosted by the Paruku Rangers. BELOW: As well as contacting project partners one-on-one, the project team has convened regional meetings in Port Augusta and Alice Springs, and consulted people at many other events about the aims of the project. Here Taleah and Anja are presenting the project at the Indigenous Desert Alliance meeting.







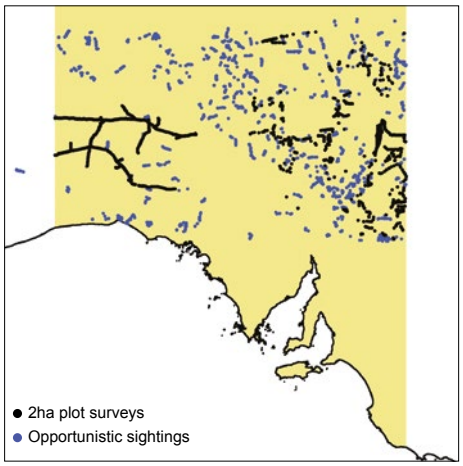




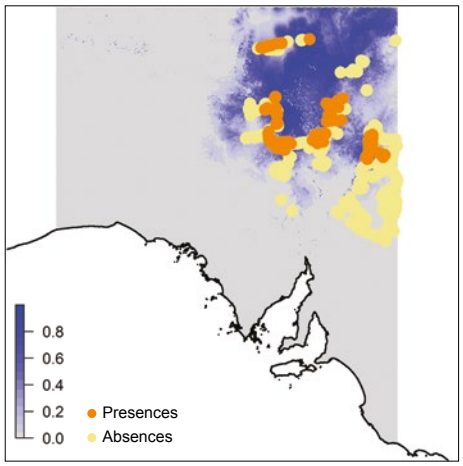

ABOVE: Some of the animals that are detected in sandplot surveys, shown together with their track or sign. The project will collate data on many different kinds of animals, including threatened species, animals that are important to Indigenous groups and feral animals.

# Reading the story written in **Australia's desert sands** (continued)

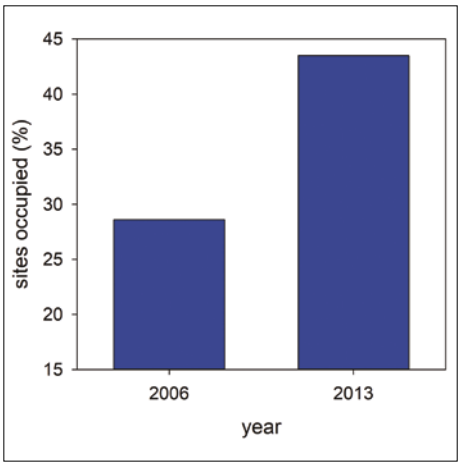
## Examples of how different types of data can be used in different analyses



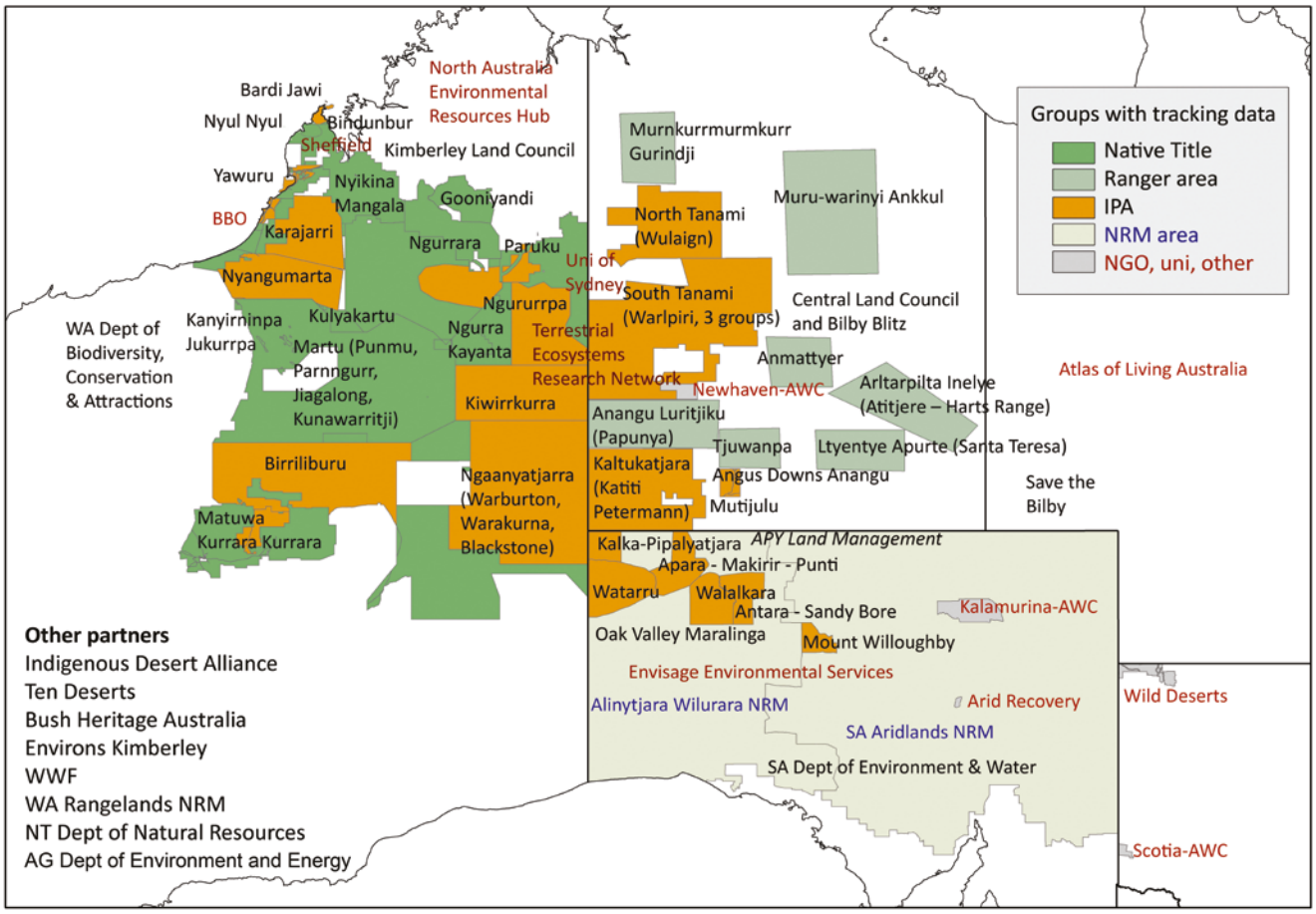

Regional analysis is possible when surveys by many groups are combined. This map shows survey data from South Australia; black dots show surveys carried out using the 2-ha plot method ($n$ > 1800, 2005–19), blue dots show tracking surveys with other methods ($n$ = 2244; 1982–2017). Despite differences in method, these different types of data can still be combined to map species distributions.




This map shows areas where crest-tailed mulgara (ampurta) are likely to occur in dark blue. Predictive distribution maps like this can be built with presence (orange dots) and absence (yellow dots) information gathered in standardised surveys, then modelled against environmental conditions.




Where surveys have been repeated at the same sites over time, we can look at trends. This graph summarises the occurrence of ampurta in 2006 and 2013 at sites in South Australia which were surveyed in both years.




The map above shows all the groups that have sandplot survey data. The project is also working with several other groups that facilitate sandplot surveys, without holding data directly (see list at left).

*The Threatened Species Recovery Hub researchers supporting this project are Sarah Legge from The Australian National University and The University of Queensland, Anja Skroblin and Darren Southwell from The University of Melbourne, Taleah Watego from The University of Queensland, and Katherine Moseby from The University of New South Wales. The project is supported by the Australian Government's National Environmental Science Program.*

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Children experiencing a smoking ceremony at Carlton North Primary School.

IMAGE: LIYAT G HAILE PHOTOGRAPHY

# Connecting Victorian kids with **Indigenous culture and the environment**

A new project is aiming to increase city kids' connections with nature, threatened species conservation and Indigenous culture. **Dr Georgia Garrard** from RMIT University talks about this project, which will see Wurundjeri Woi-wurrung Traditional Owners working with kids at Carlton North Primary School in Melbourne and Gunditjmara Traditional Owners working with kids at Heywood Consolidated School in western Victoria.

In cities it is getting increasingly common for kids to be disconnected from nature. This disconnection from nature is also thought to lead to a lack of engagement and concern for nature, including threatened species and ecosystems. Our new project, called Iconic Species in Schools, aims to tackle this problem and to engage kids with their local Indigenous cultures.

RMIT University Indigenous researcher Michael Harrison is working with two

BELOW: Bruce Pascoe launching *Young Dark Emu* at Carlton North Primary School.

IMAGE: LIYAT G HAILE PHOTOGRAPHY

Victorian primary schools – Carlton North Primary School and Heywood Consolidated School – and representatives from the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation and the Gunditj Mirring Traditional Owner Aboriginal Corporation to co-develop the program, which will be first implemented at Carlton North Primary School in Term 4, 2019.

The program will use an iconic species as a focal point to engage children to think about people's relationship with the natural world and its conservation, with particular focus on ways of viewing, interacting with and respecting nature in Indigenous culture. The iconic species will be chosen by the school and Traditional Owners.

Working with schools represents an exciting opportunity to encourage and build on children's fascination with the natural world in a way that might lead to lasting care and concern for its protection, including for threatened species. The school childrens' connections to their iconic species will be strengthened through their interactions with Traditional Owners, curriculum, learning activities and on-ground actions such as habitat creation or improvement.

Along the way, the project will build and strengthen relationships between the two schools and between schools and Traditional Owners, and may deliver benefits to individual species through on-ground actions such as habitat creation.

As this is a research project, we are going to use a series of specifically designed surveys and activities to assess the effect of the program on the kids' cultural and ecological understanding and their sense of stewardship for nature.

*This Threatened Species Recovery Hub project is a collaboration between RMIT University, Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation, Gunditj Mirring Traditional Owner Aboriginal Corporation, Carlton North Primary School and Heywood Consolidated School. It receives funding from the Australian Government's National Environmental Science Program and the Victorian Government's Department of Environment, Land, Water and Planning.*

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IMAGE: A. SKROBLIN AND KJ

# A Martu method for monitoring mankarr (greater bilby)

Kanyirninpa Jukurrpa (KJ) Rangers in the Martu Determination have collaborated with Threatened Species Recovery Hub scientists to design a monitoring program for mankarr (the greater bilby). Martu people identified priorities for the bilby monitoring program, then worked with Dr Anja Skroblin from The University of Melbourne to co-develop a monitoring method which brings together Martu knowledge and practice with Western conservation science. **Anja Skroblin** talks about the development of the new bilby monitoring program.

ABOVE: Punmu Rangers trying out the field resources for the mankarr search method.

## Bilbies stay strong on Indigenous land

The greater bilby, recognised by its silky grey fur, long snout, large upright ears and white-tipped tail, is Australia's last surviving bilby species. There are many Indigenous names for the bilby, and in the western deserts it is commonly called mankarr, ninu and muntarngarku. The bilby has disappeared from around 80% of its former range due to pressures created since European colonisation, including habitat removal, predation by foxes and cats, and changed fire conditions.

Indigenous land managers and Traditional Owners are playing a key role in securing the future of the greater bilby. Bilbies are now largely restricted to lands that are managed by Indigenous people in the north-west of the arid interior, which includes the Martu Determination. Recovery of the bilby is a priority for many of the Indigenous people who are its custodians and for state and federal governments.

## Incorporating Indigenous knowledge

Our team of Martu Traditional Owners, KJ Rangers, including the Jigalong, Parnngurr, Punmu and Kunawaritji Ranger teams, and scientists worked closely together to co-develop a new monitoring program for bilbies which would be carried out long-term by the ranger teams. The method is underpinned by Martu knowledge of bilbies, bilby distribution, behaviour and the threats bilbies face, so an important first step was to record Martu knowledge of the bilby through interviews with Martu Elders and rangers.

Next, a fit-for-purpose survey method is key to any good monitoring program. The KJ Rangers identified the need for a new method and were instrumental in creating the "Martu mankarr search" method. The method builds on existing track-based survey methods and incorporates Martu language, knowledge of local bilby ecology, and Martu ways of searching the landscape.

The data collected by the survey method is based on Martu knowledge of desert ecology, and uses Martu classification of habitat types, fire patterns, food resources, threats and management practices that influence the presence of desert animals. By using Martu practices and terminology within the method,

BELOW: A Parnngurr Ranger marks down animal signs while carrying out a Martu mankarr search.

A. SKROBLIN AND KJ

the method supports Martu in maintaining their knowledge and practices, and creates community ownership of the bilby monitoring program.

Once the survey method was developed and trialled, the team worked together to develop a monitoring plan which takes into account Martu perspectives and knowledge to identify the number and location of monitoring sites. Finally, a database was developed to manage the survey data and report on findings.

The contribution of the scientists ensures that the data collected by the program will be scientifically robust and can be analysed to tell how mankarr are doing over time and across different monitoring areas.

### Outcomes

The bilby monitoring program was rolled out in 2018. Ranger teams reported that they prefer the new Martu way of searching for mankarr, and that the method was helping them to assess the management needs of sites for burning or feral animal control. In their own words:

"I'm really happy with the new idea. It helps us, and I like that we come together and talk at the end."

"From a ranger coordinator's perspective, the new methodology is much more doable."

"The method encourages an organic process of planning and thinking about fire, the landscape and mankarr needs."

"The new method values Martu knowledge of mankarr and makes use of it."

Over time, the monitoring program will detect trends in the bilby populations, so that Martu will know if numbers are going up or down or staying about the same over time. The program will also be able to look for differences between different monitoring areas. The findings will support rangers in their management decisions, such as for burning, or controlling feral animals and weeds.

From a social viewpoint, the project and monitoring program provide ongoing employment and training opportunities and support rangers and community members to share knowledge about animal tracking, desert ecology and caring for Country.

Our project highlights how a collaborative research approach can support Indigenous peoples in their natural resource management aims. Through co-design/co-research, we can ensure that insights from different types of knowledges are synthesised to achieve results in the most powerful and culturally appropriate ways. The methods developed here can be applied or modified to be used by other ranger teams across the deserts to help monitor bilbies and other desert species.

## Martu mankarr search in action

Deep in the Little Sandy Desert in the centre of Western Australia, Martu Indigenous rangers are walking their Country. With purposeful footsteps, they weave their way between clumps of spiky green spinifex, fanning out across the sandplain. Their eyes are to the ground, reading the small indents, scrapes and scratches in the sand that reveal the movement and behaviour of animals that visited over the preceding days. Here are the toenail scratches and swirling tail drags showing the path of a parnajalpa, yellow spotted goanna, that meandered through while searching for its lunch. Over there are countless paired pock-marks – the stamp of tiny rodent feet – leading to the pop-hole openings of hopping mice burrows. And then: the tracks the rangers have been looking for, the distinctive pattern left by the bounding-overstep motion of the mankarr, the greater bilby. From the prints, this is a big one, most likely an adult male. The tracks are fresh, maybe from last night or the night before. Tracking continues. There are diggings into the roots of acacias here – the mankarr must have had a meal of witchetty grubs. Over there, nestled under a clump of old spinifex, the footprints lead to the opening of a mankarr burrow. Maybe the mankarr is asleep in there now? But maybe not … The rangers are worried. Right there alongside the mankarr tracks are fresh tracks of a large feral cat, a predator of the mankarr. It also visited that burrow last night.


ABOVE: Punmu Rangers looking for signs of the bilby and other desert animals while carrying out a mankarr search.

*This Threatened Species Recovery Hub project is a collaboration between The University of Melbourne and Kanyirninpa Jukurrpa, together with BHP, the Department of Prime Minister and Cabinet, Parks and Wildlife Services and Rangelands NRM Western Australia. It is supported by the Australian Government's National Environmental Science Program.*

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Researcher profile


IMAGE: TALEAH WATEGO

# Taleah Watego

## Drawn to work with nature and wildlife

RIGHT: Taleah with her son Mason during her fieldwork at Tenterfield.

Growing up, I spent a lot of time camping at Stradbroke Island, Byron Bay and many other coastal places. I am a Bundjalung woman, so naturally I am drawn to the water. Wategos beach at Byron Bay was named after our family, and some of my elders were actually born in the lighthouse! Spending so much time around the water as a child made me want to work with nature and wildlife. While being a marine biologist was my first dream, I have found myself on a path of wildlife biology and conservation.

I discovered a passion for our unique threatened species during my Bachelor of Science majoring in wildlife biology. I conducted a six-month study on the spotted-tailed quoll, which started from many sightings of the quolls on my family's property in Tenterfield. I looked at the effectiveness of camera traps in capturing elusive species like this one. I captured approximately five individuals, and also interacted with wedge-tailed eagles and feral pigs, and had a very close encounter with a fox.

After university, I secured a graduate position as an ecologist, and as a fauna spotter-catcher. However, this wasn't quite right for me, so I ventured out as a Wildlife Officer for the Department of Environment and Science, working at the Daisy Hill Koala Centre. This was mostly a public education role, but included looking after the five resident koalas. It was a dream: the first time as a child that I ever went to that koala centre I said to my aunty, "I want to work here!" – and now I was!

I absolutely loved being in the field and so hands-on, as well as being able to educate so many people, especially children. I know that children are the key to our future and that of our threatened species and ecosystems.

Now that I am lucky enough to have a son of my own, I strive to give him a childhood as adventurous as mine was. And it is so important that we teach the younger generations how unique our ecosystems and species are.

My next position was with the Threatened Species Recovery Hub as a Research Assistant. This role is so rewarding. I work with Sarah Legge, Katherine Moseby and others collating tracking data that has been collected by Indigenous rangers from desert areas across Australia (see pages 14–16), and I get to travel to meet some of the people who are collecting the tracking data. This project will be able to tell us a lot about the abundance of threatened species and the effect that feral animals have on them. I'm now also supporting the hub with data and publications management.

My career so far has been incredible, but I am still only 23. I have possibly more study to do, and lots of personal and cultural growth. I am not sure where I will end up, but I do know that it will involve my passions for protecting our threatened species and the environment.


IMAGE: TALEAH WATEGO

ABOVE: Taleah at her graduation ceremony.

The Threatened Species Recovery Hub is supported through funding from the Australian Government's National Environmental Science Program.

***Science for saving species***

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COVER IMAGE: KARAJARRI RANGERS UNDERTAKING A PIT-TRAPPING FAUNA SURVEY. (SEE PAGE 4 FOR THE FULL STORY). IMAGE: KARAJARRI IPA

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