ISSUE 7 SUMMER 2020

Hidden Vale Tails

– HIDDEN VALE WILDLIFE CENTRE NEWSLETTER –

New arrivals add a little magic

The Hidden Vale Project is excited to welcome two new additions to the Hidden Vale Wildlife Centre—Luna, and soon-to-arrive Harry 'Potter-roo'. These little marsupials are Long-nosed potoroos (*Potorous tridactylus*), a small member of the rat-kangaroo family.

Potoroos weigh between 660 and 1,600 grams, with a head-to-tail length reaching only 60 centimetres. They hide in forest areas with thick shrubs and grasses.

Long-nosed potoroos eat a variety of tubers, fruits and roots found by constantly sifting the forest floor. In doing so, they turn over leaf litter and spread important fungi and seeds which helps to improve the health of the ecosystem they live in.

We look forward to seeing Luna and Harry 'Potter-roo' settle in at the Wildlife Centre. They will be ambassadors for their species and a great source of education for visitors, students and researchers.

New research into threatened species

Research into the Long-nosed potoroo at Hidden Vale will start by locating the species within the 7,560 hectares that make up Hidden Vale and Spicers Peak Station.

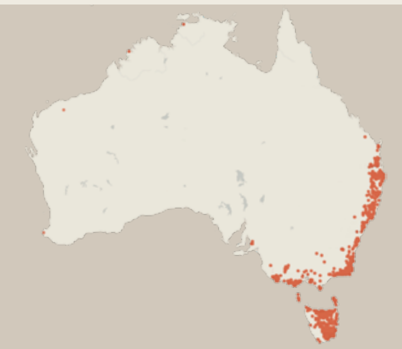
Considered threatened, there have been few recorded sightings of this species in the Scenic Rim region.

Our research will seek to gain a better understanding of what parts of its habitat allow potoroos to best avoid introduced predators. In particular, we will examine thick clumps of grass, logs and fallen timber as protection.

We will then focus on understanding how potoroos have changed physically over time and across their once wide range, to see if certain traits or genetics give some individuals a greater chance of survival.

Other research could include investigating the behavioural or social strategies used in response to different environmental conditions, or different methods to increase post-release success, such as safe havens.

Given the limited numbers of Long-nosed potoroos in the wild, we are also using their potoroid cousin, the Rufous bettong, as a model in research. All of this will be tied together to see how these factors can be altered to give existing and reintroduced populations the best chance of survival against introduced predators.



Long-nosed potoroo sightings.
Source: Atlas of Living Australia (ala.org.au)

The Hidden Vale Wildlife Centre is a collaboration between the Turner Family Foundation and The University of Queensland into the study and research of native ecosystems and wildlife.

Further information is available at turnerfamilyfoundation.com.au and hiddenvalewildlife.uq.edu.au

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The science behind gliding

Mahogany Glider at Hidden Vale Wildlife Centre

Research project description: Determining the behavioural differences between gliding and non-gliding marsupials using tri-axial accelerometers.

The evolutionary origins of novel locomotory behaviours such as powered flight represents an important habitat transition (land to air) that required 'key' innovative traits to occur morphologically, behaviourally and physiologically within a species.

Arboreality, and more specifically gliding, has been suggested to be one of the key transitional traits that has led to progressively more sophisticated aerial behaviours. Although a multitude of studies have investigated gliding as an evolutionary precursor to powered flight, the form and function of gliding as an independent locomotory behaviour is less understood.

At the Hidden Vale Wildlife Centre, we are researching the behavioural repertoires of both gliding and non-gliding marsupials to explain the possible evolutionary drivers that influenced this locomotive adaptation.

With the use of tri-axial accelerometers, we intend to quantify aspects of each species' behaviour to understand factors including overall distance travelled, total energy expended between species and the average time spent travelling on the ground.

We hypothesise that the ability to glide would increase the distance an individual would be capable of traveling in a given period (foraging efficiency), the total energy expended whilst active would be significantly reduced in gliders, and that being capable of gliding between trees would reduce the need to travel to the ground (predator avoidance).

This research can further our understanding on the behavioural ecology of arboreal marsupials to aid in the refinement of husbandry practices and future conservational efforts, especially regarding the endangered Mahogany Glider.

Mahogany Gliders in nesting box

'Leaf' the Mahogany Glider, in nesting box

Exploring the aviary

Scan the QR code to watch Hidden Vale's gliders in action

Researcher Profile:

PhD student: Joshua Gaschk

PhD Candidate, University of the Sunshine Coast

"My research on koalas inspired my PhD project which explores the locomotion of marsupials and compares their performance with Australia's invasive predators"

I completed a Bachelor of Science with majors in Zoology and Ecology at The University of Queensland. I then continued my studies at the University of the Sunshine Coast in an add-on Honours project studying koala locomotion.

For weeks we worked with a local zoo to film koalas as they walked and ran around their enclosure. We then spent months analysing video footage and data, discovering that along the ground koalas walked similarly to other marsupials, while in trees their locomotion resembled some primates.

My research on koalas inspired my PhD project which explores the locomotion of marsupials and compares their performance with Australia's invasive predators (cats, foxes, dogs). The purpose of this project is to identify species pairs whose relationship is based on either predation (dogs and bandicoots) or competition (cats and quolls) and then explore these relationships through biomechanics and associated behaviours.

There is a good body of research dedicated to understanding how effective the invasive predators mentioned above have been at adapting to Australian ecosystems. We also know a lot about how destructive they have been to Australian animals, but we don't know why.

The scope of my project seeks to answer this question. It will be done firstly by comparing the locomotor performance within these relationships and, secondly, by comparing behavioural differences.

The first idea to explore is which group of animals are better at running and cornering. How an animal moves, i.e. locomotion, is essential to the success of a species within ecosystems. By exploring locomotion, we want to see if invasive predators have a performance advantage over our native animals; making it easier for them to be caught in instances of predation. This will be achieved by filming animals during straight running and turning corners to develop performance limitations.

The second question to answer is how much locomotor-associated behaviours affect the relationship between invasive and native animals. Are these invasive animals trying harder or more often to catch prey? Are they willing to use energetically costly locomotion more often, or do they spend longer hunting?

Our investigations will use biosensors to identify behaviours, without the presence of observers. The facilities at Hidden Vale make this part of the project much easier as we can use CCTV footage of the enclosures to link biosensor output to animal behaviours.

The final goal is to place these biosensors on animals in the wild and record these behaviours in the natural environment. These ideas will be brought together, along with the population status of native animals, to determine if locomotion or associated behaviours have been responsible for declines in Australian native animals.

This is a broad project and will cover many species with the ultimate purpose of understanding how animal locomotion has been defining Australian ecosystems. Ultimately this research will inform conservation science and land managers on the best methods to protect our native fauna from invasive predators.

Joshua assisting with health checks at the Hidden Vale vet clinic

Hidden Vale students meet Queensland's new Chief Scientist

New Queensland Chief Scientist
Professor Hugh Possingham

Research students from the Hidden Vale Wildlife Centre were fortunate to spend an evening at The University of Queensland in late October speaking with Queensland's new Chief Scientist, Professor Hugh Possingham.

It was a rare opportunity and part of the Hidden Vale Wildlife Centre's commitment to providing students with professional development opportunities.

Drawing on his extensive career and wealth of experience, Professor Possingham provided advice on how to stand out when applying for positions, ways to enhance employment prospects, and how to decide what kind of work students might want to pursue.

Professor Possingham has had a distinguished career as a Professor of Mathematics and Ecology at UQ, beginning in 2000. While maintaining a part-time position at the University, he was also the Chief Scientist for The Nature Conservancy (TNC) between 2016 and 2020, before taking up the appointment as Queensland's Chief Scientist in September 2020.

Students enjoyed the opportunity to hear his perspective on work after tertiary studies, in particular if considering non-academic careers. Discussions canvassed government departments and a range of non-government organisations involved in conservation such as TNC, Australian Nature Conservancy, Trust for Nature and the Turner Family Foundation. Tom Scott and Dr Megan Brady are two UQ graduates currently working for the Foundation, demonstrating the variety of opportunities available to research students after graduation.

From left to right: Andrea Martin, Dr Julia Hoy, Graham Turner, Jude Turner, Professor Hugh Possingham, Professor Deborah Terry, Professor Bronwyn Harch, Dr Andrew Tribe, Jennifer Karlson and Ben O'Hara

"It was a rare opportunity and part of the Hidden Vale Wildlife Centre's commitment to providing students with professional development opportunities."

The Hidden Vale Wildlife Centre students were joined by a cohort from UQ's Centre for Biodiversity and Conservation Science for a presentation and social event afterwards. It was a great opportunity for collaboration and to meet Professor Possingham.

Other recent professional development provided to Hidden Vale students has included one-on-one sessions with a senior statistician, and a full-day training course entitled "*Writing and reviewing journal articles*" delivered by University of Southern Queensland academic Dr Ben Allan.

In a separate event, members of the Turner Family Foundation welcomed Professor Possingham to the Hidden Vale Wildlife Centre, along with UQ's new Vice Chancellor Professor Deborah Terry, and Deputy Vice Chancellor Research Professor Bronwyn Harch.

It was an opportunity to review the Centre's achievements and discuss future strategy and plans for collaboration between UQ and the Foundation.

A new scat survey method for koalas

Koala scat surveys are important tools for determining koala presence and distribution in large forested areas where it is impractical to conduct direct observation surveys.

However, current scat survey methods are problematic due to lack of either accuracy or feasibility. The research team at Hidden Vale Wildlife Centre has developed a new scat survey method, described in a paper recently published in the Australian Journal of Zoology, and described here by the team.

Student Alex Jiang tracking koalas at Hidden Vale

Q: What was the basis of this research?

We developed a new koala scat survey method, called Balanced Koala Scat Survey (BKSS). It provides improved survey accuracy and efficiency in the field compared with current koala scat survey methods. The efficacy of BKSS was not only justified in theory but demonstrated by field tests conducted at Hidden Vale.

Q: Why is this new method important?

Koala populations in Australia are declining and as a result the koalas' conservation status was downgraded in 2016 to 'vulnerable to extinction'. Effective conservation strategies for koalas are required to stop and reverse this decline. Wildlife conservation requires an understanding of an animal's distribution or presence by surveying them, in a specific area, so we can act to protect them. Koalas, because of their cryptic nature, are extremely difficult to see in eucalypt forest. The observation rate can be as low as 23 per cent. Therefore, scat surveys are widely used to detect koala presence, especially where koala abundance is low.

Before we developed our method, there were two other widely used koala scat survey methods that are considered biased and impractical in the field. All three methods involve counting scats under 30 trees based on selection of a central tree. The Spot Assessment Technique (SAT) subjectively selects the centre tree as potentially used by koalas, then searches the tree base area of the 30 trees with a fixed two-minute search time for each tree. SAT is biased because the centre tree selection is not randomised which may incur observer bias; the tree base search misses scats deposited outside this area; and a fixed two-minute search overlooks the variation of scat detectability due to scat density, tree size and ground cover complexity.

The other method - Koala Rapid Assessment Method (KRAM) - uses random centre tree selection, searches the entire tree canopy covered area, but still uses a fixed time frame for all trees. KRAM is biased by using a fixed time frame to search all trees and can be very time-consuming and impractical when tree canopy area can be as large as 100 square metres.

Q: Describe your new method and how it differs from the other techniques.

Our improved BKSS koala scat survey method starts with a centre tree that is randomly selected for the survey site, followed by a thorough search in the one-metre radius area around the tree base, without a time limit. The search only stops when a scat is found, or no scats are found after a thorough search. This is repeated for the nearest 29 trees around the centre tree. Although there is a chance that none of the scats fall in the one-metre radius tree base area, other research has shown that the chances of this happening are as low as 10 per cent.

Q: How was the method field tested?

To test the theory described above, BKSS was compared with SAT across the 4,560-hectare Hidden Vale property. We studied 750 trees in 25 survey sites. Scat search time for each tree was recorded, as well as the tree trunk diameter. We also examined ground cover complexity around each tree base and categorised it into four groups: leaf litter, bark, grass (shorter than 20cm) and high grass (taller than 20cm) (Figure 2). At each survey site Koala Activity Level (KAL), the proportion of trees found with a scat among the total 30 trees at one survey site, was also recorded. Our aim was to test whether scat search time was associated with KAL, ground cover type and tree size, and the rate of false-negative results in the SAT method.

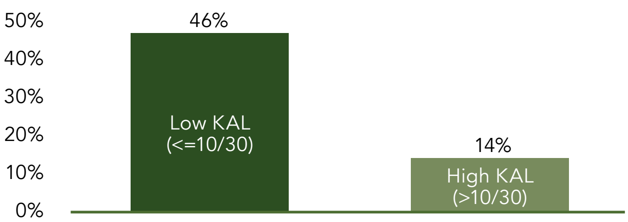
Q: What did the field testing find?

Among the 102 trees with scats, scat search time ranged from five seconds to 420 seconds, with an average of 93 seconds. In total, 26 per cent of trees with scats took longer than two minutes to find the first scat. Scat search time was negatively associated with KAL of the survey site ($P = 0.002$). At the sites where KAL was higher than 0.3 (10 of 30 trees), the mean scat search time was 73 seconds ($n = 63$), and the rate of scat search time longer than two minutes was 14 per cent ($n = 9$). At the sites where KAL was lower than 0.3 (10/30), the mean scat search time was 126 seconds ($n = 39$), and the rate of scat search time longer than two minutes was 46 per cent ($n = 18$). Ground cover complexity and tree size were not associated with the time taken to find the first scat.

Q: What is the benefit of the discovery and its applications?

Our results demonstrate that the higher the scat density, the easier and quicker it is to find the first scat, and that ground cover complexity and tree size had no impact on scat search time in this study. This is possible because of the relatively high level of koala scat density within the survey sites across the Hidden Vale property. However, there were on average 26 per cent of trees that required more than two minutes to find the first scat. This represents the failure rate of SAT, because SAT only allows a two minute search time. The failure rate of SAT was also negatively associated with KAL (Figure 1). When KAL was high, i.e. higher koala abundance, this failure rate of SAT was 14 per cent; however, when KAL was low, SAT failure went as high as 46 per cent.

Figure 1: SAT failure rate under Low and High Koala Activity Levels.



Koala conservation strategies, such as habitat protection and mitigation, are based on an understanding of koala distribution and presence in the area, which is often determined by scat surveys. Our BKSS has overcome the bias of previous survey methods with demonstrated improvement in survey accuracy and efficiency in the field, and is a more cost-effective method, especially in low koala density areas such as inland Queensland.

Figure 2: The four ground cover categories, from left to right: Leaf, Bark, Grass, High Grass.

Out and about

The Hidden Vale Wildlife Centre recently welcomed the UQ School of Biological Sciences for an information afternoon to discuss opportunities to undertake research at the centre and on the 4,560-hectare property.

Many thanks to Head of School, Professor Margaret Mayfield, Pro-Vice Chancellor Jen Karlson and Director of Advancement Evan Morgan, UQ Advancement, for helping to coordinate the afternoon and following up on the numerous research opportunities generated on the day.

Above: Acting UQ Hidden Vale Wildlife Centre Research Manager Karen Gillow addressing students and staff from the UQ School of Biological Sciences

Above: Students and staff at Hidden Vale Wildlife Centre

Hidden Vale Wildlife Centre and UQ staff recently visited Dreamworld – not to play, but to talk about koalas.

Dreamworld has been undertaking koala research work for a number of years. This visit provided an opportunity to consider our koala research and potential collaborations with the Dreamworld research team. Collaborations are vital to broader success and we look forward to working with many groups in the future.

Above: Dreamworld's Michele Barnes along with Hidden Vale's Dr Dalene Adam and Dr Andrew Tribe

On behalf of the Hidden Vale Wildlife Centre, UQ and the Turner Family Foundation, and all our wonderful wildlife, we wish you a safe and happy holiday season.

HIDDEN VALE CONSERVATION TOP-UP SCHOLARSHIPS

Turner Family Foundation research support funding encompasses top-up scholarships of $7,000 per year for three years for PhD students.

Current research project opportunities within the Hidden Vale Project are detailed on our website.

Applications for top-up scholarships close 31 December, 2020.

Further details can be found at https://hiddenvalewildlife.uq.edu.au/article/2020/10/student-research-opportunities-2021

INTERNAL RESEARCH FUNDING SCHEME

As part of the Turner Family Foundation's ongoing commitment to fostering high impact research within the Hidden Vale Project, funding is provided to support postgraduate research projects and staff research. This funding is made available on a quarterly basis to current Hidden Vale research students and staff only. Around $80,000 has been provided for equipment, fieldwork expenses, laboratory analyses, conference attendance and specialist training. The next funding round closes 17 March, 2021.

Summer at the Hidden Vale Wildlife Centre is a busy time. We'd like to take this opportunity to thank the researchers, students and staff for their dedication and hard work during what has been a very challenging year for all. We would especially like to thank the contributors to this year's editions of Hidden Vale Tails, Dr Dalene Adam, Jasmin Annett, Jennie Bacon, Dr Megan Brady, Karmen Butler, Dr Meg Edwards, Joshua Gaschk, Karen Gillow, Dr Julia Hoy, Alex Jiang, Thomas Lally, Gloeta Massie, Associate Professor Peter Murray, Ben O'Hara, Thomas Scott, Dr Andrew Tribe and Shania Watson.

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To find out more about the Turner Family Foundation visit www.turnerfamilyfoundation.com.au