Science
for saving species

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The magazine of the
Threatened Species Recovery Hub

Mixing Western Science with Traditional Knowledge

Saving the western swamp tortoise

Swift parrots: A place to call home

Best practice for recovery teams

IMAGE: RAYMOND DE GROOT

Threatened Species Recovery Hub
National Environmental Science Programme


IMAGE: ZADIE BEKESSY

From the (acting) Director

Brendan Wintle talks about the immense legacy of the out-going Director Hugh Possingham, while also highlighting that it is full steam ahead for the Hub.

Early and exciting results have already started to emerge from Hub projects that kicked off in 2015, many of which I am delighted to share with you in this edition of Science for Saving Species.

We have been going to great lengths to share our findings with the people our research can benefit, such as conservation policy makers and recovery teams. Through strong and enduring collaboration and communication we can maximise the impact of our research in supporting the recovery of threatened Australian animals, plants and ecological communities.

A great example of this was the research 'Showcase' we held in Canberra in Oct. The one-day event attracted over 100 conservation policy and management stakeholders who came to learn about and discuss research findings from a number of our projects. You can read more about this very successful event on p14.

Research activities have been ramping up, and with around 200 people, including researchers and on-ground partners now working on over 35 projects and sub projects, you can expect to see some exciting results emerge over the next 12 months.

While the future looks busy and bright for the Hub, I'd like to also highlight the immense legacy of our outgoing Director, Hugh Possingham. Hugh is now the Chief Scientist of the world's biggest conservation organisation, The Nature Conservancy (TNC).

After a stellar early academic career, Hugh moved to the University of Queensland in 2000 to set up the Ecology Centre where he developed a new sub-discipline of conservation science called environmental decision science.

During this time, together with Ian Ball he invented Marxan, which won a Fenner Medal and a Eureka Prize. Marxan is now the world's most popular conservation planning software, and has been used to zone conservation areas world-wide, including the Great Barrier Reef Marine Park.

Building on this success, Hugh lead large cutting edge research programs under the Commonwealth Environment Research Facility (CERF) and National Environment Research Program (NERP), which pulled together both leading researchers and emerging new scientists to improve decision making in conservation.

These programs resulted in many advances in conservation science and practice. As a privileged participant, I can say that it was a hugely exciting and inspiring time.

"Hugh has saved species and places by bringing landmark innovations to conservation theory and practice. And he must take a significant amount of credit for Australia's position at the forefront of conservation research globally."

In both of these hubs I served as Hugh's deputy where I observed his creativity, technical strength and dedication to conservation. His ability to foresee how research will lead to real outcomes, his collegial manner and generosity make him a great leader.

Hugh has also contributed to numerous conservation organisations, policy groups and committees across the globe as a board member, collaborator and advisor. This has included the Wentworth Group of Concerned Scientists, the IUCN, the Myer Foundation, Bush Heritage Australia, the Australian Wildlife Conservancy, Birds Australia and the World Wildlife Fund.

Over the last 20 years Hugh has also nurtured a new generation of environmental researchers, mentoring some of the most exciting young researchers in the field. Many of these people are now established as global leaders in their fields with more emerging.

I have no doubt that Hugh has saved species and places by bringing landmark innovations to conservation theory and practice. And he must take a significant amount of credit for Australia's position at the forefront of conservation research globally. He has built a community, brought people along, and generated opportunities for a generation of conservation researchers.

His thoughtful, honest and dedicated leadership of the TSR Hub has set us up well.

I'm excited to think of what Hugh will achieve with the TNC and I'm sure he will build valuable links with conservation researchers here in Australia.

From a grateful community of conservation researchers, please accept our sincere thanks and best wishes for exciting years ahead.

Associate Professor Brendan Wintle
Acting Director, TSR Hub


IMAGE: DAVID SALT

Brendan Wintle and Hugh Possingham

Inside this issue

IMAGE: OFFICE OF THE THREATENED SPECIES COMMISSIONER

The Threatened Species Commissioner Gregory Andrews on the Abrolhos Islands (Western Australia) with an Australian sea lion (listed as Vulnerable).

Science to **fight extinction**

The science emerging from the NESP TSR Hub is shaping policy and supporting on-ground action in the fight against extinction. One year on from the launch of the Threatened Species Strategy, the Hub remains a crucial partner in its success.

The connection between the Threatened Species Recovery Hub and government policy is an important one. My appointment as Commissioner, the launch of the Threatened Species Strategy and the creation of the Hub together form a powerful response to the threat that extinction poses to our remarkable native plants and animals.

The flexible and responsive approach by Hub researchers is ensuring their work feeds directly into species recovery programs by improving information and encouraging collaboration in the field.

I've seen some great examples of this approach, particularly in the Hub's science on feral cats and island safe havens for threatened species. In June, five islands (Dirk Hartog Island, Bruny Island, French Island, Kangaroo Island and Christmas Island) were identified as priorities for feral cat eradication, with the Australian Government committing more than $1 million to support community efforts on the islands.

There's a lot to be done, and Hub researchers Salit Kark and Justine Shaw are supporting us through their project *Saving species on Australian islands*, which will help prioritise actions and support scientifically robust project plans for the islands. Eve McDonald-Madden and John Woinarski are also improving our understanding of conservation on one of our priority islands with their *Enhancing threatened species outcomes on Christmas Island* project.

Richard Faulkner and Georgia Garrard, part of *Methods for better communication and community buy-in to threatened species conservation* project, are helping to monitor progress towards the Threatened Species Strategy first-year target of removing 150,000 feral cats across Australia. Their work will also help us understand why members of the community take part in cat control.

John Woinarski and Sarah Legge, through the *Developing evidence-based management tools and protocols to reduce impacts of introduced predators on threatened mammals* project, are measuring feral cat densities, numbers, behaviours and impacts. All of this information is vital in the national effort to tackle the threat of feral cats.

Then there's all the other critical work the Hub does, for so many threatened species. And I would like to recognise the pragmatic and applied science underway for Leadbeater's possum and hollow nesting birds in Tasmania. This work is not only guiding action, but taking the critical first steps in proof-of-concept and innovation to protect threatened species.

We are seeing improvements in our approaches to fighting extinction. And momentum for action continues to grow. We are achieving much more together, harnessing the power of research, policy and on-ground action, than any of us could alone. Thank you.

Gregory Andrews
Threatened Species Commissioner
ThreatenedSpeciesCommissioner@environment.gov.au

"We are achieving much more together, harnessing the power of research, policy and on-ground action, than any of us could alone."

Mixing **Western Science** with **Traditional Knowledge**

IMAGE: RAYMOND DE GROOT

Designing **a best-practice bilby monitoring program for Martu rangers**

The Martu people of the Western Desert are working to protect one of the last strongholds of the iconic bilby. TSR scientists are hoping they can help in this work by designing a monitoring program that Martu rangers can use to better understand bilby population trends over time. Anja Skroblin from the University of Melbourne describes what's being done.

The greater bilby (*Macrotis lagotis*) is the last of Australia's desert bandicoots. You probably know it as the model for the Chocolate Easter Bilby that is now available in many supermarkets at Easter time.

Once it was found across much of Australia west of the Great Dividing Range. However, changes to its habitat from pastoralism and altered fire regimes, predation by foxes and cats, and competition with rabbits has seen its range shrink dramatically. These days they are restricted to arid desert lands in central and western Australia. Most of the area where the bilbies are found lie in Indigenous lands and the continued survival of this iconic creature depends on Indigenous land management and monitoring.

The Martu people are the traditional owners of more than 14 million hectares of the Western Desert in WA (encompassing the Gibson, Great Sandy and Little Sandy deserts). That's an area twice the size of Tasmania. This is a diverse and awe-inspiring country of radiant red sand dunes, iron-rich ranges and sandy rivers bordered by gnarly white gums. Scattered across this ancient, arid landscape lie salt lakes sparkling in the harsh desert sunlight and clay pan wetlands. Martu management has helped keep this country healthy while sustaining its unique diversity of flora and fauna. This has included caring for important bush-tucker foods and a multitude of threatened species.

Martu have extensive knowledge of the occurrence and ecology of Mankarr (bilby) on their country and are keen to work with ecologists to ensure the future of this threatened species. To this end, I have been working with the Martu to design a monitoring program that they can use to understand what is happening with the bilby population over time. I'm doing this work with Brendan Wintle, and the project is a collaboration between The University of Melbourne, Kanyirninpa Jukurrpa, The Nature Conservancy and BHP Billiton.

The project aims to bring together Indigenous ecological knowledge and leading-edge western science to improve the way Martu ranger teams monitor trends in bilby populations on their country over time, and

ABOVE: Anja Skroblin (centre) with Nancy Taylor (left) and Ngamaru Bidu talking about Mankarr ecology at a very active bilby site shown to Anja by the Martu Elders.

IMAGE: ANJA SKROBLIN

No bilby to be seen in the image above but the Martu rangers can tell these tracks were left by an adult bilby that walked this way as it was foraging around these clumps of spinifex the night before.

"Bilbies are a very challenging creature to keep up with. They occur at very low density across a vast landscape, they have large home-ranges, and they shift the areas they use following changes in food and shelter."

Mankarr captured on a camera trap foraging near Punmu community.

assess whether current threat management practices (feral herbivore and predator removal, fire management) are helpful to conserve bilbies on Martu lands.

As part of this work I have been privileged to visit Martu communities to conduct interviews with Elders and rangers to document their expert knowledge of Mankarr distribution and habitat use. With the rangers we have been workshopping approaches for monitoring and management.

Ranger teams have been surveying for bilbies for the past 10 years and have detected bilbies at multiple locations. Bilbies are notoriously difficult to monitor because they are nocturnal and hard to trap, but they do leave signs of their presence in the form of tracks, scats, diggings and burrows. Martu rangers monitor bilbies by searching for these signs. It is a process that requires an extraordinary set of traditional skills.

The monitoring so far has revealed that bilbies are a very challenging creature to keep up with. They occur at very low density across a vast landscape, they have large home-ranges, and they shift the areas they use following changes in food and shelter (which is associated with fire history and rainfall). Sometimes bilbies may disappear from an area altogether and it's believed that this may coincide with increased fox or cat activity.

Part of my work has been to join rangers in the field to learn traditional tracking methods, and assess the detectability of bilbies under various sampling approaches. We will use the Martu ecological knowledge and previous survey data to evaluate different approaches to monitoring that can detect changes in the status of bilbies under various scenarios of population change.

The research will help Martu decide on which parts of their vast country they should focus their monitoring efforts, the best data to collect in the field, and how to interpret the data to understand how bilby populations may be changing. A 'best-practice' monitoring program will capitalise on the unique skills of the Martu people and allow for the challenges of working in remote and often difficult conditions.

The outcome we are after is a ranger-led monitoring program that will allow Martu to assess the impact of their land management practices on bilbies. This will help management to be adapted over time to benefit the species.

In a time of declining biodiversity, this project hopefully serves as a shining example of what might be possible if we can combine indigenous knowledge with robust scientific methods. The Martu have the skills and the passion while we have the science of monitoring, data recording and analysis. Together they may help to secure a future for the beloved bilby.

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Note: This project is supported by the NESP Threatened Species Recovery Hub and Martu Living Deserts Project (a collaboration between The Nature Conservancy, Kanyirninpa Jukurrpa, and BHP Billiton).

Ngamaru Bidu follows Mankarr tracks though an area containing small patch burns of different ages that provide rich food resources for bilbies.

Saving the western swamp tortoise

To boldly go where no tortoise has gone before

IMAGE: STEWART MACDONALD

The western swamp tortoise has all the ingredients of a fairy tale. It's the Goldilocks of tortoises needing water that isn't too hot but isn't too cold to survive. It's the Rip Van Winkle of reptiles in that it seemed to vanish from sight for over 100 years during which time it was thought extinct – but then it was rediscovered. And it's the Houdini of endangered wildlife in that it came close to oblivion in the 1980s with numbers fewer than 50 but, thanks to concerted efforts at recovery, it escaped extinction and there are over ten times that number now.

Of course, Houdini wasn't a fairy tale, but his fantastic acts of escapology have raised him to the status of legend. And the western swamp tortoise isn't a fairy tale either but to escape its current plight it's going to need an enormous effort if it isn't to become only a legend. Part of that effort is a good dose of science in order to understand where the tortoise might live in order to cope with climate change. TSR Hub scientists at the University of Western Australia (UWA) and the University of Melbourne are on the case.

A western winter-swamp specialist

As its name suggests, the western swamp tortoise lives out west, on the Swan Coastal Plain around Perth (Western Australia). It's Australia's smallest freshwater tortoise, measuring 11-13cm from nose to tail when fully grown, and it lives in swamps that only fill with water in winter and spring, the period Perth traditionally gets its rainfall.

Regarded as one of Australia's most endangered reptiles, the western swamp tortoise is a cryptic little creature. When its home swamp dries up in the warmer months it becomes inactive and hides in holes in the ground or under deep leaf litter. It naturally occurs in only two small areas on the Swan Coastal Plain and most of its habitat has been cleared for housing and agriculture.

The tortoise seemed to disappear altogether and was feared extinct for over a 100 years before being 'rediscovered' in 1953. Thanks to intensive habitat management, captive breeding and releases its numbers have increased to around 200 in the wild with more than 500 tortoises being bred in zoos.

However, this little short-necked tortoise is far from safe. Its specialist habitat requirements and a changing climate pose a major challenge.

ABOVE: Alex Bouma and Marcus Lee measure body mass and morphological changes throughout the winter-spring activity period of the western swamp tortoise. This will provide important information on how these translocated individuals are coping in the new environments.

IMAGE: STEWART MACDONALD

The turtles are tracked and measured every fortnight to see how they are adapting to their new habitat.

Marcus Lee, a volunteer assisting Alex, examines a healthy translocated western swamp tortoise.

"The challenge is more than protecting its existing habitat and releasing captive-bred specimens into this habitat to keep up population numbers. It's also about finding potential new habitat outside of its traditional range."

Not too hot, not too cold

"Western swamp tortoises are dependent on winter wet ephemeral swamps to survive," explains Alexandra Bouma, a Masters student based at UWA who is studying the impact of translocation on the tortoises*.

"The tortoise needs adequate water for approximately 5-7 months of the year," she says. "During this time it feeds, gaining enough mass and energy to survive the following summer period in which it becomes dormant.

"During the active winter/spring period the temperature of surrounding water is important. It needs to be in the range of approximately 14-30 degrees C. If the water is too hot or too cold they may become inactive or leave the water altogether. They also require certain invertebrate species and vegetation to survive."

Given their specialist needs, how will western swamp tortoises fare if the climate changes around Perth, as is already happening? Of course, this dilemma faces all species in a time of global climate change but the stakes are higher for critically endangered species like the western swamp tortoise; not much has to go wrong for the species to be lost altogether.

To boldly go

So the challenge is more than protecting its existing habitat and releasing captive-bred specimens into this habitat to keep up population numbers. It's also about finding potential new habitat outside its traditional range. This is the reality of biodiversity conservation in a time of climate change.

In a pioneering effort, 35 western swamp tortoises were released to translocation sites in south-west Western Australia in August. The release sites are north and south of their native range. The tortoises were bred and raised by staff at the Perth Zoo and released by a recovery team consisting of members from TSR Hub, Department of Parks and Wildlife and Friends of the Western Swamp Tortoise.

The experiment in assisted migration, believed to be the first of its kind in Australia, will hopefully lead to new permanent tortoise populations. Researchers will monitor the tortoises throughout their active period, recapturing them to measure their length and weight.

The tortoises have also been fixed with small data loggers which measure their temperature every 30 minutes. These temperatures will be compared to environmental temperatures which are being measured in three different microhabitats in which the turtles are likely to spend time. This will help researchers determine the thermo-regulatory behaviour of the tortoises in their new habitat.

Put to the test

As it turned out, the thermo-regulatory behaviour of the tortoises was given a real testing with Western Australia experiencing the coldest winter and early spring in about two decades.

"The exceptional weather we've been experiencing further highlights the importance of conducting this trial now, as the current habitat of the tortoise continues to become marginalised by climate change," observes Ms Bouma.

"The ability for the turtles to grow and survive in these testing conditions will be a promising indicator that these new sites will be suitable in the future."

During the winter-spring activity period, Ms Bouma and colleagues visited the two translocation sites in the south west corner of the state every fortnight to recapture and take measurements of growth rates. While the collected data is still to be rigorously analysed, initial results are promising.

"Preliminary results are showing that the tortoises are gaining mass at both of the translocation sites, which means they are foraging and exploiting the habitat to find food. This is very encouraging!" says Ms Bouma.

"We're also seeing tortoises basking just below the surface on warm, sunny days which is also a good sign because if the water temperatures are too cold they will often lay inactive near the bottom of the swamp.

"So far, so good. It will be interesting to compare these growth rates to tortoises which are living in a hotter, drier climate further north."

If the western swamp tortoise has all the ingredients of a fairy tale, let's hope all this hard work gives this story a happy ending.

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**Alex Bouma's research is being done in collaboration with Dr Nicki Mitchell and Dr Gerald Kuchling. Dr Mitchell is based at UWA and is leading the TSR Hub project on the assisted migration of the tortoise. Dr Kuchling, from Western Australia's Department of Parks and Wildlife, has been studying the tortoise for 25 years.*

Making threatened-species **monitoring count**


IMAGE: DAVID SALT

Monitoring the status and trends of threatened species is vital to informing management and policy decisions. And yet, monitoring of threatened species rarely occurs, and when it does - it is usually not carried out effectively. Why is this, and how can we remedy the situation? This was the central issue underpinning a two-day workshop hosted by TSR researchers from the Australian National University.

The workshop, held at the picturesque and historic Quarantine Station at North Head, in Sydney Harbour National Park, brought together 30 conservation managers, policy makers and scientists with long-standing commitments to threatened-species monitoring from all over Australia. They came from a diverse range of government and non-government organisations, community groups, and universities; each bringing different experiences and perspectives to the discussion.

"A detailed understanding of the current status of monitoring for threatened species is essential for identifying the key areas for improvement," says Dr Sarah Legge, one of the lead organisers for the meeting.

"To this end we compared assessments of the current status of threatened-species monitoring in Australia to gauge how representative it was across and within taxonomic groups. We considered how adequate such monitoring has been. We then discussed the ideal role of monitoring in national recovery planning and how this compared to what was actually happening."

Using case studies as diverse as threatened mammals in southwest Western Australia, fish in ephemeral pools in western Queensland and frogs from Victoria, the workshop identified some specific examples of how monitoring can support conservation management, and discussed ways of increasing the perceived value of monitoring across different sectors of the conservation community.

Threatened species and citizen scientists

One avenue for 'mainstreaming' threatened-species monitoring is to involve the public in citizen-science projects. Workshop participants shared their direct experience of working with volunteers to establish systematic monitoring for threatened plants, birds, and mammals.

"Citizen-science projects can greatly enhance data collection," says Dr Natasha Robinson, a co-leader of the workshop. "This is especially the case when resources for the management of threatened species are extremely limited which, as we heard during the workshop, was unfortunately quite frequent.

ABOVE: Conservation managers, policy makers and scientists from across Australia met at the Quarantine Station in Sydney to improve the policy and practice of threatened-species monitoring.

"Beyond generating data, such projects can also raise the profile of, and engagement with, threatened species. This could prove critical in the raising the political focus on this component of conservation management.

"However, citizen science is not a panacea. It was clear through the workshop discussions that projects based on citizen science can come with high transaction costs both in terms of time and money. It's important to acknowledge that some types of data collection suit citizen science projects more than others."

"While the animals and plants being worked on were as varied as could be imagined – from tiny alpine frogs to mighty marine whales – the challenges being faced were remarkably similar, as was the passion to make a real difference."


IMAGE: DAVID SALT

The Quarantine Station is located on the North Head of Sydney Harbour. Historically it was a way station for ship-bound travellers coming to Australia suspected of carrying infectious disease. These days it's part of Sydney Harbour National Park and offers refuge to a range of native species including the little penguin.

Indigenous participation

The distributions of many of Australia's threatened species now occur largely on land owned and managed by Indigenous groups, who place a high cultural value on the continued existence of these species. What's more, their traditional knowledge is proving vital to our ability to locate and monitor these species, contributing enormously to our understanding of the trajectories of these animals and plants.

Collaboration with Indigenous people, therefore, will prove critical to future efforts to improve the monitoring of threatened species. Such collaborations are already generating valuable information on the population trajectories of threatened species (as well as helping in the management of threats).

Examples of such programs ranged from ambitious nationally-scaled monitoring for bilbies (over 80% of wild bilbies occur on Indigenous land), to more locally-scaled programs of camera trapping for rock-wallabies and bettongs.

Choices and challenges

Some of the liveliest debates amongst workshop participants eddied energetically around tough issues such as deciding when not to monitor a threatened species (eg, because of scarce resources, or limited ability to influence the species trajectory); whether monitoring should be framed around clear questions (for example, about the impact of threats or management inputs to trends in threatened species) or be less targeted 'surveillance' style of monitoring; and whether threatened species monitoring could ever be substituted with 'surrogate' indicators.

Workshop participants highlighted real examples of some of the monitoring design hurdles (and their solutions) that are common in threatened species. These examples ranged from aerial surveys of wide-ranging marine mammals (like dugongs), to the challenge of monitoring irruptive desert mammals (like mulgara and desert mice) whose populations go through boom and bust cycles in which they fluctuate from plentiful after high rainfall periods to impossible to find in tough times.

"Monitoring for threatened species needs to deal with rarity, low detectability, populations dispersed thinly or erratically over large scales and a host of other challenges," comments Dr Legge. "These attributes create serious monitoring design challenges that we need to consider. The consensus from the workshop was that the peculiarities of monitoring threatened species mean that monitoring design needs to be tailored carefully, and it should be fit-for-purpose. General biodiversity monitoring programs, including surveillance monitoring, are important for picking up unexpected changes in more common species but are usually inadequate for identifying trends in threatened species."

Practical guidelines

The workshop's ultimate purpose was to develop a preliminary framework for practical guidelines to make threatened species monitoring more effective. These guidelines, along with much of the material presented

at the workshop (including case studies of threatened species monitoring programs from around Australia), will be collated into a book as a valuable resource for people and organisations aiming to improve conservation outcomes through enhanced threatened species monitoring. The book should be available in 2017.

"Another important dimension of the meeting was the networking and sharing of experience," says Dr Robinson. "While the animals and plants being worked on were as varied as could be imagined – from tiny alpine frogs to mighty marine whales – the challenges being faced were remarkably similar, as was the passion to make a real difference.

"It's a network the TSR Hub hopes to build and consolidate over time."

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IMAGE: THEA O'LOUGHLIN

Volunteers monitor the southern brown bandicoot in Booderee National Park in southern NSW. Monitoring the performance of threatened species is critical to ensuring their long-term persistence.


IMAGE: DEJAN STOJANOVIC

A place to call home

in a time of a swift-parrot housing crisis

Swift parrots are in trouble. Their numbers have been in decline over many years. The loss of nesting habitat has been an important driver behind this trend but in recent years it's been discovered sugar gliders have made the problem worse by invading their tree hollows and eating adult and baby birds. Amidst the gloom, however, there is a glimmer of hope. Experiments with purpose-built nest boxes have this year demonstrated that swift parrots can use them for breeding. TSR Hub's Professor Rob Heinsohn describes what's been observed.

Swift parrots (*Lathamus discolor*) are slim, medium-sized, green-and-purple birds with a streamlined shape in flight. Each year they migrate between Tasmania, where they breed, and the Australian mainland. A few years ago it was estimated that there were fewer than 2000 mature individuals remaining in the wild. Modelling work we undertook on their population trends suggested the species may face extinction by 2031. (And, as an aside, it was on the strength of this science that the species has just been upgraded to Critically Endangered. Sometimes science does result in timely change in conservation policy.)


IMAGE: DEJAN STOJANOVIC

Dejan Stojanovic with a 'cute' little sugar glider. He discovered this introduced possum was ravaging swift parrot nests.

So, what's the problem for the swift parrot? Basically, they're facing an extreme housing shortage. Like many Australian bird species, swift parrots depend upon tree hollows for nesting. Tree hollows only form in older trees, normally over a hundred years old, and swift parrots are particularly choosy about which trees and which tree hollows they'll use. The trees (eucalypts) have to be in certain regions in Tasmania, close to the parrot's food sources, and need to be tall.

The hollows that swift parrots use need to be deep with small entrances to protect mothers and fledglings from a wide range of predators (including currawongs, raptors and brush tail possums). Hollows are rare because they take centuries to form but good hollows for swifties (as we tend to call swift parrots) are even rarer – only one in twenty fits their requirements.

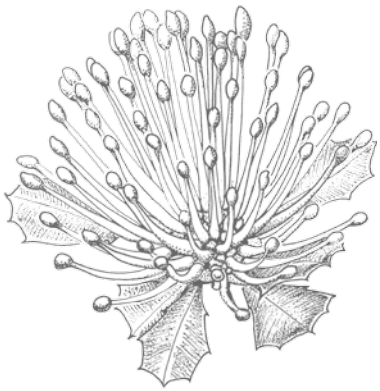
The main problem for the swift parrots is that land management in Tasmania, and specifically forestry, has reduced the number of suitable nest hollows to such an extent that the population of parrots has been in decline for some time. Unfortunately, this dire situation has been made considerably worse by the discovery that sugar gliders are preying on nesting swift parrots.

ABOVE: Swift parrots use tree hollows that are high up, deep and with small entrances to protect mothers and fledglings from a wide range of predators.

The sugar-glider problem was quite unexpected. My colleague Dejan Stojanovic made the discovery only a few years ago as part of his PhD studies on swift parrots.

"Of course, it was an experiment. Swift parrots have never been known to use nest boxes so we really didn't know whether it would work. But it looks like it has."

We built them, the birds came, the boxes worked. Nest boxes can augment the number of nesting sites available to swift parrots.



Sugar gliders are not native to Tasmania. They were introduced to Tasmania some time ago from the mainland, possibly as a cute native pet. Sugar gliders are small, sleek possums; so slim that they can access the high, deep nesting hollows of swift parrots. And if they come across a hollow being used by a female swiftie then the results are not cute at all. They will enter the nest and eat the incubating adult female swift parrot and her fledglings – and there's little the birds can do to protect themselves.

Caught in the act - a sugar glider enters a swift parrot nest.

Dejan's studies suggest 83% of deaths of adult female swift parrots on mainland Tasmania are the result of being eaten by sugar gliders. The description here of 'mainland Tasmania' is important because there is no female parrot mortality in nest hollows on Tasmania's offshore islands – where there are no sugar gliders!

Swifties move all over the place following available food, usually in the form of good eucalypt flowering. When that flowering occurs on mainland Tasmania, that is where they nest – and that is where you'll also find sugar gliders and subsequent high death rates of female parrots.

Every so often, however, you'll get good flowering on Tasmania's offshore islands (the two major ones being Bruny and Maria Island). This is what occured this year. And when that happens the swifties head for the island where there is plenty of food but not enough hollows.

And this is where I can offer you a glimmer of hope. We knew it was going to be a good flowering year on Bruny Island (near Hobart) and that a lack of hollows was going to be a problem. So, we deployed around 500 purpose-built nest boxes high up in the tree tops on Bruny Island. And with the help of arborists from the Victorian Tree Industry Organisation we carved 62 tree hollows into tree branches. How ingenious is that!

Of course, it was an experiment. Swift parrots have never been known to use nest boxes so we really didn't know whether it would work. But it looks like it has. We are still checking what happened but at this point it looks like one in four of the nest boxes have been in use. In one box we found six eggs, and the carved hollows are also being occupied.

This is fabulous news for anyone interested in the future existence of swift parrots. And, given the catastrophic declines we are seeing in biodiversity everywhere, it's vital that we hear good news every now and then to stop us giving up altogether. Having said that, I need to caution that the prospects for the swift parrot are still pretty grim. Hopefully this success buys us some time, and maybe raises the profile of this sleek little parrot. How we use that time will be critical to its future prospects.

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Swift parrots follow the food - flowering gums.

Guiding recovery effort

Best-practice governance for recovery teams

IMAGE BY BUTUPA_FLICKRCC2-0

For most people, threatened species recovery is about doing something to save a threatened species – planting habitat trees, translocating individual animals and managing threats like foxes and cats. The 'doing' is important but what is often not seen is the organisation behind the doing. How are decisions made? Which bits of the 'doing' is given the priority? And how do we make sure we 'learn' as we 'do'? The TSR Hub is working with the Australian Government on drawing together what we know about best practice for recovery teams – one of the key strategies for securing the future of Australia's many threatened species and ecological communities. Peter Latch from the Australian Government Department of the Environment and Energy sets out what's being done.

The first thing to acknowledge when attempting to plan a successful species-recovery process is that it represents an enormous and difficult challenge requiring input from many different people and groups. The recovery of threatened species and ecological communities is generally a highly complex, multi-disciplinary task usually involving many individuals, organisations and agencies.

> "Good governance is the cornerstone of any effective system involving decision making and multiple stakeholders."

Successful recovery relies on a combination of collaborative and focused planning, the coordination of complementary actions, the monitoring and analysis of results, the reporting of effectiveness against objectives and the adaptive revision of planning. Governance is the system that combines these steps into a cycle of continued improvement in effectiveness; it is about the development of good processes for making and implementing decisions.

Good governance is the cornerstone of any effective system involving decision making and multiple stakeholders, be it running the nation, a business or the local Frogwatch group. It's also something that is largely taken for granted until it clearly isn't working (such as a business going bankrupt).

Governance and the recovery team

Recovery teams are a good example of a collaborative governance model. A recovery team is a collaboration of partners brought together by common objectives to develop and/or coordinate the implementation of a recovery program for a threatened species or ecological community. A recovery team provides a forum to bring together the diverse interests of those involved in the recovery process. The recovery team is responsible for ensuring that actions are implemented in an effective, coordinated and complementary way.

While recovery teams have been operating in Australia for many years, most overseeing recovery of nationally listed species or ecological communities, there is no coordinated national framework providing consistent guidance on best-practice governance or reporting.

In response, a key commitment of the Australian Government's Threatened Species Strategy is to improve recovery practices. The Strategy recognises the importance of the recovery-team model as a governance system to drive implementation of recovery programs and to report on progress and effectiveness. The Strategy calls for:

- the publishing of a set of best-practice guidelines,
- the creation of a reporting framework and
- the establishment of a national recovery-team database.

The first of these targets, recovery-team governance – best-practice guidelines, are currently under development and expected to be available in late 2016. The guidelines will provide an overarching framework for establishing and operating effective recovery teams. They are designed to help recovery teams to establish their governance and operating arrangements

IMAGE LEFT: The malleefowl: enormous effort has gone into saving this threatened bird, including countless hours put in by volunteers and a dedicated recovery team. Not only should this effort be recognised, but we should learn from it.

They set out a series of 'best-practice' principles to guide and support recovery teams including when a recovery team might be needed, how to establish a team as well as membership, structure, and communication and reporting processes. A template is provided to guide teams in establishing their terms of reference; the team's operating rules, the process through which responsibilities are discussed, identified and agreed upon.

Learning from success

The guidelines have been developed in consultation with recovery teams drawing on their collective expertise and experience. They have also been developed in collaboration with the Threatened Species Recovery Hub's Project 6.4 (*Learning from success in threatened species conservation*). The guidelines complement the research examining success factors in threatened-species conservation and the role of recovery teams and other governance systems in driving such success.

Monitoring, evaluation and reporting is an important part of any recovery effort. Assessing progress of a recovery program provides clarity on whether investments are improving the status of threatened species and ecological communities. It also enables adaptive management, so that we can adjust our efforts accordingly.

Recovery teams have an important leadership role in communicating the effectiveness of recovery programs. A national reporting framework is also being established to assist recovery teams in reporting on progress in achieving the objectives of a recovery program. Reporting will enable recovery teams to progressively build a story of their work over time.

Collective and consistent reporting across recovery teams will, for the first time, provide a national snapshot of our conservation efforts over time. Recovery team reporting will also inform other national environmental frameworks such as the State-of-the-Environment reporting and in monitoring progress against Australia's international obligations such as under the Convention on Biological Diversity.

Recovery teams, operating in accordance with these governance and reporting guidelines, can be nationally registered. A national database of registered recovery teams will be progressively published and reporting will be collated and published annually.

Becoming a nationally registered recovery team provides national recognition of a recovery team's work. Over time it is planned that a national recovery team network be established to connect recovery team practitioners across Australia. A network could link and coordinate planning activities, allow recovery teams to share experiences, collaborate and over time build a national community of practice.

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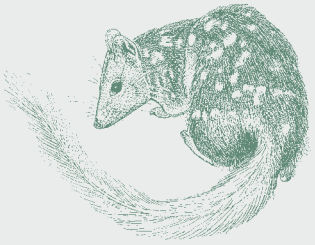

Learning from conservation success

What do the endangered western swamp tortoise (WA), pygmy bluetongue lizard (SA) and eastern bristlebird (NSW) have in common? They might all be extinct were it not for the efforts of dedicated threatened-species recovery teams. The TSR Hub recently brought together representatives from each of these recovery teams, and from other recovery teams from all across Australia, to a two-day workshop at the University of Melbourne. The workshop is part of an effort to learn what features of a recovery group contribute to its success.

In the doom and gloom surrounding the ongoing loss of Australia's unique biodiversity, the success stories of threatened-species recovery are often overlooked. Not only does that discount the efforts of hundreds of threatened-species recovery teams around the country (many of which achieve amazing things with little resourcing), it means we may be failing to learn about the ingredients of success.

Led by Professor Stephen Garnett (Project 6.4), in partnership with the Australian Government Department of the Environment and Energy, the Hub workshop brought together over 30 wildlife officers, community workers, policy makers, researchers and representatives from leading conservation NGOs to share their experiences.

Common elements of threatened species recovery success were identified from a series of case studies including work to save the helmeted honeyeater, malleefowl, Warru (black-flanked rock wallaby), red-tailed black cockatoo, western swamp tortoise, pygmy bluetongue lizard and the eastern bristlebird.

The group discussed how these lessons might inform a set of guidelines for recovery team governance (see 'Guiding a recovery effort'), and agreed on common principles behind success, which included being: purposeful, transparent, responsible, inclusive, supportive, adaptive and innovative, evidence driven, efficient and effective.

Professor Garnett will draw together the findings from the workshop and publish them in a book celebrating the successful case studies.

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Recovery teams

https://www.environment.gov.au/biodiversity/threatened/recovery-teams

The National Threatened Species Strategy

https://www.environment.gov.au/biodiversity/threatened/publications/strategy-home

IMAGE BY DAVID SALT

Peter Latch at the TSR workshop on 'success in recovery teams'. Peter explained how the government was developing its guidelines on governance while also asking for feedback from the recovery teams.


IMAGE BY DAVID SALT

Our **first showcase**

The size of Australia's feral cat population, the effectiveness of biodiversity offsets and recent successes in creating artificial breeding sites for the swift parrot were some of the topics on display at the TSR Hub's first annual showcase held in Canberra in October. Rachel Morgain, the Hub's new Knowledge Broker, takes us through what happened.

Over 100 policy-makers, land managers and researchers gathered at the National Portrait Gallery's Liangis Theatre to engage with key findings from across the Hub's six research themes. Some of our newest early career scientists presented alongside leading international researchers. Presenters grappled with how research could be put to most effective use in protecting and recovering Australia's threatened species.

The discussions that followed our presentations revealed a high level of engagement with managers and policy makers, exploring how findings from the Hub's projects could be applied directly to decision-making and land management strategies. Audience members asked how to improve feral cat control and where adaptive management strategies could be used to ensure greater success for threatened species.

Other presentations examined the economic value of environmental assets and community valuations of threatened species. These underscored the social significance of policy decisions to invest in protecting threatened species.

Discussions also highlighted what we don't yet know. Research on adaptive management will be used to understand the effects of fox baiting for malleefowl and how this strategy can be more effectively applied. More publicly available data is also needed for us to better understand whether, and where, biodiversity offsets are effective.

"Some of our newest early career scientists presented alongside leading international researchers, grappling with how research could be put to most effective use in protecting and recovering Australia's threatened species."

Representatives from the Australian Government Department of the Environment and Energy and the ACT Government particularly commended projects with evident implications for policy and land management.

Dr Andrew Weeks revealed surprising findings about the need to assess gene pool variation in threatened species translocations. This research suggests that random genetic drift often drives genetic divergence in fragmented populations, over and above adaptive selection. Translocation of genetically varied populations can help improve genetic diversity in isolated populations. This can ensure continued genetic connectivity between populations and strengthen their capacity to adapt to changing environmental pressures. At Mount Buller, translocation strategies aimed at widening the gene pool of mountain pygmy possums has helped create larger hybrids and more robust populations. This research has implications for other taxa, including plants, showing how genetic strategies can work hand-in-hand with habitat restoration and threat management to contribute to more effective recovery of threatened species.

The showcase concluded with feedback from a panel consisting of members of the Hub's Steering Committee and the Office of the Threatened Species Commissioner, who noted the level of collaboration on display throughout the day. Dr Steve Morton, Chair of the TSR Hub Steering Committee, congratulated the Hub on its "unparalleled research cooperation and determination to seek solutions and make a difference."

The panel praised the cross fertilisation of ideas throughout the showcase, seeing this as reflecting the strong partnerships being built between researchers, land managers, policy advisers and decision-makers across the Hub's projects.

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Or check out the showcase presentations on the TSR Hub's YouTube Channel

https://www.youtube.com/channel/UCyEr0iKISIRN9NXZZnnLHoA

ABOVE: Professor David Lindenmayer shares the results of his environmental accounting analysis of Victoria's Central Highlands
BELOW: Some of the Hub's key stakeholders reflect on the Showcase in a panel discussion. From left are Judy West (Parks Australia and member of the Hub Steering Committee), Casey Harris (Office of the Threatened Species Commissioner), Steve Morton (Charles Darwin University and Chair of the Hub Steering Committee) and Sebastian Lang (Office of the Threatened Species Commissioner).

How **many cats?**

Conservation management works best when it is based on robust evidence. If we're trying to manage a threatening factor, such as a pest or a weed species, we really should know how many there are, how they're distributed, and how many we should control to make a difference. For example, feral cats are constantly cited as a major threat to Australia's native wildlife. How many are out there? Sarah Legge, Brett Murphy and John Woinarski explain how the TSR Hub is answering this question.

How many cats? It's a simple question but there isn't a simple answer. Even counting the human population in Australia is a formidable challenge – and mostly we self-count.

For native and introduced Australian animals, there are reliable population estimates for only a very small proportion of species. These mostly comprise relatively large, conspicuous and abundant species (such as kangaroos and camels) that can readily be counted from planes or helicopters, or species that now have extremely small populations and are restricted to very small areas (such as the northern hairy-nosed wombat). For the great majority of species between these extremes, there is generally no reliable information on total population size.

Feral cats are a classic example of the problems involved in estimating a wildlife population. They are furtive, not large-bodied, and widespread across almost all Australian environments. But, given that the evidence suggests that feral cats are a major cause of the decline of many Australian wildlife species, it's important to try to assess their population size and its variation.

In a recent study, TSR Hub scientists attempted to derive a national population estimate for feral cats. This collaborative study involved researchers from most state and territory conservation agencies, many universities, and some conservation non-government organisations. The study was based on collations of nearly 100 separate local-scale estimates of cat density, spaced widely across Australia. These were derived from many different approaches, including total removal of cats from isolated areas (mostly islands), nocturnal (spotlight) transect surveys, and studies that used arrays of remote cameras from whose images individual cats were painstakingly identified.

"Many recent studies have shown that severe losses of native wildlife can be wrought by very few cats."

These estimates varied markedly, from very close to 0 up to 100 cats per square kilometre. We sought to understand this variation in relation to a series of locational, environmental, land-use, climatic and other factors.

Feral cats were at much higher densities on islands than on the Tasmanian or Australian mainland. Where they occurred on islands, they were at higher densities on smaller than larger islands, although they were far more likely to occur on larger than smaller islands. We collated records of feral cats on 97 Australian islands, amounting to about 80% of the total area of Australian islands.

Cats are pervasive on the Australian mainland. Adding the cat-occupied island area, we found that feral cats are absent from less than 0.1% of the total Australian land area. (Another way of saying that is that cats are present on 99.9% of the total Australian land area.)

In largely natural areas of the mainland, variation in feral cat density was not strongly related to any of the environmental and other variables we considered. It was best (but still weakly) related to annual rainfall: cats tended to be slightly more abundant in drier areas (with more open vegetation) than on the higher rainfall coastal fringe (with denser vegetation). The density of feral cats in conservation reserves was similar to that outside conservation reserves, suggesting that Australia's national parks provide little refuge for native wildlife species that are susceptible to cat predation. The population of feral cats in Australia also varies substantially over time, with about 2-5 fold increase in the inland during good seasons following extensive rainfall events.

From the analysis and modelling, we estimated that the average population density of feral cats in Australia is about 0.27 cats per square kilometre, and hence the total population of feral cats in largely natural environments in Australia is 'normally' about 2.1 million, with this figure fluctuating between 1.4 during dry periods to 5.6 million after extensive rainfall events.

In addition to this estimate for largely natural environments, we also estimated the number of feral cats in highly modified environments in which humans inadvertently provide much supplementary food (and hence which have much higher cat densities) to be about 0.7 million. So, the total Australian population of feral cats fluctuates between 2.1 and 6.3 million. This number can be compared to a national estimate of about 3.3 million pet cats, derived more simply by other sources from household surveys.

Our estimate of Australia's feral cat population is substantially smaller than the few previous estimates, of about 15-20 million. The origin of these estimates is unclear, but possibly they were based on a far smaller set of field data, perhaps from areas where cats were locally abundant.

This new and more robust estimate of the cat population will help managers understand how much control effort will be needed to achieve significant reductions in local cat population numbers. However, the population figures are by no means the end of the story. Of far more importance is the actual impact of cat predation, and many recent studies have shown that severe losses of native wildlife can be wrought by very few cats.

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IMAGE BY JAANA DIELENBERG

TSR Hub Researcher Profile

Angela Guerrero has interviewed a wide range of people involved in threatened-species conservation, from on-the-ground staff to policy makers, about how team structures can help or hinder the effectiveness of recovery groups.

The **governance** of saving species

Saving a threatened species is a big task often requiring the effort of many people over a sustained period. The way these people organise themselves (the rules they follow, the networks they form, the way they make decisions) is critical to the success of any species recovery program. The way people organise themselves is known as governance and Angela Guerrero is working with the TSR Hub to understand what forms of governance help a recovery effort (and what forms may hinder it.)

"The majority of science on saving threatened species focuses on the ecological side of the problem," says Dr Guerrero. "My research focuses on the people side; how governance systems and the decision-making processes can be designed to enable effective management. At the end of the day, species are saved by people so understanding how people organise themselves to undertake this task is important."

The work is part of her broader interest in understanding the human and ecological dimensions of conservation. She applies research methods that allow her to analyse social-ecological systems, to map their structure and attempt to understand how they operate over different scales of space and time.

"My research looks at complex interactions between humans and nature," she says. "A better understanding of these interactions helps us to design effective management interventions.

"My work with the TSR Hub focusses on the governance of threatened species recovery efforts – in particular the processes of implementing recovery plans. I'm examining recovery efforts across Australia in an effort to identify the barriers and enablers of successful recovery efforts.

"In the broadest sense governance can sometimes be characterised as being 'bottom-up' where people and groups organise themselves; or 'top-down' where people follow instructions from above. My research shows that while bottom-up governance structures enable some environmental challenges to be addressed, they are not always the most effective approach. Depending on the governance challenge, top-down guidance is sometimes necessary so that ecological complexity that sometimes cuts across multiple management scales can be adequately dealt with."

The more she studies governance, the more Dr Guerrero has come to realise how important it is to good conservation outcomes.

"I've discovered there is so much we still do not know about effective governance in conservation," she explains.

"In many ways Australia is at the forefront of conservation science. We are world leaders in the science that underpins 'good' conservation and environmental decision making. However, it has become clear to me that we need to better understand the governance behind our decision making and incorporate this in the management tools we produce.

"It's a fascinating challenge and one I hope to advance in the years ahead."

"At the end of the day, species are saved by people so understanding how people organise themselves to undertake this task is important."

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Science for saving species

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www.nespthreatenedspecies.edu.au

COVER IMAGE: ANJA SKROBLIN (LEFT) AND NGAMARU BIDU TALKING ABOUT MANKARR ECOLOGY AT A VERY ACTIVE BILBY SITE SHOWN TO ANJA BY THE MARTU ELDERS. SEE PAGE 4 FOR THE FULL STORY. IMAGE: RAYMOND DE GROOT.