

# The importance of tea and Tim Tams

## Professor Stephen van Leeuwen

Curtin University

**Stephen van Leeuwen is a botanical ecologist, research scientist, senior manager and respected South West Booijarah Wardandi Noongar leader. He was appointed Australia’s first Indigenous Chair of Biodiversity and Environmental Science at Curtin University. Stephen engages and builds collaborative relationships with Traditional Custodians and other land managers to co-deliver novel and enduring outcomes for biodiversity conservation, bio-cultural land management, and the stewardship of Country.**

I WORKED IN THE PILBARA IN Western Australia for over 20 years, undertaking research into the fire ecology of mulga woodlands. It was initially a biological survey that then became a monitoring project, for which I ran the botanical and invertebrate component. That work was wonderful. For the first five years, half my life was spent in a swag and we went to some stunning remote places. One that I am still passionate about is a nature reserve called Barlee Range Nature Reserve, which was established in the early 1960s. When we started to survey that place it was very special – after the first trip there I came back with three species of plants new to science, and numerous geographical range expansions for a whole set of species. One night we were sitting around the campfire and we thought someone was throwing mandarin peel at us. Then we realised it was the Pilbara form of the orange leaf-nosed bat (*Rhynonictis aurantia*), which is orange, flying around the campfire. Seeing it in that area was a new range extension. It was a fantastic experience.

While in the Pilbara I received some funding from the National Reserve System to do a biological survey of the Little Sandy Desert, driven by the fact that Australia’s only presumed-extinct eucalypt at the time, *Eucalyptus rameliana*, had just been re-collected there. It wasn’t extinct, in fact it wasn’t rare at all – it was the dominant species found over hundreds of hectares in dunefield landscapes. Then the Pilbara biological survey came along, which I think is still the biggest biological survey undertaken in Australia. I managed the site selection process for that with a zoological colleague and then led the botanical survey team for over seven years. We visited a couple of hundred sites across the Pilbara at least two times and we collected over 70,000 specimens. It took our team of six people almost two years to sort and do all the identifications.

You don’t need to go to Antarctica to be an explorer, just go out into the Western Australian deserts and you will find new species of plants, reptiles and invertebrates. Lots of them are new to Western science. That said, you can’t do anything in the Pilbara and the western deserts without engaging with Indigenous communities, and neither should you because it’s mostly their Country. My survey teams had lots of input from Traditional Custodians and lots of talking to mob about coming on and doing things on their Country. Any decisions you



Mulga (*Acacia aneura*) and spinifex (*Triodia* genus), Central Australia.

CREDIT: JENNY DAVIS.



Karijini National Park, Western Australia.

CREDIT: JUDY DUNLOP.





Tree fern understorey breaks through the canopy, Inverloch, Victoria.

CREDIT: MATT CLANCY.



Hairpin banksia (*Banksia spinulosa*), Georges River Nature Reserve, New South Wales.

CREDIT: COOPER TAMAYO.



Manuka (*Leptospermum scoparium*) flower buds, Melbourne, Victoria.

CREDIT: YENNIFER LONGO.

in the last few years because I've had to move on and start different things with new students and new grants. But it still has information that is waiting to be explored. I might have to wait until I retire and then I'll get some more findings out of it because I had all sorts of questions about the processes that underlie those latitudinal gradients.

The other thing I took away from that study is the importance of collaborations. I obviously like the big picture things about ecosystem-level differences and global-level differences. But I'm terrible at nuanced things like telling apart the different species of eucalypts, for example. I need collaborators to help with those fine scale things. That's one of the things that ecology has got better at doing – forming collaborations with people who have different skill sets and recognising that one person can't do it all. Especially if you want to work at a global scale. You need people who can tell you how the ecosystems in Greenland work, for example, because while you can get a decent idea by going there in person and feeling the plants and seeing what it's like, you won't know the history of the ecosystem, or what the disturbance regimes are. It is invaluable to actually listen and find out what local people think is most important. You shouldn't really interpret data without having some idea what the ecosystem is doing or what it has done in the past.

It's been an interesting time in ecology – we've gone from usually very small scale studies focusing on tens of species at a time pre-2000, to now having so much data. There's data on plant traits, there's climate data, genetic data, spatial data, all sorts of different things. The answer that keeps popping out now is that it's complicated. We're entering a major period of fishing for results rather than testing hypotheses and it's a little bit scary. I wonder where we will go next. ■



# Restoring habitat for the giant freshwater crayfish

## Fiona Marshall

*Cradle Coast Natural Resource Management*

**Fiona Marshall has over 30 years' experience in soil erosion, river management and community engagement. As part of the Cradle Coast NRM team, she delivered environmental improvement programs for the giant freshwater crayfish in targeted rivers across northern Tasmania.**

THE GIANT FRESHWATER CRAYFISH (*ASTACOPSIS GOULDI*) is the largest freshwater invertebrate in the world but is only found in rivers across northern Tasmania. It used to occur in most of the rivers that flow into Bass Strait, but it is now much more difficult to find. It's very hard to be precise about actual numbers but we have past records from people like Todd Walsh and Professor Alistair Richardson, which show enough of a decline in numbers that now it is listed as vulnerable under both state and federal legislation.

People used to catch these crayfish in the past, as they were a good food source. They targeted the larger sizes and this unfortunately meant they were taking the breeding pairs, both male and female. The species can grow up to 6 kg but in the monitoring we've done in this project the largest we trapped was 3 kg – so either those 6 kg ones are very rare or they're very good at hiding. One of the issues with the giant freshwater crayfish is that it takes an awfully long time to reach maturity. It must be nine to 13 years old before it is even able to breed. The only way we can keep track of them now is by trapping and tagging over the long term.

Other things have affected crayfish numbers as well. One of them is development, particularly when it involves removal of vegetation and shading along the rivers. Vegetation not only helps to keep the waters cool, it also keeps the riverbanks stable and reduces siltation and sedimentation off roads and farmland. Siltation definitely impacts the crayfish's ability to survive because they use gills to breathe. Removal of timber from rivers has also had an impact because that's part of their main diet and provides places for them to hide.

We have been trying to build collaborative projects to address those factors by revegetating some of the affected areas. We started by identifying watercourses of high conservation value, trying to find streams or rivers that had good existing native vegetation, especially those that were free from weeds like willow and blackberry, so that we could provide connectivity. We narrowed it down to six high conservation value areas then contacted the larger landholders to see if they would be interested in joining the project. Generally, we got pretty positive responses. For some people, it was part of what they were planning to do anyway, so this helped them bring it forward.



Giant freshwater crayfish (*Astacopsis gouldi*), Tasmania. CREDIT: FIONA MARSHALL.





Leadbeater's possum (*Gymnobelideus leadbeateri*), Toolangi, Victoria.

CREDIT: JUSTIN CALLY.



Short-beaked echidna (*Tachyglossus aculeatus*), Chichester Dam, New South Wales.

CREDIT: KATHERINE MORTIMER.



Southern spotted velvet gecko (*Oedura tryoni*), Girraween National Park, Queensland.

CREDIT: WESLEY READ.

to people conducting more planned burns. If the response to the increased fire risk from climate change is to increase the frequency of planned burning, that too will have an impact on plants that require a minimum amount of time between fires to reproduce.

Immediately after the 2019–2020 fires, the drought broke, leading to an enormous amount of vegetation regrowth in a lot of places. But in places that were severely burnt, like some alpine ecosystems in the Australian Capital Territory, it was many months before they started to look like they were going to recover. My expectation is that while visual recovery will happen in a lot of places, the longer-term impacts will depend on what the history was before the fire, including the number of fires in that location in the past. We'll end up with a mosaic of recovery that reflects the site history.

As we enter this era of altered fire behaviour and increased risk of mega-fires, there will be a cumulative impact on some of these ecosystems and they will have less time to recover. Vast areas were burnt in 2019–2020. Some plants and animals in those areas need 15–20 or more years between fires to recover properly. That means there's a window of time – this decade and into the next – when we have enormous areas of south-eastern Australia that are going to be highly vulnerable to big impacts if they burn again. Fire management needs to be very cognisant of which areas were burnt and how to keep fire out of them for the next decade or so. ■





Australian giant cuttlefish (*Sepia apama*), Whyalla, South Australia.

CREDIT: RICHARD WYLIE.



Seahorse (*hippocampus* genus), Blairgowrie, Victoria.

CREDIT: IMOGEN MANINS.



Giant spider crab (*Leptomithrax gaimardii*), Rye Pier, Victoria.

CREDIT: RICHARD WYLIE.





Red-eyed tree frog (*Litoria chloris*), Casino, New South Wales.

CREDIT: JARRAD BARNES.



Wallum sedgefrog (*Litoria olongburensis*), Marcoola, Queensland.

CREDIT: JONO HOOPER.



Graceful tree frog (*Litoria gracilentia*), Yandaran, Queensland.

CREDIT: DAVID FLACK.



Waterfall frog (*Litoria nannotis*), Tablelands, Queensland.

CREDIT: MURRAY KELMAN.



# Conserving the eastern quoll

**Dr David Hamilton**

Tasmanian Land Conservancy

David Hamilton is a conservation ecologist with the Tasmanian Land Conservancy and an Adjunct Researcher with the University of Tasmania. Working across both organisations helps him apply a behavioural ecology lens to conservation management practices in Tasmania.

I WORKED ON TASMANIAN DEVILS (*SARCOPHILUS harrisii*) for my PhD, but when trying to catch them I would often end up catching quolls. At that point in my career quolls weren't high on my loved-animal list, they were just getting in the way. Every time I saw a quoll I'd be slightly disappointed that it wasn't a devil, but over time I began to be fascinated by them. I came to realise that the eastern quoll (*Dasyurus viverrinus*) had undergone quite a substantial decline in Tasmania over the last 20 years and it is now listed as endangered at the federal level. So I became less annoyed and far more invested in them.

There's been a fair bit of monitoring of eastern quolls in Tasmania for the last 30 years, although often incidentally as a result of monitoring other species. The Tasmanian Government has conducted spotlighting surveys to look at the numbers of species using forestry landscapes across the island, and they record eastern quolls as part of that. As I discovered myself, eastern quolls also turn up during devil monitoring. It's been extremely spatially variable in terms of the areas where they've declined – in some regions they have bounced back a little, and in others they've chugged along at very low levels without really recovering at all. A lot of work has been done by people like Bronwyn Fancourt to look at the reasons why eastern quolls have declined in some areas but not others. It's likely to be down to a combination of habitat factors, climate, prey availability and the density of competitors like devils, other quolls and feral cats.

A large part of my role with the Tasmanian Land Conservancy is to look at the different plants and animals that are using our reserves, assess how management of the reserve is affecting their conservation values and ongoing use of the environment, and work out how we can potentially improve their trajectories as a result of that knowledge. In the case of the eastern quoll, we've identified that declines are happening in certain places and we want to do something about the situation now, before it reaches the point of no return. Protecting their habitat is of vital importance. You can't conserve eastern quolls without conserving the habitat they live in, including the vegetation communities that they den and forage in. You can't hope to help one without helping the other. Ecosystem-level conservation, including conserving areas that are large enough for native species to persist and thrive in, is critical.



Eastern quoll (*Dasyurus viverrinus*), West Pencil Pine, Tasmania.

CREDIT: DAVID HAMILTON.



Eastern quoll (*Dasyurus viverrinus*), Bruny Island, Tasmania.

CREDIT: DAVID HAMILTON.





Humpback whale (*Megaptera novaeangliae*), Fog Bay, Northern Territory.

CREDIT: CAROL PALMER.



Common dolphins (*Delphinus delphis*), Eden, New South Wales.

CREDIT: KATHARINA J. PETERS.

Most times the whales are heading east, not west, but we are not sure whether they are coming to our waters via the Kimberley region or all the way around Cape York. We're also not sure whether they are coming from the Antarctic or from the Pacific.

Over many years, colleagues in the Australian Antarctic Division have been able to collect DNA samples and put satellite tags on humpback whales. Satellite tagging of whales and the larger dolphins is a good way to record where they go but it is the DNA sampling that will answer the question of where our whales are coming from. The Antarctic Division has hundreds of DNA samples from whales in southern waters and if we can get more samples from whales up here, we will be able to analyse them, compare them to the archived samples and confirm whether our visitors are Antarctic or Pacific humpback whales. We need to carry out more research here, but to do that we need funding. It's difficult because we tend to be a bit overlooked due to the low whale numbers here.

Our work also shows the irreplaceable role of ranger groups. In trying to research a species we only see every few months or once a year, rangers and communities along the coastlines are the only people who can reliably spot them. The Northern Territory has perhaps the most polluted coastlines in Australia for marine debris accumulation, particularly around the Wessels and in the Gulf of Carpentaria, and the rangers are trying to reduce the impacts on marine species. The teamwork between the rangers and researchers like me is not based on a Western science interpretation – we work together using both Western and traditional science. It's really interesting and certainly for all the coastal ranger groups we've worked with in the last few years, who are sea people, it is one of their most important works.

We've got more research to do, and that's exciting. Humpback whales are interesting animals, it's beautiful up here on the Northern Territory coast and we're very keen to move forward. ■







Emu (*Dromaius novaehollandiae*), Lake Gairdner, South Australia.

CREDIT: CHRISTIAN SPENCER.

Don't wait for a leadership role to find you. We are all leaders in some way. It's empowering to identify yourself as a leader, as well as what you are doing in your day-to-day work and research to support others. Doing so can give you the confidence to take on bigger or different roles and find your niche. Trying new things outside your comfort zone helps you grow and think in different ways, no matter how small.

**Professor Nigel Andrew**  
*Southern Cross University*

Nature is full of uncertainties. Humanity's ecological future has never been more uncertain, and the shape of ecological careers is changing. We cannot expect to know the future or to fully predict the consequences of our actions. But an old piece of advice still holds true – follow your own interests and instincts.

**Professor Carla Catterall**  
*Griffith University*



Emperor gum moth (*Opodiphthera eucalypti*), Bungonia National Park, New South Wales.

CREDIT: THÉOTIME COLIN.



Australian sea lion (*Neophoca cinerea*), Abrolhos Islands, Western Australia.

CREDIT: COLBY JAMES BIGNELL.





Gang-gang cockatoo (*Callocephalon fimbriatum*), Canberra, Australian Capital Territory.

CREDIT: TREVOR RIX.

Indigenous leadership differs from Western ways. This includes healing Country (land, water and sky), ideally through Indigenous methodologies. Country is telling us through cultural indicators and our long-term observations that it is sick and has changed, just like the climate. If we heal Country right, everything will heal with it. Country will look after us if we look after it. As carers of Country, Indigenous people are required to be in decision-making roles as well as leading the recovery.

**Associate Professor Bradley Moggridge**  
*University of Technology Sydney*



Peacock spider (*Maratus albus*), Altona Foreshore Reserve, Victoria.

CREDIT: TOM SAYERS.



Whale shark (*Rhincodon typus*), Ningaloo, Western Australia.

CREDIT: COLBY JAMES BIGNELL.

While mentoring is about guiding, it's also about validation. Everyone has imposter syndrome, so a word of advice or encouragement can make an amazing amount of difference.

**Dr John Morgan**  
*La Trobe University*

Pursue your passions! Although that's a cliché in many respects, it is really important – it can be difficult and emotionally hard to undertake and sustain a career in ecology and conservation. But if you're passionate about it, it's incredibly rewarding at the same time. Akin to an ecosystem, our community will work best and thrive when we support each other.

**Professor Euan Ritchie**  
*Deakin University*