



AUSTRALIAN

Wildlife

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Celebrating a new century of wildlife preservation in Australia

Journal of the Wildlife Preservation Society of Australia Limited

(Founded 1909)

CAIRNS FROG HOSPITAL PROVIDES AN INVALUABLE SERVICE IN REHABILITATING FROGS. FULL STORY ON PAGE 20



The colour and spotted pattern on this green white-lipped tree frog shows that its nervous system is being attacked by a fungal pathogen.

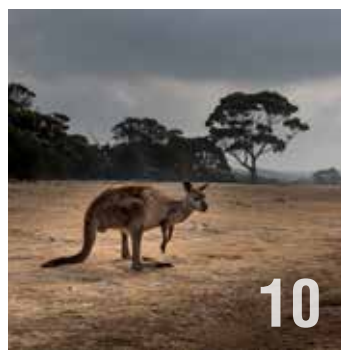


Some problems defy explanation such as this invasive and unknown bacterial or fungal flesh-eater.

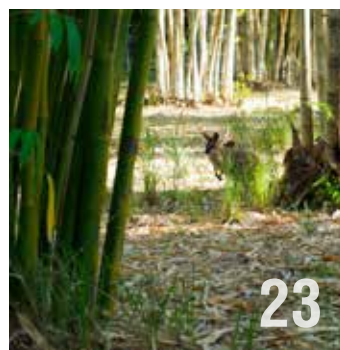
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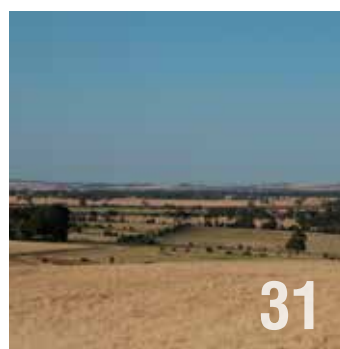
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Editor, Australian Wildlife



Sabine Borgis
Sub-Editor, Australian Wildlife

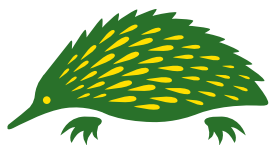


Front cover:
A new home.

Back cover:

Top: Dusk: in a relatively secluded place on Kangaroo Island, some days - around dusk or dawn - you will see families of kangaroos quietly grazing in the fields being warmed by the twilight sun. Unfortunately, there are now some plans to turn this beautiful oasis into a golf course and cull many of the kangaroos.

Bottom: A new day: Grassdale (a reclaimed farming property and now part of the Kelly Hill Conservation Park on Kangaroo Island, South Australia) is a secluded, safe and lesser-known gathering place for mobs of kangaroos. Some days you will see hundreds grazing in the fields, being lit by the early morning sun. On other days, you may find just a few.



Australian Wildlife Society

Conserving Australia's Wildlife
since 1909

Australian Wildlife

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Contact

National Office

Australian Wildlife Society

(Wildlife Preservation Society of Australia Limited)

PO Box 42
BRIGHTON LE SANDS NSW 2216

Tel: (02) 9556 1537

Email: info@wpsa.org.au

Accounts: accounts@aws.org.au

Editor "Australian Wildlife":

suzanne@wpsa.org.au

Website: aws.org.au

Correspondence to:

**Hon Secretary:
Australian Wildlife Society**

PO Box 42
BRIGHTON LE SANDS NSW 2216

Directors 2017

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Notice to our members

The Australian Wildlife Society (Wildlife Preservation Society of Australia Limited) is managed and controlled by an elected board of ten volunteer directors. The Society is a registered company limited by guarantee with ASIC and is responsible for complying with all its regulations.

Any member who might like to consider serving as a director of the Society is invited to contact the national office for more details. The most important qualification to serving as a director is 'a commitment to and love of Australian wildlife'.

The Society holds regular monthly meetings on the first Wednesday of each month in Sydney.

The Editor would like to feature a member's profile in the fortnightly email newsletter and occasionally in our quarterly magazine. Members are invited to consider submitting a short article with a photograph for possible publication.

Our Mission

The Australian Wildlife Society (Wildlife Preservation Society of Australia Limited) is an independent, voluntary, non-profit conservation organisation, formed in 1909, and is committed to the preservation of Australia's precious flora and fauna. We act as a watchdog and provide advice to government agencies and institutions regarding environmental and conservation issues concerning all aspects of wildlife preservation. Our mission is to conserve Australia's fauna and flora through education and involvement of the community. We are dedicated to the conservation of our unique Australian wildlife in all its forms through national environmental education programs, political lobbying, advocacy and hands on conservation work.

Our Society has always known that a conservation battle is never really won until the victory is enshrined in legislation. We have always tried to convince politicians of the necessity to include the preservation of Australia's precious wildlife and its vital conservation habitat in all their planning and environmental issues and discussions.

Articles and comments expressed in this magazine do not necessarily reflect the opinions of the Editor, Society or members. Articles contributed from outside sources are included for the reading enjoyment of members and to encourage discussion on different points of view.

Articles may be copied or quoted with appropriate attribution.

From the President's desk

Suzanne Medway AM - President

Since the inception of the NSW Nature Conservation Council representatives of our Society have attended their annual conference, and I am delighted to let our members know that our Society won the prestigious NSW Nature Conservation Council Member Group Award for 2016.



This is always a busy time of the year, with lots of functions to attend and the chance to catch up with old and new friends in the conservation movement.

Since the inception of the NSW Nature Conservation Council representatives of our Society have attended their annual conference, and I am delighted to let our members know that our Society won the prestigious NSW Nature Conservation Council Member Group Award for 2016.

The NCC award is given annually to a Member Group of NCC judged to be the most outstanding environment group that has demonstrated an outstanding commitment and success in the conservation of the environment in New South Wales, particularly through empowering and organising individuals and groups to protect the environment.

New South Wales was the first state in Australia to form an umbrella organisation for its environmental and scientific societies. This council, which promotes the cause of conservation throughout New South Wales, was formed in 1955 as the Nature Conservation Council of NSW (NCC). Other states of Australia were to follow this example in the years that followed.

The Australian Wildlife Society (Wildlife Preservation Society of Australia) was a member from the earliest days. The Council's annual conference is the key policy-making forum of the New South Wales environment movement. It provides an opportunity for groups from all over New South Wales to meet and agree on common policies.

At different times, the late Vincent Serventy (previous President and

President of Honour of our Society) and Allen Strom (previous Secretary of our Society) each acted as Chairman of the conference, and on more than one occasion. The conference elects an executive, currently twelve in number, which is responsible for the Nature Conservation Council's activities between conferences. Vincent served on this executive for thirty years, only relinquishing the position in 1996. Two delegates from the Society have attended the annual conference each year, submitting recommendations when appropriate, and contributing to resolutions passed by the conference. Patrick Medway (CEO of our Society) served on the executive for five years.

The goals of the Council are to conserve the environment of New South Wales. Specifically, the Council aims to conserve and protect:

- the diversity of living plants and animals in New South Wales, especially rare and threatened species;

- New South Wales's unique ecosystems, from the western arid lands to the eastern coastline; and
- the environmental quality of New South Wales's land, air, waterways and adjacent sea, and of the urban environment.

Today the NCC includes about 150 conservation societies from across New South Wales. It is represented on many important NSW government boards, councils and advisory committees. The number of advisory positions at last estimate was 45, not including representatives on Regional Bushfire Committees. This allows for an opportunity to have an effective input into a wide range of environmental policy-making processes. As a legitimate member of the Council, the Society thus has a voice in furthering the aims of the Council and influencing policy on a broader front. Although the policies of the NCC may at times conflict with those of member bodies, there is no compulsion to comply.



Presentation of the prestigious NSW Nature Conservation Council Member Group Award for 2016. L to R: Clive Williams, Suzanne Medway, Professor Don White (President of NSW Nature Conservation Council) and Ken Mason.



Dr David Suzuki and Suzanne Medway.

I recently had the pleasure of catching up with Val Taylor. In 2001 the Serventy Conservation Medal was presented to Ron and Valerie Taylor, who have been tireless workers promoting a greater understanding of the wonders of the Great Barrier Reef and the urgent need to protect and preserve the unique wildlife found on this world heritage coral reef. Val told me that *Australian Wildlife* was one of the only magazines she now reads. Quite a compliment!

I also had the chance to meet Dr David Suzuki at the same function and was fascinated to learn about his latest project, Blue Dot. The project was introduced in Canada and is based on the belief that Canadians should have

the right to a healthy environment – clean air and water, safe food, a stable climate and a say in decisions that affects health and well-being. I have since been in touch with Dr Suzuki and will be suggesting to the Society's board that we might adopt Blue Dot into Australia as a major project for 2017.

Annual General Meeting

On 1 March 2017 the Society will be holding its 108th Annual General Meeting. This is a major achievement in the conservation movement anywhere in the world, let alone Australia.

Dr. Richard (Dick) Mason, the longest serving member of the Board decided to retire and the December meeting was

his last. Dick, one of our Life Members, joined the Society during the 1970s when controversy over mineral sands mining in the coastal sand dunes was at its height. His particular interest is in birds and he regularly attended bird camps. He has been a diligent member of the Board and we presented him with two books as a farewell present. We will miss his contribution and passion.

To take up the casual vacancy caused by Dick's retirement, the Board, under Clause 10.5(a) of the Constitution, agreed to appoint Christine (Chrissy) Banks to the Board. Chrissy's name will be familiar to readers of the *Australian Wildlife* magazine as she has contributed numerous articles. She grew up in New Guinea, spent some time in Western Australia and now lives in Sydney's western suburbs. We look forward to working with Chrissy from our next meeting in February 2017. Under Clause 10.5(b) of the Constitution Chrissy will offer herself for election at the AGM.

Our CEO and Honorary Secretary Patrick Medway will retire at the AGM and in accordance with the Constitution (10.3) and being eligible, he offers himself for re-election.

Clive Williams also retires in accordance with the Constitution (10.3) and being eligible, offers himself for re-election.

As there are three board vacancies I ask any member who is eligible (must have been members of the Society for a period of six years or more) to consider nominating for a vacant position on the Society's board of directors. Nomination forms are available from the national office and must be completed with the signature of a nominator and seconder (who must be financial members of the Society) and delivered to the Secretary of the Society by 22 February 2017.

The Board meets on the first Wednesday of each month in the 1st floor meeting room at the Masonic Club, 169 Castlereagh Street, Sydney. We start at 10.00am and, at the conclusion of the meeting, have a light sandwich lunch.

On behalf of the Board of Directors I wish you a happy and healthy New Year. We are looking forward to our mission of conserving Australia's precious wildlife in 2017.



Val Taylor and Suzanne Medway.



ON MUSEUMS OF NATURAL HISTORY, EXTINCTIONS, AND THE WONDERFUL LIFE

Eduardo Gallo-Cajiao

I grew up in a small city in the Andes of Colombia, where during my teenage years the local Museum of Natural History fuelled my passion for the natural world. That museum, far from being on the list of the world's most famous, is humble, but filled with specimens that represent extremely well the current diversity of vertebrates in my country of birth. Ever since, I have been fascinated by museums of natural history, but a new experience has made me even fonder of them taking me millions of years back in time.

Recently, I had the opportunity to visit the American Museum of Natural History in New York City for the first time whilst undertaking a fellowship at Princeton University. After this experience, museums of natural history will never be the same to me. When I arrived at the museum and found myself a map, I didn't know exactly where to start or what to expect. All I knew was that I was in one of the

world's most famous museums of natural history. Quickly, after unfolding the museum's map in the foyer, I realised that the top floor was dedicated entirely to fossils. So I made my way upstairs, bypassing all the artistic, and perhaps now historic, dioramas. When I arrived at the fossil collection, I realised that before my eyes was the very story of vertebrate evolution, as close as I could possibly get. It was like reading all of my text books of vertebrate zoology from undergrad again. Most of the quintessential fossils that have been fundamental for shedding light on vertebrate evolution were there. Key breakthroughs in the evolution of vertebrates include: the development of jaws, the colonisation of the terrestrial environment, and the conquering of the skies through active flight.

The fossil collection gave me the opportunity to see iconic specimens representing the evolution of different lineages at various stages. For instance,

I found a specimen of *Dimetrodon*, a synapsid reptile forming the basal lineage of mammals. I also found *Hesperornis*, a toothed bird that has enabled us to understand the evolution of modern birds. In the hall of mammals, there were specimens of *Glyptodon* (a giant 'armadillo'), *Megatherium* (a giant ground sloth), and *Diprotodon* (a giant 'wombat'), all of them part of the Pleistocene megafauna.

Hence, I came to realise that museums of natural history are always worth a visit wherever you are, not precisely because of the opportunity to see extant animals but rather, extinct ones! After all, zebras and polar bears are still roaming the earth as we speak, but fossils represent a sample of the earth's life history that is no longer with us. Hence, museums of natural history with good fossil collections are a lens

Above: Paleozoological Museum of China in Beijing.



Eryops is the genus of a primitive amphibian that lived during the Early Permian 295 million years ago.

through which we can explore the exciting history of life on earth.

As a part of my PhD at the University of Queensland, I've recently had the opportunity to visit Beijing, where I could explore the city on the weekends. After settling in, I quickly

found out about the existence of the Paleozoology Museum of China in Beijing, which is affiliated to the Institute of Vertebrate Paleontology and Paleoanthropology of the Chinese Academy of Sciences. Thanks to the media I had a good reason to believe this museum was worth a visit.



Glyptodon is a relative of armadillos that lived during the Pleistocene epoch until as recent as 10,000 years ago.

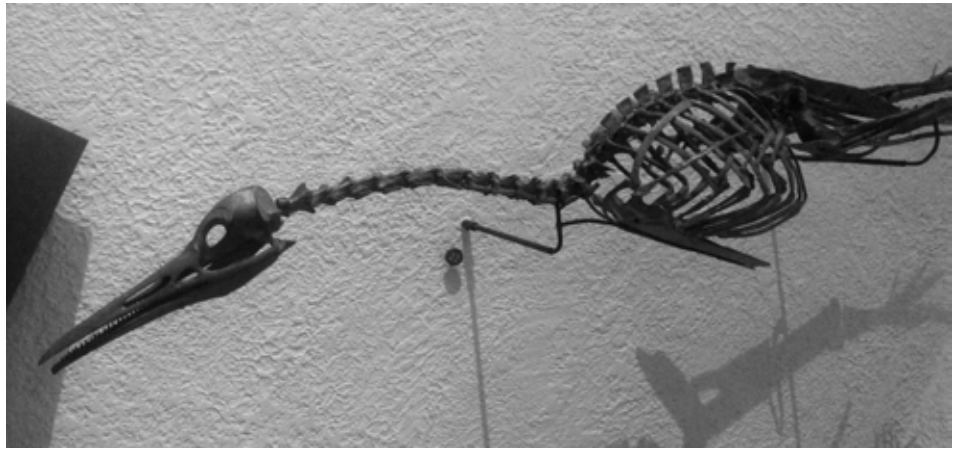
National Geographic magazine had published on its front cover of July 1998 news about feathered dinosaurs discovered in China, all of which have become crucially important in supporting the dinosaur origin of modern birds. Consequently, I didn't hesitate to go for a visit.

As its name suggests, the museum is fully dedicated to extinct animals. With that in mind, I entered the building with high expectations of finding feathered dinosaurs. Not far from the main entrance, I was inside the so-called dinosaur hall, where I found a fine collection of fossils from the early Cretaceous (130 million years ago), resulting from obliteration by an erupting volcano. This sample has been dubbed the 'Jehol Biota', and represents the assemblage of fossilised animals and plants that once lived in Liaoning Province in northeast China. The collection includes fishes, amphibians, reptiles, and mammals, as well as basal flowering plants. Amongst the reptiles there are a few specimens of feathered dinosaurs, exquisitely preserved in slabs where feather prints have been captured. Specimens of now well-known dinosaurs include *Microraptor* and *Confuciusornis*. Whilst the former is special because it has feathers present not just in its forelimbs but also in its hindlimbs, the latter is the earliest toothless beaked feathered dinosaur found to date.

After spending a couple of hours wandering through the museum, I asked myself, wouldn't it be nice to have the opportunity to see all these great animals alive? Well, some people have dreamed about it, such as in Michael Crichton's novel *Jurassic Park*. But beyond that, I may just settle for the dream and let my imagination travel back in time to the various times in the history of earth represented by the various fossils in front of me. I then realised how wonderful life is, it is just not possible to fully describe its value, or why it is so important to us. Yes, animals and plants have provided food, medicine, shelter, clothes, and many other goods and services to our species now and well into our earliest origins. But standing in those halls, where the history of vertebrate evolution is right before my eyes, as I imagine pterosaurs soaring the skies, I reflect on the fact that maybe I don't wish any animal from the past to be back. After all, they are now extinct and that has been the unchangeable course of events on earth.

Instead, what I did consider is that as a society and individuals, we are extremely privileged to have the opportunity to be amazed by a time slice of the wonderful life's history as it happens. After all, standing in those halls full of fossils, which once were real animals, is like watching humpback whales breaching, or shorebirds departing in their arduous migrations. There is simply no explanation as to why we are amazed by life, I just feel elated about it. Maybe it is because the diversity of life, now and well into the past, is a story of fantasy, one where magic is even greater than in the most elaborate sci-fi novels. Partly perhaps because all that is left from animals in the past is primarily their skeletons, eggs, and footprints. I don't really need *Avatar* and other sci-fi movies to let my imagination fly. To me it's enough to read books about vertebrate palaeontology, or visit museums of natural history teeming with fossils.

After having visited those two museums of natural history, I can't wait now to visit and revisit some of the finest museums in Australia. Our country is also a great place to look at the past of life on earth, where many institutions have been collecting fossils since the 1800s. These efforts have resulted in large collections that represent really well the history of life from Australia and beyond, including dinosaurs, toothed baleen whales, and giant marsupials, to name but a few. Some of the greatest collections include the Australian Museum, the Melbourne Museum, and the Queensland Museum. Whilst most of their fossils are shelved away for research purposes, some of them are exhibited in public displays.



Hesperornis is a genus of flightless aquatic bird that lived during the Late Cretaceous period 80 million years ago.



Microraptor is a genus of small four-winged dinosaurs that lived during the Early Cretaceous 130 million years ago.

The environmental movement sometimes seems to have forgotten the very reason why we conserve biodiversity, mostly because we have been forced to construct narratives that try to legitimise conservation within a capitalist and neoliberal logic. But today, I have come to realise that I refuse to accept those narratives as hegemonic. I am simply blown away by the wonderful story of life on earth, and I feel grateful to have the

opportunity to witness a sliver of its history in real time. And for the same reason, I think we should all embrace and celebrate this opportunity.

Ed is a conservation biologist undertaking doctoral studies at the University of Queensland, where he studies the effectiveness of international policy for conserving migratory shorebirds in the Asia-Pacific region. His email is: e.gallocajiao@uq.edu.au



Microraptor zoomed in.



KANGAROO ISLAND

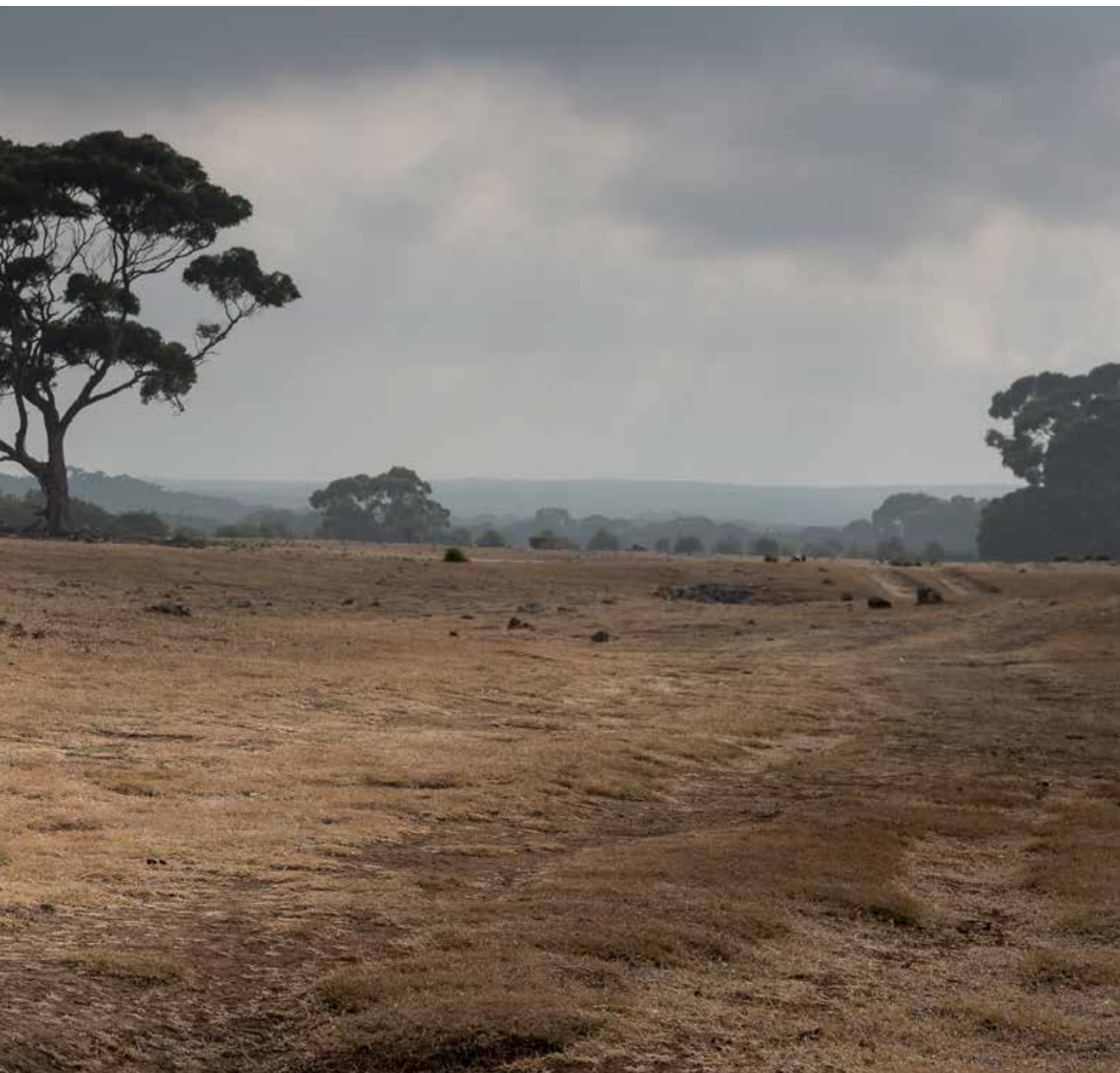
The issue of wildlife road trauma is not new to Australia or many other places in the world. However, many people who have been to Kangaroo Island (just off South Australia) are shocked by what they see on the side of the road.

Almost half of the island is still covered in natural vegetation, and around a quarter of this is protected in national parks, conservation reserves and wilderness protection areas, the five main ones being:

- Flinders Chase National Park
- Seal Bay Conservation Park
- Cape Gantheaume Conservation Park
- Cape Bouguer Wilderness Protection Area
- Ravine des Casoars Wilderness Protection Area

Kangaroo Island's wildlife has escaped the effects of foxes and rabbits due to its isolation from mainland Australia,

and domestic cats are required to be registered and microchipped. Native animals resident on the island include the Kangaroo Island kangaroo, tammar wallaby, southern brown bandicoot, Rosenberg's sand goanna, common brushtail possum, short-beaked echidna and New Zealand fur seal, as well as six bat and frog species. A small marsupial carnivore (the Kangaroo Island dunnart) is the only endemic vertebrate, and koalas, common ringtail possums and platypus have



FAST ROADS, SLOW DEATHS

Suzanne Medway

all been introduced from mainland Australia. The koala population has grown so much that their preferred food, the manna gum, is on the brink of local extinction.

Lauded as one of Australia's premium wildlife destinations, each year nearly 200,000 visitors arrive on the island by plane or ferry, and most will then explore the island by road. The Kangaroo Island kangaroo is a subspecies unique to the island and,

with no natural predators, is the slowest moving of all kangaroo species. Each year hundreds of these kangaroos and other native wildlife (some listed as endangered) are killed, maimed or fatally injured by vehicle collision.

It is estimated that in more than 50 percent of cases the animals are not killed on impact, and instead suffer slow and traumatic deaths either by the roadside or after limping into the bush. Unsuspecting tourists are

Above: A new day: Grassdale (a reclaimed farming property and now part of the Kelly Hill Conservation Park on Kangaroo Island, South Australia) is a secluded, safe and lesser-known gathering place for mobs of kangaroos. Some days you will see hundreds grazing in the fields, being lit by the early morning sun. On other days, you may find just a few.

All images are copyright © Doug Gimesy



Caring for Joey: each year thousands of kangaroos and other Australian wildlife are killed or fatally injured by vehicles, often dying slow and traumatic deaths, having been clipped but not immediately killed. If someone stops and checks, sometimes joeys can be found still alive in their dead mother's pouch, and if lucky, can be rescued and cared for by dedicated people such as these Kangaroo Island residents, who look after them in their home until they are well and old enough to be relocated. The kangaroos here are 9–15 months old.

involved in a significant percentage of these collisions, being unaware that many Australian animals are more active in the hours between dusk and dawn.

Although it is a well-known fact that the likelihood of hitting kangaroos and other wildlife is greatly increased between dusk and dawn, Kangaroo Island has still not put in place any dusk-to-dawn speed limit reductions – even in the well-known 'hot spots'. The trauma is not just restricted to the wildlife – it also affects people, either in the vehicles involved, those who witness an impact or discover it after the event. As well as physical trauma, the effects can also be psychological. If an animal needs euthanising due to the extent of its injuries, professional help is often some time away. Australia's strict gun regulations and restrictions on using a firearm on or near a road unless authorised (e.g. by police) mean that animals are most



Sweet painted lady: in one small secluded region on Kangaroo Island Doug found a few with incredible face markings. No one is certain why some have developed this feature. One possible explanation is that this is the start of an evolving camouflage adaptation to help them blend more easily into their limestone and grassland environment. Photo by Doug Gimsey.

frequently euthanised using whatever rudimentary implements that may be at hand, such as a tyre iron or a nearby rock.

If people stop and check a kangaroo that has been killed, a joey can sometimes be found still alive in its dead mother's pouch. If they are old enough and triaged appropriately, these fortunate few have the potential to be adopted by a small group of dedicated wildlife carers who raise them in their homes until they have developed enough to be relocated.

When Doug Gimesy, the Australian-born wildlife and conservation photographer, and his partner first visited Kangaroo Island they were amazed by the natural beauty, but also shocked by the amount of dead wildlife lining the roadsides. What really upset them was the discovery that a lot of the 'roadkill' doesn't die instantly. Many animals go on to suffer slow, painful deaths on the side of the road or in the bush nearby.

With many species predominantly mobile from the late afternoon until early morning, the low visibility period that exists between dusk and dawn, with the addition of inflexible speed limits of up to 110km/h, collisions are



Jump for your life: kangaroos often jump out from the roadside bush into oncoming traffic. Fortunately in this instance, the car had been travelling relatively slowly, and had time to brake and allow the kangaroo to escape unharmed.

common occurrences. Indeed the issue of dusk-to-dawn collisions is so well known that Kangaroo Island is one of the few places in Australia where car rental companies actually place restrictions on driving during this period.

Whilst exact local figures are difficult to come by, the national annual rate of kangaroos being killed by car

strike is estimated to be in the tens of thousands. A recent government report notes that the majority of Kangaroo Island's car crashes occur at speeds above 100km/h, but many stakeholders seem resistant to lowering speed limits. In August 2016, the federal member for Finniss, Michael Pengilly, told the local newspaper, *The Islander*:



Taken in the night: a barn owl lies dead on the side of the road – the all too common but sad result of when vehicles at speed meet wildlife.



Peek-a-booo.

“Kangaroo Island residents do not need advice on how to deal with animals on the road at night. As a matter of course, Islanders take extreme care so as not to damage their vehicles or indeed their occupants. From an early age, country drivers across the nation are taught that you never swerve to avoid an animal for fear of crashing off the road and potentially causing harm or injury to themselves or the occupants of their vehicle. Visitors to Kangaroo Island are also advised to take ‘extreme precautions’ when driving at night. Kangaroo Island is a rural community with predominantly farming families and business operators who value their environment and lifestyle and they do not need to be told how to drive and at what speed to drive at on the roads at night time.”

Michael Pengilly has dismissed the introduction of dusk-to-dawn speed limits out of hand, calling them “out of touch with reality”!



The killing field: despite the well-known fact that many kangaroos and other native species are most active between dusk and dawn, sadly there is still no dusk to dawn speed restriction on Kangaroo Island as implemented in some other parts of Australia. This particular speed sign is just a few hundred metres from the boundary of the island's largest national park. It marks the beginning of nearly 100 kilometres of road that passes through dense kangaroo habitat as it heads towards the largest town on the island, Kingscote.

Shocked by the amount of road trauma and roadkill, in 2014 Doug decided to undertake a photo-documentary to try to highlight the issue and get some change – including the introduction of dusk-to-dawn speed limit reductions in known ‘hot spots’.

He believed this was purely and simply an ethical issue, and that by not actively addressing this problem, the state government and local council were not doing everything they should to minimise wildlife suffering.

Taken over a two-year period, his ‘Fast roads, slow deaths’ series covers a range of issues, from the trauma that occurs, to the beauty of the island and the love and caring some people give to those animals whose injuries are the result of vehicle impact.

Dark, eerie and confronting, Doug Gimesy’s ‘Fast roads, slow deaths’ photo series is garnering international attention on the issue of car accidents on the wildlife-heavy Kangaroo Island. The series aims to capture not just roadside bodies, but the longer sustained trauma inflicted on kangaroos and other animals.

One poignant image titled *The Killing Field* recently took out the Our Impact category of our own 2016 Australian Geographic Nature Photographer of the Year awards. Most recently however, his images have received international attention, with the photo titled *Caring for Joey* making the finalist of the annual Wildlife Photographer of the Year competition, currently being shown in Britain’s National History Museum in London, and will be touring the world and coming to Geelong and Sydney in 2017.

Doug and his videographer partner (Heather Kiley of Snowgum Productions) have also edited together a brief video that catalogues the emotional toll just one wildlife roadside incident can have on a wildlife carer. The video is available at watch ‘Roads of distress – Sandy’s story’ on Vimeo.

For more information, or to sign the petition to help reduce roadkill, please visit <http://www.kiwildlifetrauma.com/>



Sudden impact.



Silenced.



Fallen.

BEHIND THE SCENES

OF A WILDLIFE RESCUE GROUP



Volunteer-run organisations such as AWARE Wildlife Rescue work tirelessly to not only rescue and rehabilitate wildlife, but to increase community awareness of the challenges to their survival - and how everyone can help.

MAGGIE CHEN AND SHARON BONDY

The phone doesn't seem to stop ringing at wildlife carer Gillian Donath's place. The long-time AWARE Wildlife Rescue carer often mans AWARE's hotline, which the public can call to report sick, injured or orphaned wildlife 24 hours a day. It's a task that requires wildlife knowledge so that on-the-spot advice can be provided. The organisation's volunteers often rescue and transport animals so that they can receive urgent veterinary care, before being taken to a wildlife shelter where they will be nursed back to health. Gillian, who is also AWARE's vice president and runs the Warrawee shelter in Langwarrin in Victoria, gets hundreds of calls a year and cared for about 1,000 animals in 2016.

Founded by five wildlife carers (including Gillian) and two rescuers in 2005, AWARE is one of the many small volunteer-run not-for-profit organisations dedicated to the rescue, care and rehabilitation of wildlife across Australia. Covering Bayside and the cities of Frankston, Kingston and Casey - south-eastern bay areas of Victoria - the group's coverage is only limited by where they have people to rescue and care for animals, says Cinzia Giannelli, AWARE's Secretary. "There's a lot of areas that are not covered, because of the lack of carers and rescuers," she adds.

On an early spring morning in late September 2016, someone has called about a fledgling that has been found. Gillian endeavours to ascertain the condition of the bird. "Is it standing? Is it walking?" she asks. Sometimes young birds just stray from their nests for a bit - in which case they just need to get back as soon as possible and

they shouldn't be taken unless they are injured, Gill explains. "Every bird has to go through the 'learning to fly' stage."

Warrawee, on just over one hectare of land, is temporarily home to over 60 animals, including lorikeets, a kookaburra, ducks, tawny frogmouths, seagulls, magpies, brushtail and ringtail possums, kangaroo joeys, a turtle and a wallaby. "She spends all night feeding young animals," says AWARE volunteer rescuer Nicky Rushworth. "She's so dedicated and passionate." With dozens of animals to feed and many enclosures to clean, Gillian needs several shelter helpers to assist her each day.

Gillian specialises in birds, having looked after over 80 different species. "You never stop learning," she adds, citing where and what different birds feed on and how best to rehabilitate them as examples. "We do it because we are losing our wildlife," says Gillian. "It's about just trying to keep species going; keep viable populations out there. And we have such a diversity in our region."

Wildlife groups do more than you may realise

While people may consider AWARE volunteers to be primarily involved with the care and release of wildlife, AWARE provides a far wider range of services than most people initially recognise or appreciate.

In addition to providing volunteer wildlife rescue and rehabilitation, the group is big on educating the community, with volunteers also

spending considerable time educating the public about wildlife. They provide information to the public in one-on-one conversations when they respond to phone calls on the wildlife emergency hotline and regularly hold information or education events on raising the awareness of the impacts of humans on wildlife (e.g. by offering improper food) and offer easy solutions to reduce negative impacts and empower the local community on helping wildlife survive urban habitat (e.g. wildlife-friendly fruit tree netting, guides to creating wildlife-friendly gardens, etc.). Sometimes after seeing AWARE rescuers in action, AWARE is asked to educate a local group on what they do (e.g. in October 2016 AWARE ran a free workshop on wildlife rescue techniques for the staff at the Cranbourne Botanical Gardens).

"Conservation is a major part of our work," says Cinzia Giannelli, AWARE's Secretary. "This is why our education component - with scout groups, schools and anybody who's interested - is extremely important. We teach the value of our natural environment. Once it's gone, it's gone - you can't get it back. Everything's interconnected. We can't be saving and rehabilitating animals if there's no environment to put them back in," says Cinzia.

One major concern has been loss of habitat. Urbanisation has a huge impact on the environment, with the demolition of old houses and the removal of vegetation to make way for new developments, remaining animals have been over-browsing some areas because they've got nowhere else to go, says Gillian. "We're cutting

down the trees with hollows. We've got more animals in the world that need a hollow to breed than any other country: a lot of our parrots, our microbats, brushtail possums and sugar gliders are all originally from tree hollows."

Paving or decking areas and using ornamental, non-native plants can deprive wildlife of their food and habitat, says Gillian. Paved areas mean dead soil, where there are no worms or insects for birds to get. This affects the whole food chain. But there are ways in which people can make a difference. All of us can help ensure the survival of our native fauna by planting local native species in our backyard. "Most councils have indigenous native nurseries now, especially along the Peninsula area," says Gillian.

Another concern is the loss of wildlife corridors, which connect remnant areas of bushland. This has resulted in animals such as koalas found travelling on freeway overpasses. "The animals will follow the path they've always followed," said Cinzia. "They don't stay put in their own area. They're wild animals; they will do what they have always done and roam."

AWARE encourages responsible pet ownership (it recently had a marquee at the Frankston Pets Day Out), safe driving in areas where wildlife roams (it's been working on getting more wildlife-related road signs up) and how to help out wildlife during heatwaves. "It's about people appreciating what's there," says Gillian. "We think it's important to educate people that these animals are not pests, they're just trying to survive and were here before you," says Nicky.

In addition to AWARE's talks to local schools and scout groups, they educate and support professionals working with domestic animals about wildlife.

In November 2016, AWARE held a free wildlife first aid course featuring well-known Adelaide-based veterinarian Dr Anne Fowler. The course educated those who assess injured animals (vets, vet nurses, wildlife carers and zoologists) on how to handle, assess and give first aid treatment to injured wildlife.

People concerned about injured wildlife often do contact vets



Juvenile joey kangaroo - orphaned when its mother was hit by a car in Cranbourne, Victoria. Photo courtesy of Kim Croker.

and other groups who work with domestic animals. While some of these professionals may have limited knowledge of, and experience with, wildlife, most have limited experience in the safe and appropriate handling and assessment of wildlife, says Sharon.

"If we can better educate and support vets and vet nurses, the animals will come into our care [in better shape] and will have a better chance of survival," says Sharon. Over 100 people attended the fully booked workshop, including carers from other wildlife groups who would not have otherwise been able to afford such a course.

Sharon Bondy, AWARE's president, describes how AWARE sometimes gets urgent calls from project managers on construction sites who see native animals in harm's way. By law, such

animals are protected and AWARE volunteers can be called in to rescue such animals. Performing rescues on construction sites often requires the rescuers to hold a 'white card' for access to the site and may also require a 'working at heights' certificate to reach animals high up on construction sites, for safety reasons, she adds. These courses required by volunteers are paid for by AWARE.

"Human intervention is making it difficult for animals to survive," says Nicky. "Cars are hitting them and cats and dogs are attacking them. We've been seeing some unusual behaviour as we encroach more and more onto their environment." For example, they recently saw a ringtail possum out during the day, despite it being a nocturnal animal, says Nicky. "Competition for food sources is so great at night that they're



Tawny frogmouth found entangled in a barbwire fence in Sandringham, Victoria. There was some damage to feathers but it only required some 'clipping' of the damage and was successfully released that evening. Photo courtesy of Kim Croker.

breaking all their natural instincts by looking for food during the day. It's heartbreaking."

Collaboration for the best outcome

AWARE works with other rescue and environmental organisations, such as the Frankston Environmental Friends Network, as well as vet hospitals, vets and park rangers. Some calls to AWARE come via other organisations, such as Wildlife Victoria which sends out SMS messages to volunteers of various Victorian wildlife rescue organisations to see which one is best placed to assist an animal, says Sharon. Once an organisation responds to this SMS, it receives an email with more details of the animal reported, and then contacts its own volunteers to see which rescuers, transporters and carers may be mobilised to help out the animal.

But as in a human medical emergency, time is of the essence in a wildlife emergency, so AWARE always stresses to those in their area of coverage, if they see wildlife in distress to call AWARE's hotline directly (Ph.: 0412 433 727), to reduce the time between when a call is received and when a rescuer can be mobilised to help an animal, says Sharon. It's important



Boobook owl rescued from a swimming pool fence in Hampton, Victoria, by AWARE. It was chasing prey and became stuck under the clear glass pool surround. Photo courtesy of Kim Croker

that a local group becomes involved as quickly as possible, as they have specific knowledge of local wildlife as well as the local area. AWARE's hotline is manned by trained volunteers 24 hours a day, 7 days a week.

Fundraising and volunteer support

The public is often not aware of the benefits of wildlife rescue and rehabilitation, including the many public services that wildlife rescue groups provide free of charge. Commonly, the public does not realise that there are no government authorities that include rescue and rehabilitation of wildlife in their activities.

AWARE Wildlife Rescue was formed to assist rescuers and carers who take on significant costs and efforts to help Australia's wildlife. It relies on grants, memberships, fundraising efforts and donations to keep going.

The group's biggest single expense is food: it spends about \$30,000 a year just to feed the animals it cares for, says Sharon. A huge variety of food is required, much is specialty food and very expensive, e.g. milk powders for marsupials and live food such as meal worms. Pelican food can be particularly pricey; it costs \$20 a day to feed them, says Gillian. Other expenses include petrol and volunteer-training (ranging from technical training on wildlife assessment and care to courses such as those legally required for rescuers to attend rescues on construction sites).

"We always need more volunteers," says Sharon. Because human population and building has been growing in our area, and our native wildlife continues to get pushed out of its natural habitat, we are seeing more injured, orphaned and displaced animals as a result. Volunteer roles include rescuing, transporting, caring (by running a wildlife shelter) and being a 'shelter helper'. While requirements vary from state to state, in Victoria, carers need to be licensed to run a wildlife shelter, explains Gillian. Shelter helpers who assist with cleaning enclosures, food preparation and washing can learn about what each species of animal needs. AWARE's busiest times are in spring and summer, when many baby animals are born and there are



Seal juvenile on Frankston beach, Victoria, monitored by AWARE volunteers for several days until it returned to the bay. Photo courtesy of Kim Croker.

many heat stress events. In a recent heatwave, over 50 ringtail possums had to be helped within 24 hours, says Gillian.

"Not all our volunteers need to be on the front line with animals," says Sharon. Other ways in which people can volunteer include manning the rescue hotline (after receiving training from AWARE), assisting at events and fundraising efforts, helping with social media, growing native grasses and other food (such as mealworms) for animals, making hollow and nest boxes for possums and birds, knitting

hand puppets for feeding orphans, and sewing joey pouches.

Gillian, whose love of wildlife was fostered when she went camping as a child, started out as a foster carer for a shelter over a decade ago. Rescuing and caring is not easy. Bites and scratches can happen. Some young animals need feeding every two to three hours and months of care. "You have to be emotionally and physically strong," says Nicky. But the rewards can be priceless. "There is no greater feeling than putting an animal back in the wild," says Gillian.



Alas, poor frog... CAIRNS FROG HOSPITAL

Wildlife rehabilitators do such an important job with a wide variety of Australian species but what is happening to the country's frog populations is quite the 'next level'. The concept of frog rehab is still a new venture for many wildlife rescue groups and some have probably been dragged into it because the calls keep coming in from the public about sick and dead frogs in their yards. It is a very difficult area to get into if you are new to it.

It is 'old hat', however, for one lady up in Cairns, far north Queensland. Her name is Deborah Pergolotti and she started the small non-profit Cairns Frog Hospital back in August 1998. Early on, even other frog conservation groups would ask her, "Why would you bother rescuing frogs? They lay so many eggs in each clutch" – but those questions fell on deaf ears. Deborah KNEW this activity was going to be critical – possibly more so than for any other native wildlife that rehabbers assist.

Cairns is an excellent place to kickstart a new operation focussing on frog health. Immediately after the chemical group neonicotinoids hit the local market, residents started to report sick and dead white-lipped tree frogs (*Litoria infrafrenata*) in their yards. The next year, the numbers got worse. Coincidentally, Deborah was trying to recover from chronic illness and was looking for something constructive to do from home. Having been involved with the Sydney-based Frog and Tadpole Study Group before relocating north, a frog project was what she set her mind to. Knowing how rapidly a frog species can go from common to extinct when a new pathogen arrives was the guiding base principle.

This setup would include learning to match clinical symptoms with health problems and trialling what techniques would repair different illnesses and injuries. Because the animals come in directly from the public, it is also a very useful disease surveillance exercise which allows Deborah to know many

months earlier than the government when a new problem starts affecting frogs.

There are so many reasons why frog rescue is important and should be taken up by rescue groups all around the country. In the tropical north at least, much of the decline has been pinned on chytrid fungus, but it is almost non-existent on the tropical coast so there are other reasons for the Cairns coastal area having lost approximately 95 percent of its frog population since 1997. Loss of habitat is always part of the situation for any declining species but what is actually happening to Australia's frogs is almost certainly down to rampant chemical use – especially the neonicotinoids which came on the market in 1996.

Above: Another freak occurrence which the lab said wasn't cancer but they didn't know what it actually was.

All photos are the copyright © Pergolotti / Frog Safe, Inc.

The value of rescuing frogs is that it provides firsthand information about what is actually happening to the animals. The frogs that come into the Cairns Frog Hospital have everything from bacterial infections, viruses, heavy loads of parasites and protozoa, flesh-eating disorders, several types of cancer and malformations. They are clearly immune-deficient. They also have a range of injuries but the majority of injuries have been incurred because the frog is sick and in the wrong place at the wrong time. These are not conventional problems and require careful handling, a lot of attention to disinfection procedures, and a great deal of experience in recognising the subtle clinical symptoms and how they might overlap when the animal has several concurring pathogen problems.

Eighteen years and nearly 3,000 adult frogs later, the Cairns Frog Hospital is now consulted by veterinarians, keepers and rehabbers around the country (and even overseas!) to assist with diagnosing amphibian health problems. The indications of this work point to a glaring need for extensive toxicology work on amphibians to prove which chemicals are involved in disabling their immune system. Only after those questions are answered will it be possible to slow and eventually reverse the decline in amphibians.

The Cairns Frog Hospital does not get government support and exists strictly on business sponsorships and public donations. Their website – www.frogsafe.org.au – is packed with information.



One of the most common cancers in local frogs has been squamous cell carcinoma.



Flesh-eating disorders are another common problem.



Malformations are centred around bone abnormalities where they appear to be 'rubberised'.



A common malformation is for one or both eyes to be missing.



BAMBOO the eco-friendly, climate-change mitigation material of the future!

Kit Prendergast, PhD student, and zoologist and conservation biologist (BSc Hons, First Class)

Introduction

Most people associate bamboo with giant panda fodder. And true, bamboo is absolutely critical to the preservation of this icon of conservation biology: the long-term conservation of this loveable black-and-white Asian vegetarian bear necessitates the preservation of large tracts of bamboo forest. Yet bamboo has a much greater range of applications; indeed, this plant's versatility, growth characteristics and high carbon storage potential points to the need to publicise and increase its cultivation as human demand for natural resources increases and simultaneously, as climate change mitigation schemes are increasingly urgent.

Bamboo comprises an incredible estimated species diversity of over 1,400 species, in 115 genera. What is truly remarkable is that bamboos are

actually a type of grass! Bamboos are flowering, perennial evergreen plants in the subfamily Bambusoideae, within the grass family Poaceae. Evolving in the warm climate of the Cretaceous in Asia, this region remains the hotspot for bamboos. Nevertheless, the various species of bamboo can grow in a range of climates, from the tropics to temperate regions, and also thrive in the Australian environment.

The unusual flowering phenology of bamboo

Bamboos are highly unusual in their flowering phenology: cohorts flower simultaneously in a mass-flowering event lasting several years, yet such flowering events only occur once every 65 or 120 years. The record is for *Phyllostachys bambusoides*, with a flowering interval of 130 years. Plants produced by clonal propagation, even if transplanted to different

geographic regions, will still flower simultaneously. Once the mass-flowering occurs, the entire cohort then dies. The lack of environmental cues indicates that there is an 'internal' genetic mechanism that signals plants of the same cohort to cease growth and instead direct all energy into flowering. It has been hypothesised that this unusual lifecycle has evolved in response to native rat predators that eat bamboo fruits: the simultaneous mass flowering means that predators will become satiated and will be incapable of ever consuming all the fruits, and the long flowering intervals means that predators can never increase numbers sufficiently to have a severe impact on the bamboo.

Above: A stand of *Dendrocalamus asper* (commonly known as 'Hitam') bamboo growing at a bamboo farm in the Northern Rivers region of New South Wales. Photo: Mark Donald.

Bamboo's incredible growth, productivity and carbon storage capacities

Bamboo is one of the fastest growing plants on earth. In fact, bamboo has been reported to grow 91 cm in a mere 24 hours. Growth rates, however, vary according to species, and soil and climatic conditions. Some species can grow up to 30 m, reaching 30 cm in diameter. Bamboo's fast growth not only makes it a highly useful resource for a variety of purposes for human industry; its rapid biomass accumulation also is an indicator of bamboo's high capacity for fixation, capture and sequestration of atmospheric carbon; consequently, bamboo has great potential in contributing to climate change mitigation. Because the process of photosynthesis not only draws CO₂ out of the atmosphere but also generates oxygen as a by-product, bamboo stands have been described as "natural oxygen bars". Rapid growth also means that bamboo has a high net primary productivity (12–20 tonnes per hectare per year), and despite regular selective harvesting, the plantation still has a standing carbon stock, representing a living ecosystem that continues to grow.

These characteristics make bamboo the ideal plant for carbon mitigation, carbon farming, and carbon sequestration: its capacity to convert solar radiation into useful goods and services is superior to most tree species, and research has confirmed that bamboo outperforms fast-growing trees in its rate of carbon accumulation. For example, International Network on Bamboo and Rattan (INBAR) reports that bamboo biomass and carbon production may be seven to 30 percent higher compared to the fast-growing trees such as *Eucalyptus* species. As a carbon sink, bamboos have significant advantage over other biomass resources for carbon sequestration due to the diversity of bamboo species, their vigorous growth, early establishment, adaptability to various soil and climatic conditions, short harvesting period, sustainability in yield and the multitude of uses harvested products can be put towards. An added benefit of this fast growth is that it can be harvested without destroying the hundreds of years that large, old-growth trees take to accumulate carbon, with the concomitant destruction of centuries-



A sweet red-necked wallaby (*Macropus rufogriseus*) peeping out behind bamboo stands at a pristine bamboo property in the Northern Rivers region of New South Wales. Photo: Kit Prendergast.

old ecological legacies. In fact, the frequent (often annual) harvesting regime of bamboo is certainly superior in terms of ecological sustainability because there remains standing carbon stock in the ecosystem, as well as habitat for fauna, and root systems to maintain soil health and integrity, unlike harvesting of other forestry species like fir, pine and eucalypts that involves clear-cutting after an extended period of growth, which removes all above-ground carbon stock. In contrast to other tree plantations that are subject to the environmentally damaging practice of clearfelling when the plantation reaches maturity, about two-thirds of the above-ground total carbon, and all of the below-ground carbon, remain on site after harvesting bamboo. This owes to the unique growth form of the bamboo, so that even if the bamboo stems are harvested, the underground carbon is not lost into the atmosphere (a net carbon emission), and the plant itself continues to live.

Bamboo's high regrowth capacity, and hence its high carbon sequestration capacity, provides benefits to harvesters as well as entire ecosystems.

Bamboo needs to be recognised in climate mitigation schemes, for it can generate tradeable amounts of carbon under CDM (Clean Development Mechanism) and REDD (Reduced Emission from Deforestation and

Forest Degradation) schemes. In contrast to tree cutting and removal of biomass from non-bamboo forests, which is recognised as being clearly unsustainable under REDD, selective harvesting of bamboo does not affect the productivity of the bamboo forest, making it one of the most sustainable resources around.

Bamboo as a multipurpose sustainable resource

Accumulating research confirms the importance of bamboo as a multifunctional natural resource, providing human livelihoods and socioeconomic benefits, as well as ecosystem services that are beneficial to natural processes that underpin ecosystems, as well as providing goods and services that are more directly orientated to benefitting humans, including materials and food; regulating ecosystem processes that are important for human well-being and health like climate and erosion control; provide for social and cultural activities; and provide for economic benefits through revenue created by bamboo products. These ecosystem services include ones that promote the resilience and functioning of natural processes, as well as those that benefit humans – namely provisioning, regulating, socio-cultural and economic services. These services stem from the growth form of bamboo: bamboo forests have an extensive



A mixture of various bamboo species flourishing on a bamboo farm, located in the Northern Rivers Region of New South Wales. Photo: Mark Donald.

rhizome system, a thick litter layer, and a dense canopy – characteristics that create a high capacity for erosion control, soil and water conservation, landslide prevention, riverbank protection, and for serving as a windbreak/shelterbelt.

Bamboo also provides habitat for biota. Apart from supporting species of key conservation concern in their native ranges that are bamboo dietary specialists such as the giant panda (*Ailuropoda melanoleuca*) and the unrelated red panda (*Ailurus fulgens*, most closely related to mustelids like

racoons, weasels and badgers rather than bears), bamboo also supports a diversity of biota wherever it occurs. Bamboo provides food and habitat for numerous species of insects in the soil and tree layers, as well as for spiders, butterflies, birds and other vertebrates.

An additional benefit of bamboo in reducing the environmental impact of harvested plants is that unlike other cash crops, bamboo requires little fertiliser and pesticides for its management. Fertilisers are known to reduce biodiversity and contribute to eutrophication of waterways. Pesticides



Dendrocalamus asper (commonly known as 'Thai green') growing at a bamboo farm in the Northern Rivers region of New South Wales. It is a key species grown to produce shoots for human consumption (where it is economically important especially in Thailand). The culms are also used in construction, for producing chopsticks and toothpicks, and for pulp. Photo: Mark Donald.

have been repeatedly demonstrated to cause deaths of non-target organisms, including valuable pollinators and predators of pests, which can have severe repercussions for entire ecosystems when these insects are depleted by pesticide applications. Bamboo can also be turned into a natural, organic ecosystem-friendly fertiliser in the form of biochar, which when applied appropriately, enhances agricultural productivity in nutrient-poor soils. Moreover, bamboo biochar application accrues longer-term benefits owing to high nutrient retention and the reduction of leaching of nutrients such as nitrogen, which therefore reduces eutrophication associated with most fertiliser applications.

Bamboo uses

Bamboo has been cited as being used in more than 1500 applications; but really, it seems the range of purposes bamboo can be used for is only limited by the imagination! Bamboo is used in construction, housing, furniture, flooring, packaging, for musical instruments, in bikes, as a component in hair products (I can vouch that these do produce luscious silky locks!), for clothing and textiles, toothbrushes, cutlery, mulch, food for both humans and non-humans including livestock, wine – the list goes on!

Bamboo is regarded as a high-quality construction material, with physical (mechanical) properties like high tensile strength, high flexibility and light weight often exceeding that of timber species. The durability of most bamboo products is advantageous not only to buyers, but also to the environment because high durability contributes to the overall storage of carbon in harvested culms. Bamboo products therefore can be labelled as 'carbon neutral'. In fact, under certain conditions, when the harvested bamboo is turned into durable products, the ecosystem can actually store more carbon than if it were not harvested, making it 'carbon negative'. Likewise, gasification of bamboo biomass to generate electricity also generates 10–15 percent carbon as biochar, making this process 'carbon negative'.

A major innovative way that bamboo can be used to promote biodiversity is by using the small bamboo rods as nesting substrates for native bees! Many native bees, including those in Australia like the reed bees (*Exoneura* species, family Apidae), carpenter bees

(*Xylocopa* species, family Apidae), leaf-cutter and resin bees (family Megachilidae), and some bees in the family Colletidae nest in small holes or cavities, which in nature are produced by wood-boring beetle larvae. Yet such holes can be of limited availability, and numerous studies have found that by increasing the number of cavities through creating 'bee hotels', this can boost native bee populations! To make a bee hotel, simply tie some small open-ended bamboo sticks together and hang them from a tree, ideally in a warm location and observe the female native bee occupants entering, stocking the bamboo with pollen and nectar, laying their brood, and then capping the end of the bamboo, keeping the nest protected until the next generation emerges!

Conclusion

Bamboo's significant role in climate change adaptation and mitigation, along with the plant's abilities to contribute to socioeconomic benefits for people in both developing and developed nations, and its provisioning of other environmental services, means that bamboo warrants increasing attention for farming, including carbon farming and trading of carbon credits. Although bamboo is growing in popularity in African and Asian countries, there is a need to boost the recognition of bamboo and bamboo products in Australia so that we can move towards more sustainable patterns of resource use.

Fun bamboo facts:

- Bamboo has played important roles throughout human history. A few noteworthy key historical examples include how bamboo: (1) was used as the carbonised filament by Thomas Edison, inventor of the lightbulb; (2) was used as a phonograph needle by Graham Bell, who invented the first telephone; and (3) was one of the pioneering plants to first recolonise the area after Japan was devastated by the atomic bombing of Hiroshima.
- The tensile strength of bamboo can even exceed that of mild steel, and for certain bamboo species, compression strength can be stronger than that of concrete!
- Just recently in 2014, scientists discovered that two rare endangered Indian frog species, including the



Thriving stands of two popular clumping bamboo species *Bambusa lako* (commonly known as Timor black bamboo or Java black bamboo) and *Bambusa oldhamii* (commonly known as Oldhamii) growing in the Northern Rivers Region of New South Wales. Photo: Mark Donald.

Critically Endangered tiny (less than 2.5 mm) white spotted bush frog (*Raorchestes chalazodes*), rediscovered in 2003 after being presumed extinct for over 100 years, breed inside bamboo. This represented an entirely new reproductive mode in amphibians! Males enter the hollow bamboo culms through tiny slits where they then serenade to females. After mating, the female lays a clutch of eggs inside the bamboo – unlike most frogs, which lay their eggs in water. The eggs undergo direct development, with the tadpole stage confined to the egg, so that little froglets rather than tadpoles emerge at hatching. Unlike most anurans, the male frog is an excellent role model father, for he stays with the eggs to take care of them and protect them from predators and pathogens until they hatch.

- Giant pandas eat 12–38kg of bamboo a day!
- Three species of lemur (Genus *Haplemur*), the most endangered group of primates on the planet, all of which are endemic to Madagascar, dine almost exclusively on bamboo, in particular the giant Madagascar bamboo (*Cathariostachys madagascariensis*), which comprises 72–95 percent of their diets! Moreover, they all have evolved physiologies adapted to eating the cyanogenic (containing a cyanogenic glucoside

toxin) parts – young leaf bases, young pseudopetioles and young shoots (note that only new culms are toxic and are rendered edible for consumption for humans by processing).

- The Critically Endangered golden bamboo lemur (*Haplemur aureus*) was only discovered as recently as 1987. This highly adapted bamboo specialist has evolved with the physiological ability to consume the high levels of cyanide in young bamboo shoots, consuming the equivalent of 12 times the lethal dose of cyanide for most mammals on a daily basis!

Australian Bamboo Farm for Lease or Business Opportunity

Bamboo property for lease near Bonalbo, in the scenic Northern Rivers region, northern New South Wales. The bamboo can be utilised for any of this versatile plant's multiple purposes. Be part of the wonderful and increasingly popular bamboo industry, internationally recognised as a top-quality, eco-friendly and carbon-sequestering material with a huge greener-world potential!

Open to propositions with all proposals considered. Send all interests to: countrycharacter@gmail.com or contact mobile: 0418 124 463.

2016 University Student Grants Scheme winners

The Australian Wildlife Society's University Research Grants are scholarships offered to honours or postgraduate students at Australian universities. Each year, ten grants of \$1,500 are awarded. Grants are available for research projects of direct relevance to the conservation of Australian wildlife; plant or animal. Grants may be used for the purchase of equipment and consumables, travel expenses related to field research, or attendance at conferences at which you are presenting your work.

The Australian Wildlife Society is delighted to announce the winners of the ten grants of \$1,500 each to honours or postgraduate students conducting research that will contribute to the conservation of Australian wildlife. The winners for 2016 are:

HANNAH BANNISTER - The University of Adelaide
Project title: Identifying successful reintroduction techniques for brushtail possums (*Trichosurus vulpecula*) in a semi-arid environment

ANICEE LOMBAL - School of Biological Sciences, University of Tasmania
Project title: Re-establishment plan of Providence petrels (*Pterodroma solandri*) on Norfolk Island

DONALD McKNIGHT - James Cook University, Townsville
Project title: Do bacterial immune defences drive the recovery of threatened frog populations?

GARY PALMER - Griffith University
Project title: Seed predators in rainforests: What are they eating, and how are they influenced by forest fragmentation?

LAUREN ROMAN - Institute for Marine and Antarctic Studies (IMAS), University of Tasmania
Project title: "We've had a gutful of this rubbish"; Population-level effects of plastic ingestion in Australasian seabirds

EMILY ROY-DUFRESNE - The University of Adelaide
Project title: Mapping the distribution of the European rabbits (*Oryctolagus cuniculus*) in Australia using occurrence data from targeted and non-targeted field studies

MONIQUE SMITH - The University of Adelaide
Project title: Interactions between native and introduced grass species in the context of restoration of grassy habitats

PATRICK TAGGART - The University of Adelaide
Project title: Investigating correlates of *Toxoplasma gondii* infection to explain its higher seroprevalence on Kangaroo Island

JACK TATLER - The University of Adelaide
Project title: Spying on Dingoes in the desert – New insights into the behaviour energetics and resource selection of free ranging dingoes – *Canis lupus dingo*

LUKE TILLEY - The University of Adelaide
Project title: Potential impacts of Western Quolls (*Dasyurus geoffroii*) on in situ species at Arid Recovery





Re-establishment of Providence petrels (*Pterodroma solandri*) on Norfolk Island

ANICEE LOMBAL

PhD Candidate, University of Tasmania

Seabird translocations are being increasingly proposed during the past decade in response to the large number of seabird species threatened with extinction throughout the world (28 percent). Nevertheless, information on population mixing among seabird colonies is crucial in assessing the genetic risks posed by this method of conservation (e.g. reduced genetic variation, genetic load or outbreeding depression).

The Providence petrel (*Pterodroma solandri*) is IUCN listed as Vulnerable due to its restricted breeding range. The only significant breeding locality of this species of pelagic seabird (approx. 32,000 breeding pairs) is Lord Howe Island, a small island off the eastern coast of Australia. Providence petrels used to breed on Norfolk Island (approx. 1,000,000 breeding pairs) before becoming extinct after European settlement by the late 18th century. The species was considered extinct within the Norfolk Island group until 1986 when a small population (approx. 20 breeding pairs) was discovered on Phillip Island, seven kilometres south of Norfolk Island. Re-establishment of a Norfolk Island colony using Lord Howe Island individuals has been proposed to reduce the extinction risk of this species and to provide key nutrients for the regeneration of threatened native forests and associated species. However, this translocation may erode any distinctiveness of the small adjacent Phillip Island colony, which shows a specific behavioural adaptation to diurnal predators.

The study used molecular data to investigate genetic connectivity among Providence petrel colonies and quantify the age of divergence between populations in order to assess the maximum possible duration across which differences in roosting behaviour developed. Primary results show a high gene flow between colonies and limited risks associated with this conservation



Providence petrels at their nesting sites.



Anicee Lombal presenting her research on the re-establishment of Providence petrels on Norfolk Island at the Sixth International Albatross and Petrel Conference in Barcelona.

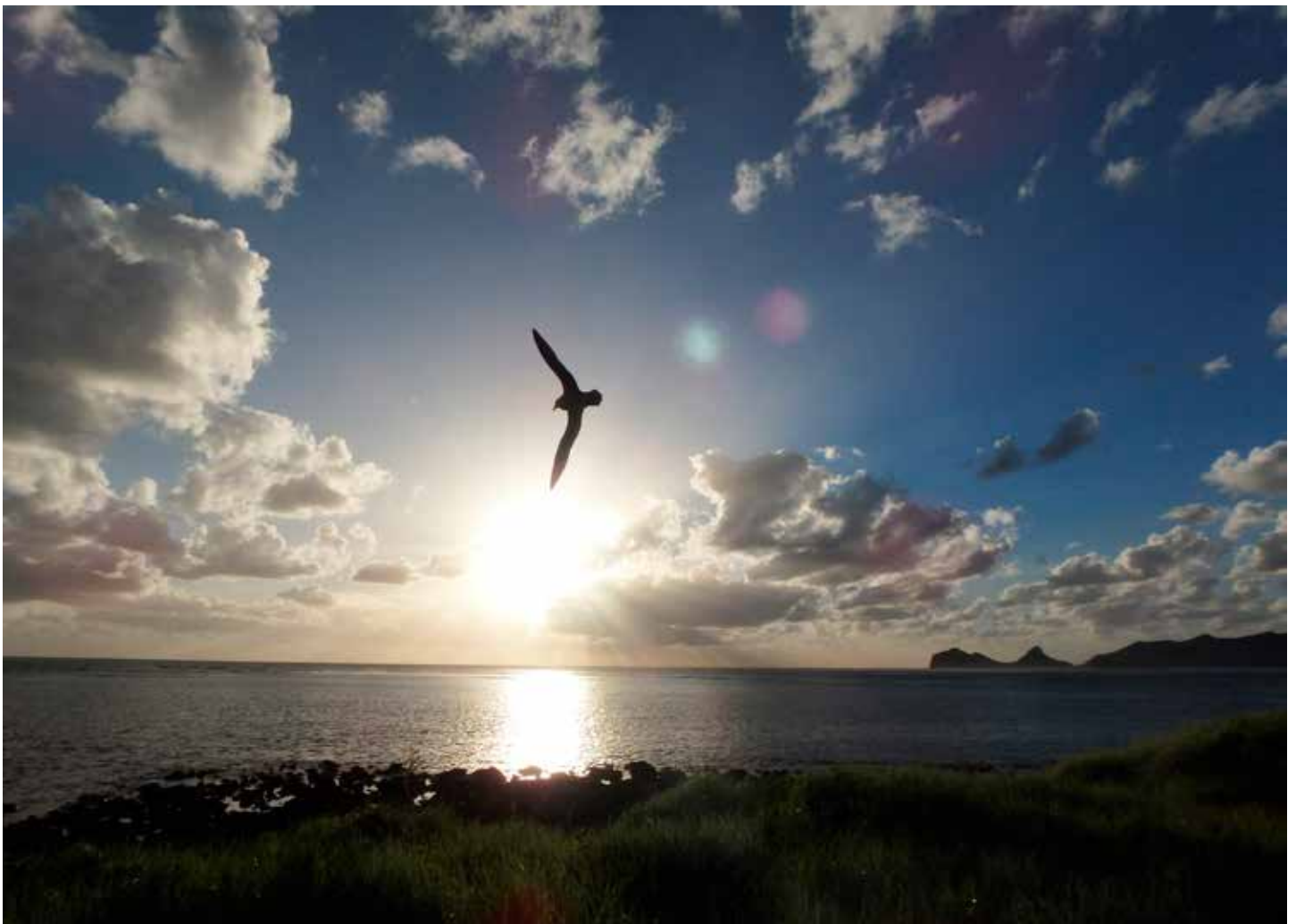


Anicee Lombal holding a Providence petrel on Lord Howe Island.

management plan. If this translocation occurs, the resulting increase in marine-sourced nutrients would assist in halting and reversing the decline of Norfolk Island's native forest and associated fauna, which includes many other imperilled birds (e.g. the endangered Norfolk Island green parrot (*Cyanoramphus cookie*)).

This study provides crucial information on an understudied Australian species, an indicator of human-induced change, which is fundamental to the understanding and management of our environment. The Australian Wildlife Society has assisted in conserving the Providence petrel by enabling the presentation of my research at the Sixth International Albatross and Petrel Conference in Barcelona. This meeting was a fantastic opportunity to interact with an international group of scientists with similar interests to my research topic in order to have access to their expertise on the re-establishment of this key species on Norfolk Island in the near future.

I thank the Australian Wildlife Society for its generous support.



Providence petrels flying around their nesting sites at dusk.



Mapping the distribution of the European rabbits (*Oryctolagus cuniculus*) in Australia using occurrence data from targeted and non-targeted field studies

EMILIE ROY-DUFRESNE

Adelaide University

Invasive species are a major driver of global change, presenting an enormous threat to biodiversity today and in the future. One of the most notorious introduced species in Australia is the European rabbit (*Oryctolagus cuniculus*). The rabbit is listed among the world's 100 worst invaders by the Invasive Species Specialist Group (www.issg.org). It was introduced on the continent with the First Fleet in 1788 and, since then, its populations have caused extensive damage to the Australian wildlife. The distribution and abundance of many native species of plants and mammals are considerably affected by the pressure exerted by the heavy presence of rabbits. This includes issues from competition, high population density, heavy grazing, and soil erosion. Their occurrence in Australia is considered a threat to the management and regeneration of native wildlife and wooded rangelands.

The presence of the European rabbit in Australia has been studied considerably since its introduction. Until now, scientists and expert managers have conducted close to 300 studies of the species. The aim of the majority of these studies was to investigate different methods to evaluate the rabbit population size and to measure the impact of control measures on its population density. Nonetheless, no attempt was made to model the distribution of rabbit populations in Australia using both climatic and environmental variables.

To remedy this situation, I recently compiled a large database which includes data from more than 100 studies describing over 50 years of rabbit occurrence in Australia. To estimate the rabbit geographical ranges, I used distribution models which statistically relate the

occurrence records of the rabbit to the environmental conditions found where those records were taken. I therefore matched the records in the database to climatic and environmental predictors, with the aim to document important trends in the distribution of rabbits in Australia. The datasets contained in the database come from diverse

sources. It includes data collected by biologists and management experts, data obtained from museums and state-based collections, and data collected by citizens as part of the Feral Scan program. While the collection of most of these data followed a pre-established scientific field protocol, others such as the citizen science data



European rabbit (*Oryctolagus cuniculus*), Freemantle, 2015. Photo: Michael Graham Stead (PhD student at Adelaide University).



Rabbit plague, Quinyambie Station North East, South Australia, 1988. Photo: Peter Bird.



Emilie extracting a rabbit from a trap during a capture-mark-recapture study with Biosecurity SA, Barossa Valley, 2015.

are opportunistic and do therefore not follow a standardised field protocol.

Although more recurrently recorded in online databases, the citizen science datasets in science remain a source of constant debate, especially when creating a model of distribution.

One of the main reasons for this is commonly referred to as sampling bias. Sampling bias occurs when a data sample is collected in such a way that one characteristic of the data is more frequently represented than the others. For instance, some sites tend to be visited more often than others

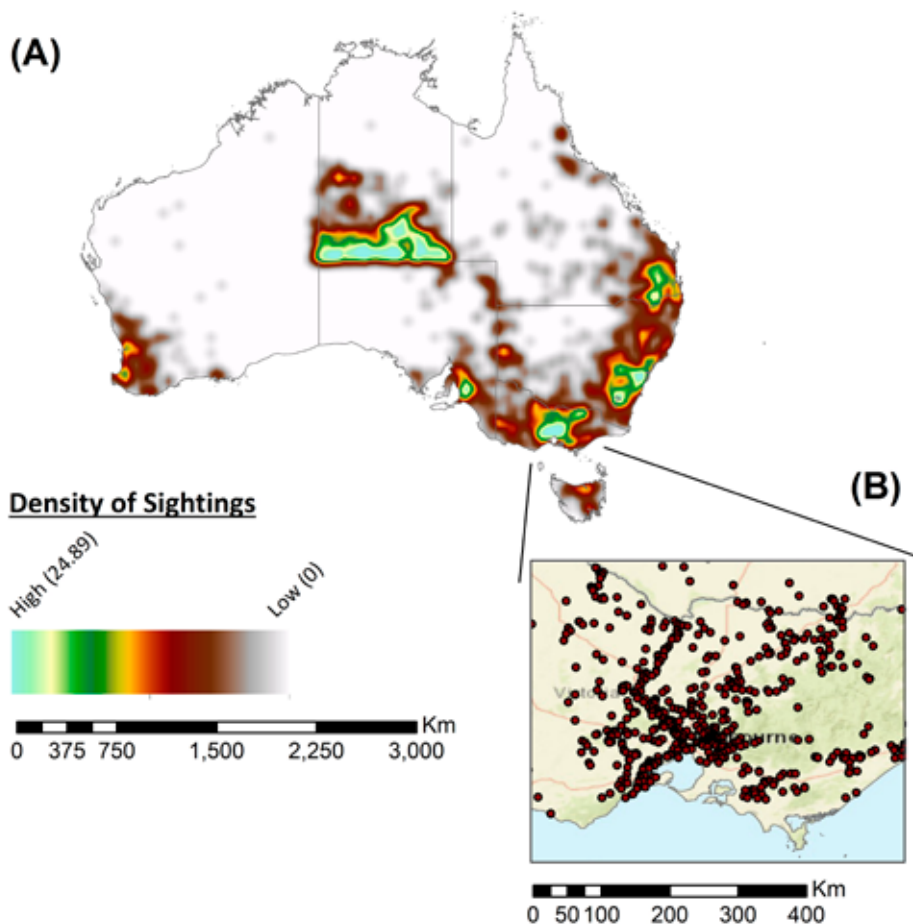


Figure illustrating: (A) The density of sightings from the citizen science program, (B) Sampling bias of the citizen data around the city of Melbourne.

because they are more accessible (i.e. near roads and towns) or offer greater naturalistic interests. In the case of the data obtained from the Feral Scan program, it is easy to identify major roads and cities in Australia while exploring the distribution of recorded sightings on a map. This sampling issue has consequences for the ecological information gleaned from the data and can lead to errors in a statistical model. The model will associate these regions with a higher probability to observe the species, while in reality the regions represent areas where more data were sampled. Nonetheless, the network of citizen scientists has the potential to observe species at a broad spatial and temporal scale, which would be logistically or financially unfeasible to achieve with traditional field sampling methods. Data contributed by citizen scientists therefore remain valuable for modelling the distribution of species, especially while attempting to cover an entire continent.

This research was driven by the need to model the distribution of rabbits in Australia in order to support the implementation of effective population control measures. In addition, the inclusion of a diverse range of datasets opened new avenues for modelling. Several methods are now proposed in the scientific literature to correct for sampling bias. The first objective of this research is therefore to investigate how data coming from opportunistic citizen science programs, such as the Feral Scan data, can influence the outcome of our distribution models. In this project I ask if, by controlling for the uncertainties associated with the provenance of this data, I can improve the accuracy of the models compared to models that ignore the additional data. The second objective of the research is to evaluate the potential role of opportunistic citizen data to fill spatial and temporal gaps in the datasets where no other type of data was collected, and again how it can influence the outcome of the models.

The outcomes of this research will have several significant implications. In terms of rabbit management in Australia, the results of the models will help experts understand the ecological characteristics of rabbit populations in their introduced ranges. Moreover, results will promote a better approach to the management and monitoring of the species across Australia. By

providing a map of where rabbit populations can be observed across the country, the project helps target control measures and consequently contributes to a reduction of the species' impact on native wildlife populations. The results from the models will also provide evidence on how uncertainties associated with citizen data sampling can be accounted and adjusted for in different distribution models.

I recently finished the calculations for statistical analysis to build and run the models and am currently in the process of analysing the results.

Thanks to the funding from the Australian Wildlife Society, I was able to present the first results of the analysis at the Australian Wildlife Management Society Conference in Auckland, New Zealand. I hope that by sharing this research, I will stimulate more discussions about the management of rabbits in Australia. At the same time, I am also excited at the opportunity to gain insights into the methods other research groups use to address the issue of spatial bias in citizen science data. I believe that despite these biases, it is important that we take advantage of the quantity of data accumulated and the efforts volunteers undertook to the benefit of science.



Rabbit warren characterised by heavy grazing and soil erosion, Barossa Valley, 2015.



Barossa Valley landscape



“We’ve had a gutful of this rubbish” The population level effects of plastic ingestion in Australasian seabirds

LAUREN ROMAN

PhD Program in Quantitative Marine Science,
Institute for Marine and Antarctic Studies,
University of Tasmania

Seabirds are the world’s most threatened group of birds, with nearly half of the world’s species experiencing population declines, and 28 percent are globally threatened. According to the IUCN Red List, of the 66 Australasian Procellariiformes (tube-nosed) seabirds, including albatross, petrels, prions and shearwaters, almost 40 percent are threatened with extinction. Understanding the threats to seabirds in their environment is critical to planning effective conservation and management strategies for these species if we hope to manage and reverse these trends.

Ingestion of plastics floating in the marine environment is a widespread emerging threat to marine birds who mistake the floating plastics for food. With an estimated five trillion plastic pieces floating in the world’s oceans currently, and more entering daily, the

threat floating plastics pose to marine birds only increases with time.

Despite the potentially significant conservation issue that marine debris ingestion poses to Procellariiformes globally, very little is known both of the extent of plastic ingestion among Australasia’s 66 Procellariiformes species, and nothing is known of population-level impacts globally. My PhD study aims to both identify the extent of marine debris ingestion across all Procellariiformes families, and model the impact of marine debris ingestion across Australasian seabird populations.

To survey marine debris ingestion in wild seabirds, we collect and perform necropsies on dead seabirds from a variety of sources. Many of the seabirds are collected dead on the beach, but we also are assisted by carcass donations of casualties from veterinary clinics,

museum collections and the carcasses of seabirds by-caught in fisheries. As we cannot patrol all beaches at all times, this study heavily relies upon volunteers throughout Australia and New Zealand to assist with collecting carcasses. We have been very privileged to have many interested people volunteering their time (and their freezers!) to assist us, including wildlife interest groups, park rangers, wildlife veterinary hospitals, museums and enthusiastic individuals throughout Australasia.

This year I was lucky to be selected for an Australian Wildlife Society University Student Grant to travel to New Zealand in September 2016 to collect and perform necropsies on seabird carcasses that had been collected by volunteers over the past 12 months. Bird carcasses were collected from across New Zealand from 90 Mile Beach in the north down to Invercargill in the south by the Ornithological Society of New Zealand’s Beach Patrol Scheme, Wildlife Management International, Auckland Museum, Te Papa Museum, Holistic Vets and a number of individual collectors. Hundreds of individual carcasses spanning 20 seabird species were collected, from the tiny diving petrel (*Pelecanoides urinatrix*) to the large white-capped albatross (*Thalassarche steadi*).

The timing could not have been better for collecting seabird carcasses. During August 2016, persistent winds and storms west of Auckland caused a mortality event (often called a ‘wreck’) of prions, which are small plankton-feeding seabirds. Prions are one of the seabird groups we are particularly interested in as they are a species we don’t often



Gizzard of a fairy prion containing hard plastic.

Above: Lauren measuring mixed seabirds collected by members of the Ornithological Society of New Zealand’s Beach Patrol Scheme.

receive in large numbers, but those we do receive often have plastic ingestion. This seabird wreck presented the perfect opportunity to examine the prevalence of plastic ingestion among prions. The wreck event affected mixed species of prions, predominantly fairy prion (*Pachyptila turtur*) and slender-billed prion (*Pachyptila belcheri*), with a small number of Salvin's prion (*Pachyptila salvini*), Antarctic prion (*Pachyptila desolata*) and broad-billed prion (*Pachyptila vittata*), with a total of about 300 beach-washed prions collected.

We found plastic ingestion among all prion species examined, all shearwater species examined, some petrels and to our surprise, none of the albatrosses. Salvin's and slender-billed prions took the cake for the most birds affected with greater than two out of three individuals containing ingested plastics. The highest number of items we observed in a single bird was a sub-adult male slender-billed prion who



Plastic items removed from the gizzard of a short-tailed shearwater.



Lauren at Auckland Museum with mixed species of beach-washed prions collected by volunteers throughout New Zealand's North Island.



Fairy prion at sea.



White-capped albatross



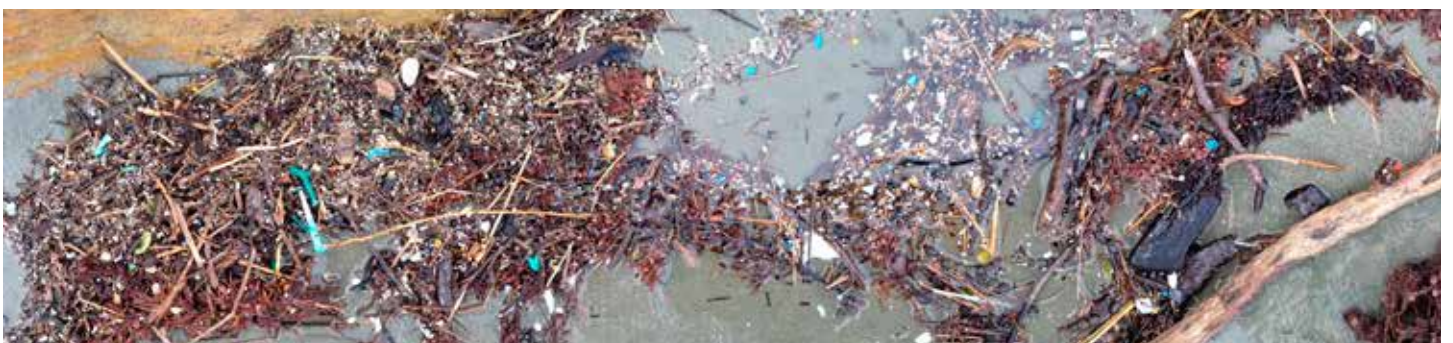
Juvenile white-capped type albatross at sea.

had ingested 21 pieces of hard plastic. An adult male short-tailed shearwater (*Ardenna tenuirostris*) took out second place with 19 items (mostly hard plastic). The largest item we found was a piece of blue balloon, also ingested by a slender-billed prion.

We are grateful to the Australian Wildlife Society and their contributors for the opportunity to travel to New Zealand to study plastic ingestion in these seabirds, adding valuable data to the picture of plastic ingestion in Australasian seabirds. We are also grateful to the collectors throughout Australia and New Zealand, as we could not do this valuable research without their contribution. For those who would like to follow the progress of this study, we have a Facebook page which we regularly update with photos and information about seabirds and plastic ingestion. You are welcome to follow the progress of this study at: <https://www.facebook.com/seabirdsdebris/>

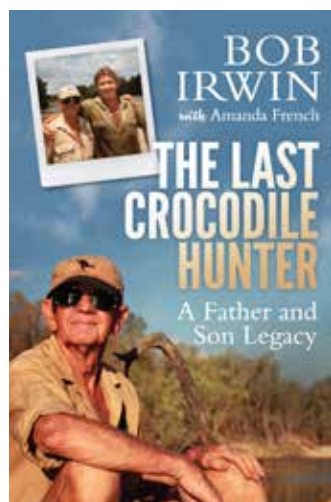


Short-tailed shearwaters at sea.



Plastic on the shore line of a New Zealand beach.

Book Reviews



The Last Crocodile Hunter - A Father and Son Legacy by Bob Irwin with Amanda French

There have always been conservation heroes in Australia's conservation history and Bob Irwin is definitely up there with the 'greats'.

Publisher: Allen & Unwin
RRP: \$29.99

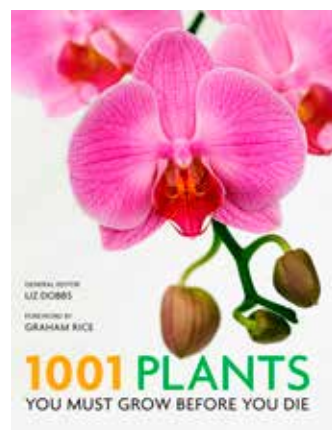


Cat Wars by Peter P. Marra and Chris Santella

Cat Wars paints a revealing picture of a complex global problem – and proposes solutions that foresee a time when wildlife and humans are no longer vulnerable to the impacts of free-ranging cats. This compelling book traces the historical and cultural ties between humans and cats from early domestication to the current boom in pet ownership, along the way accessibly explaining the science of extinction, population modelling, and feline diseases. It charts the developments

that have led to our present impasse – from Stan Temple's breakthrough studies on cat predation in Wisconsin to cat-eradication programs underway in Australia today. It describes how a small but vocal minority of cat advocates has campaigned successfully for no action in much the same way that special interest groups have stymied attempts to curtail smoking and climate change.

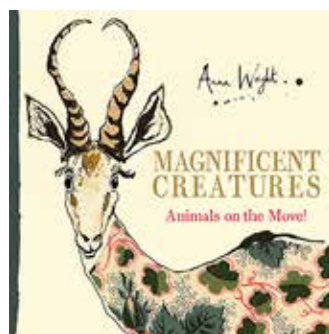
Publisher: Princeton University Press
RRP: \$24.95



1001 Plants You Must Grow Before You Die by Liz Dobbs

With so many plants in the world, this book helps you to navigate the myriad number of species and hybrids available and learn what to look for when choosing varieties. The plants in this book are featured for being particularly enjoyable or delightful – edible fruits, tender vegetables or fresh herbs, ornamental flowers, eye-catching foliage or plants with evocative scent. *1001 Plants You Must Grow Before You Die* features species suitable for the smallest spaces, from window sills to yards. There are also selections to provide seasonal interest in a suburban plot, as well as tasty edibles for vegetable patches and herb gardens. It will steer you through the hype of marketing to find the most rewarding plants – and, along the way, you'll discover what characteristics to look for when choosing varieties.

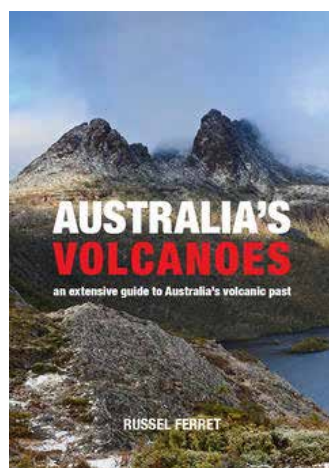
Publisher: Murdoch Books
RRP: \$49.99



Magnificent Creatures - Animals on the Move by Anna Wright

Anna Wright's stunning introduction to non-fiction and the natural world is enlivened by her gorgeously sophisticated and fun art style which mixes pen and ink, watercolour and fabric collage. Both educational and beautiful, Anna's unique picture book shows the character of these animals beyond their familiar forms. I loved the illustrations in this book; the animals are exquisitely illustrated with masterful watercolour washes.

Publisher Allen & Unwin
RRP: \$24.99

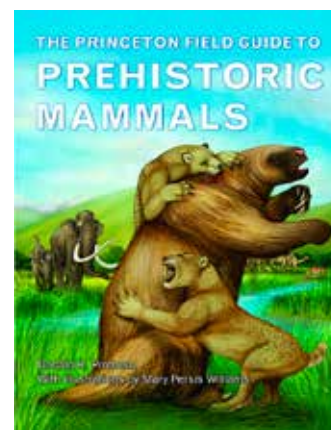


Australia's Volcanoes - An Extensive Guide to Australia's Volcanic Past by Russel Ferret

Australia's Volcanoes will take you on a journey of discovery through Australia's volcanic upheaval. The book explains what happened all those years ago to create the volcanic landforms that you see today, such as Mt Warning in New South Wales, Tower Hill in Victoria, Cradle Mountain in Tasmania, the Undara lava tubes in Queensland, the diamond deposits in Western Australia's The Kimberley and

Mt Gambier's crater lakes in South Australia, which are the result of volcanic activity from thousands to millions of years ago. Most of the sites featured are accessible by car or foot and maps are provided to help you find and explore them.

Publisher: New Holland Publishers
RRP: \$29.99



The Princeton Field Guide to Prehistoric Mammals by Donald R. Prothero

After the mass extinction of the dinosaurs 65 million years ago, mammals became the dominant terrestrial life form on our planet. Roaming the earth were spectacular beasts such as saber-toothed cats, giant mastodons, immense ground sloths, and gigantic giraffe-like rhinoceroses. Here is the ultimate illustrated field guide to the lost world of these weird and wonderful prehistoric creatures. This up-to-date, comprehensive and very readable book will delight academics and fans of fossils as well as anyone with an interest in general science. Prothero is a renowned expert in this field, with decades of experience working on diverse groups of prehistoric mammals.

Publisher: Princeton University Press
RRP: \$35.00

Australian Wildlife Society

(ACN 134 808 790)

Formed in 1909 and dedicated to the conservation of Australia's wildlife

*Patron: His Excellency General the Honourable Sir Peter Cosgrove AK MC (Retd)
Governor-General of the Commonwealth of Australia*



**Australian
Wildlife Society**

Conserving Australia's Wildlife
since 1909

108th ANNUAL GENERAL MEETING AGENDA

**Wednesday 1 March 2017
Commencing at 11.30am**

**1st Floor Meeting Room, NSW Masonic Club (Castlereagh Inn)
169 Castlereagh Street, Sydney, NSW**

1. Welcome and recording of those present.
2. To receive apologies.
3. Minutes of the 107th Annual General Meeting held on Wednesday 2 March 2016.
4. President's Report for 2016.
5. Treasurer's Report for 2016. Receive and adopt the Balance Sheet and Income and Expenditure of the Society for the year ending 31 December 2016 in accordance with our Constitution.
6. Election for the Board of Directors of the Society
 - a) Patrick Medway retires in accordance with the Constitution (10.3) and being eligible, offers himself for re-election
 - b) Clive Williams retires in accordance with the Constitution (10.3) and being eligible, offers himself for re-election
 - c) Christine Banks offers herself for election in accordance with the Constitution (10.5 (a) (b))
7. Vote of Thanks to retired Director Richard Mason
8. Appoint the Auditors for 2017
9. Closure.

Issued by authority of the Board of the Wildlife Preservation Society of Australia Limited Trading as Australian Wildlife Society.

Patrick W Medway AM
HONORARY SECRETARY/CHIEF EXECUTIVE OFFICER
15 January 2017

**All members are cordially invited to attend the annual President's
luncheon at the conclusion of the Annual General Meeting.**

National Office: PO Box 42, Brighton Le Sands NSW 2216

Tel: 02 9556 1537 Mob: 0402 435 049

Email: info@wpsa.org.au

Website: www.wpsa.org.au

Australian Wildlife Society

Cordially invite you to the

ANNUAL LUNCHEON

of the Society

Wednesday 1 March 2017

Commencing at 12 noon

in

Cellos Restaurant

Level 4, Castlereagh Inn Boutique Hotel

169 Castlereagh Street Sydney

RSVP by 25 February 2017. Booking and prepayment essential



Acceptance form:

I am pleased to accept your kind invitation to the Annual Luncheon.

\$.....for Tickets at \$55 per person
2 course - main, dessert and coffee. Wines, beer and soft drink included.

Name Address.....

..... Email

Cheques can be mailed to:

Secretary, AWS
PO Box 42
BRIGHTON LE SANDS NSW 2216
Telephone 02 9556 1537 with credit card details.

Direct debit:

Australian Wildlife Society
BSB: 062 235
Account No: 1069 6157
Confirm details via email at info@wpsa.org.au

Be a part of the Australian Wildlife Society's conservation future



To commit to being a part of our future, please complete this form. You may cancel your donation subscription at any time by notifying the national office.

Australian Wildlife Society
PO Box 42
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Tel: (02) 9556 1537
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You may also commit by visiting www.wpsa.org.au and registering online

All donations of \$2 or more are tax deductible.



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☐ I want to join the Friends of WPSA and give by automatic deduction each month to help protect our unique native wildlife and its important habitat

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Date

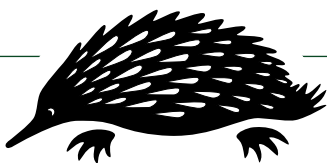
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Deduction will be made on 15th of each month.

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Membership Form



WILDLIFE PRESERVATION SOCIETY OF AUSTRALIA LIMITED

PO Box 42 Brighton Le Sands NSW 2216

Membership

Become a member of the Wildlife Preservation Society Limited

Simply fill out this form.

Name:

Address:

City/Suburb: Postcode:

Telephone: Fax:

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Membership category (please tick)

- ☐ Individual: \$55
- ☐ Family: \$70
- ☐ Concession (pensioner/student/child): \$50
- ☐ E-mag (emailed as PDF, no hardcopy will be sent): \$30
- ☐ Associate (library, school, conservation groups): \$85
- ☐ Corporate: \$125
- ☐ Life: \$2,000

(Includes postage within Australia. Add \$40 for overseas postage)

Three year membership (please tick)

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- ☐ Concession (pensioner/student/child): \$135
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- ☐ Associate (library, school, conservation groups): \$230
- ☐ Corporate: \$340

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Donation \$.....

Signature:

Total \$.....

Mail to the: Wildlife Preservation Society Limited
PO Box 42, Brighton Le Sands NSW 2216.
Email: accounts@aws.org.au Website: www.wpsa.org.au

Direct debit: BSB: 062 000
Account No: 1043 2583
Account Name: Wildlife Preservation Society of Australia

Note: All cheques to be made out to the Wildlife Preservation Society of Australia

Consider - A Bequest

Another way which you can support the work of the Wildlife Preservation Society of Australia (Australian Wildlife Society) is to remember us in your will.

If you would like to make a bequest, add the following codicil to your Will:

I bequeath the sum of \$..... to the Wildlife Preservation Society of Australia for its general purposes and declare that the receipt of the Treasurer for the time being of the Society shall be complete discharge to my Executors in respect of any sum paid to the Wildlife Preservation Society of Australia Limited.

"The challenge to the present adult generation is to reduce the increasing pressures on the Earth and its resources - and to provide youth with an education that will prepare them emotionally and intellectually for the task ahead."

