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Newsletter of the Ecological Consultants Association of NSW

ECA
ECOLOGICAL
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of NSW Inc

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INSIDE THIS ISSUE!

Editor: Jason Berrigan

ECA Photo Gallery

Right: *Diuris arenaria. Photo Courtesy of Isaac Mamott*

Above: Red-crowned toadlet.

Left: Sugar glider

Below: Eastern brown snake.

Photos courtesy of Daniel O'brien

Front Cover Photo: A Masked Owl at Explosives Reserve, Castle Crag, NSW. *Photo Courtesy and Copyright of Chris Charles.*

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Message from the President

Mark Couston *August 2012*

Dear members,

I would like to thank the members who attended the 2012 Annual General Meeting and their support for my 3rd year as president of the ECA. The 2012-13 ECA Council elected at the AGM also comprises of some familiar faces as well as some members that have returned after a break from official ECA duties.

I would like to thank Dr Martin Denny and Ray Williams who did not stand for positions this year, as both have provided continuous support on the ECA Council since its inception in 1998. Martin has however offered assistance to finalise the accreditation scheme for ecological consultants.

This years conference on Roadside Ecology held at Wollongong was a great success with fantastic speakers, good food and an excellent location. Several members made the comment to me that it was one of the best conferences we have run.

This years Council Executive consists of myself, Vice President- Stephen Ambrose, Secretary - Deryk Engel, Treasurer- Paul Burcher with the elected Councillors being Dr Alison Hunt, Judie Rawling, Belinda Pellow, Rebecca Hogan, Liz Ashby, Rhidian Harrington, Matt Richardson, Liz Norris, John Travers and Steve Sass.

The first meeting of the new ECA Council was held in September 2012 at Parramatta, the following ECA sub-committees were established:

- *Accreditation Committee* Alison Hunt (Chairperson);
- *Professional Conduct Committee. S*tephen Ambrose (Chairperson);
- *University Liaison Committee. B*elinda Pellow (Chairperson);
- *Student Grants Committee. P*aul Burcher (Chairperson), and
- *2013 Conference Committee* Judie Rawling (Chairperson),

On behalf of the ECA Council we look forward to continuing and improving the current services to members and dealing with new matters which seem to arise regularly in our profession.

ECA Councillors present at September 2012 meeting. From left Paul Burcher, Stephen Ambrose, Mark Couston, Judie Rawling, Rebecca Hogan, Deryk Engel, Alison Hunt, Belinda Pellow, Elizabeth Ashby and Rhidian Harrington.

EUROKY

***Euroky*: ability of an organism to adapt to changes in the environment**

If you have any interesting observations or useful hints and information that you would like to share in the euroky column, please forward them to the newsletter editor or administration assistant to be included in the next edition.

An X-rated Surprise in the Grass

Narawan Williams
Ecotone Ecological Consultants

On a calm warm sunny day earlier this year, I was carrying out a reptile search at a site when I heard some movement in the grass downslope of me. The sound appeared to be coming from the reeds and grass around the edge of a small dam. I could not see the animal in question, even though the sound was moving around. I was half expecting to see a lace monitor strolling out from the grass, and decided to go and have a closer look. I slowly walked down towards the dam and to my surprise, I spotted two Eastern brown snakes entwined together with both their heads and first part of body stretching up towards the sky. I was able to creep as close as six metres, without disturbing them to watch the action. They were very focussed on what appeared to be their mating ritual.

Unfortunately my camera, usually attached to my belt, was absent, so there are no photos and you will have to use your imagination.

One snake was a pale fawn colour and slightly larger than the other which I assume was the female. The other snake was more of a grey colour and was trying to be dominant over the female. Two thirds of their bodies were twisted together most of the time during this observation. It was quite a violent scene with both their heads raised; hissing, thrashing and dummy striking each other. At times they would press their necks against each other, then the male would put his head on top of the females head and press it down towards the ground. The female would then lash out again, both with their necks flaring out a bit, with more dummy strikes at each other. Their heads then separated side by side from twenty to forty centimetres apart, and then they turned their heads to face each other with intense eye contact. This sequence was repeated many times while their entangled bodies were writhing around. You could see the strength of their bodies testing each other. It looked like the male was holding the female and the female testing how well he could hold her.

At times they would relax a little and their bodies would untwine except for the lower third. They would move slowly with heads lowered or pause briefly with head raised. They moved together along the ground flattening the grass under them around the edge of the dam. Interestingly they also went into the reeds and in the water a couple of times. I was wondering if it was to help them cool down as it was a warm sunny day and snakes can overheat easily.

I was not sure if the male hemipenis was inside the female at any time during this ritual or if that were to happen later somewhere. Their tails seemed to be moving around too much to be joined. I watched the snakes for over an hour and a half, and in that time they had only separated briefly once - at the end of this period when they moved off downslope staying in the cover of bracken fern. I left them entwined and wondered how long this ritual would continue. No wonder they had to cool themselves off occasionally and take some short rest breaks!

Eastern Brown Snake. *Photo courtesy of Narawan Williams*

If you have 2nd hand ecological equipment that you would like to sell or would like to purchase you can place an ad in this newsletter. Free for members or $40 for non -members. Contact admin@ecansw.org.au.

The ever-changing face of Biobanking

Cassandra Thompson
EMGA Mitchell McLennan

Just when you thought you had your head around the Biobanking methodology and the new Version 2 calculator, the scheme is now under review with some significant changes likely as a result. I recently attended a small meeting with some other Biobanking accredited assessors at OEH to discuss the proposed changes and the current review of the Biobanking scheme.

The changes to the methodology have been made mainly to make the process less rigid to increase usage of the scheme. Such changes include:

- making the assessment process easier by reducing mapping and calculator input requirements (taking out the need for threatened species sub-zones and allowing vegetation zones to extend across CMA subregions);
- limiting connectivity values to within the 1000ha circle;
- an additional category for extra large remnants when assessing adjacent remnant area;
- allowing species to be removed from the list of predicted species for a development site where an assessment shows that the species habitat is not present or substantially degraded;
- including riparian areas (to be in line with the NV Act and as these areas often support a greater diversity of plants and animals);
- increasing clearing allowance for highly cleared vegetation types from 4ha to 10ha on a development site; and,
- changes to the definition of low condition vegetation (increasing native overstorey percent foliage cover from 25% to 50% of the lower value benchmark, and the addition of a new definition - vegetation with a site value score of less than 34 (using Equation 1).

A controversial proposed change is allowing credits to be retired across vegetation types, vegetation classes and wait for it - across vegetation formations!

I think that the proposed changes are going to assist me with my assessments. Even though I haven't 'officially' used the scheme, it is a really useful tool to determine offset requirements, even though I have crashed the calculator many times from too much data (from very large projects)!

And so we eagerly await the review process to finish and changes to be made. In the meantime, many of us will have to sit a 'refresher' so that our accreditation doesn't lapse and then some time next year, we will have to get up to speed once again with the new and improved methodology!

Tick Bite Induced Meat Allergy

Dr Margaret Smith-White
ACS Environmental

Some years ago I developed symptoms that I thought at the time were Irritable Bowel Syndrome (IBS) but I didn't present the usual patient symptoms. I knew food was the problem as when I fasted all symptoms disappeared, but one can't fast for ever. My symptoms were inflammation, fatigue, muscle aches and rashes that came and went. I was sleep deprived from the pain in my joints at night. I looked at times as if I was pregnant from the inflammatory response in my gut. I tried many different diets and food elimination trials including low salicylate, low amine, gluten-free, avoiding nightshade foods, avoiding grains etc. Nothing seemed to work. I eventually went to see an immunologist as my igE mediated antibody count was escalating and doctors thought I had an arthritic disease of some sort which could explain the joint pain. I saw Professor Sheryl Van Nunen at North Shore Hospital. She was sure she could solve the mystery. When I told her my profession and that I lived on the Northern Beaches, she asked me if I had bad reactions to tick bites. I have been bitten many times but the worst reaction I had was to nymph stage ticks. I disturbed a nest of nymph ticks and ended up with approximately 100 embedded in my back. They are so small its hard to tell if they are ticks but the trusty microscope confirmed their presence. I can't remember how I got rid of them (probably the worst way) but I suffered a tetanus like paralysis in my neck as a result and was sick for about two weeks. Professor Van Nunen did some blood tests and the results came back positive to an allergy to red meat and a cross reactivity to dairy. She told me I was able to eat anything with fins or feathers.

The red meat allergy is common in the US where tick

bites are also a problem. Experts have identified the part of the red meat allergen giving rise to the allergic reactions, galactose alpha-1,3-galactose (alpha-gal for short). Alpha-gal is essentially a bunch of sugars stuck together in the blood, which is in the meat of all non-primate mammals, including deer, cats and dogs.

Diagnosing the allergy can be challenging due to its delayed onset. Typical food allergies elicit reactions within 30 minutes of consumption, but individuals allergic to meat experience symptoms up to six hours after the offending meal. If they happen to partake of meat at dinner, the result can be a terrifying middle-of-the-night awakening with unexplained hives or even full-blown anaphylaxis. It's definitely an allergy, as opposed to an intolerance. For those allergic to meat, eating a hamburger doesn't just cause digestive problems or make them feel ambiguously unwell, it creates an antibody-mediated allergic response.

Like the bulk of allergies, reactions to meat are mediated by Immunoglobin E (IgE) antibodies†, which the body produces in response to a particular allergen (in this case alpha-gal.) Why some people become "sensitized" (i.e., produce allergen specific antibodies) to relatively harmless things like pollen, peanuts, or meat is not entirely clear, but as with many physiological quirks, it's likely a mix of genetic and environment factors.

I no longer ache at night and have no joint pains at all. It will take longer for my gut to recover but things are much better. I miss a good steak but its not worth the inflammatory response or pain. I still get bitten, usually when I am down in the leaf litter scavenging for scats but I endevour to protect myself with insect repellent and wear a 'tick suit' (fine weave overall) when working in areas where ticks are a known problem. If I get a bite I immediately spray the area with 'Aerostart' which freeze dries the tick immediately and it drops off without injecting any toxin.

For more information see;
*www.theaustralian.com.au/...**red-meat**.../*
https://www.mja.com.au/.../association-between-tick-bite-reactions

Platypus Hairs Through a Microscope

Luke Foster
Ecobiological

The method of identifying this particular hair sample followed those outlined by Brunner and Coman (1972) and Barbara Triggs (pers. comm.) and involved the preparation of a clump of hairs in order to observe characteristic traits via a microscope. The initial steps taken in identifying this particular sample was to prepare a microscope slide with a mixture of hair types (guard, over and under hairs) in order to see a whole mount view of each hair strand. From this view, the general profile of the hair was observed which included identifying the length of each hair, colour, presence of a shield region (a widened area), colour bands, waviness and any constrictions. The whole mount view also allows the medulla (the innermost part of a hair) to be observed and any patterns identified. From the information gathered thus far, I was able to make a positive identification of the sample.

However on many samples, further steps must be taken in order to provide an accurate identification. These steps include the preparation of a cross section (a 90° cut of hairs showing the shape of the hair and medulla) and sometimes the preparation of a cuticle scale slide (a scale cast made with glue highlighting individual scale patterns). More often than not, an accurate identification of the species can be made

using the whole mount and cross section.

As can be noted with this species, the whole mount shows a distinct constriction between the shield region and the shaft region; and the medulla (although difficult to see at this magnification) is a very distinctive globular appearance, almost like a knotted rope.

This image has been made by stitching 30 whole mount images of the primary guard hairs together through a microscope at 400x magnification.

Miscellaneous Note on *Corybas dowlingii*

Isaac Mamott
RPS

Great news for all you botanists.....soon we should no longer have to tear our hair out (not that I have much left) to try and distinguish between the TSC listed *Corybas dowlingii* and the more widespread and common *Corybas acontiflorus* when looking at sites on Nerong Volcanics geology on the lower and mid NSW North Coast.....Dr Mark Clements from CSIRO Canberra has indicated that a paper will be coming out in the not too distant future detailing the results of his research which Mark tells me conclusively shows that *C.dowlingii* is just a form *of C.acontiflorus* and should not be recognised as a separate species. Based on his research, the CSIRO have recommended the species be de-listed from the TSC Act.

C.dowlingii was split from *C.acontiflorus* by Jones (2004), a split which was not widely accepted amongst the orchid community.....

For those of us who regularly scratch our heads over some of the taxonomic splits described in Jones (2006) (the orchid bible), this news is welcome.

PHOTO COMPETITION

Congratulations! to ***Chris Charles*** on winning the last photo competition with his photograph featured on the front cover of a Masked owl.

Thank you to everyone who entered our photo competition. All entries have been included in the ECA Photo Gallery on the back cover.

Email your favourite flora or fauna photo to admin@ecansw.org.au to enter a competition and have your photo on the cover of the next ECA newsletter. Win your choice of one year free membership or free entry into the next ECA annual conference. The winner will be selected by the ECA council. Runners up will be printed in the photo gallery

Photos entered in the competition may also be used on the ECA website

www.ecansw.org.au

The ECA website has recently undergone an upgrade.

Please visit the site to access:

- Member contact list
- Membership application and renewal forms
- Photo Gallery
- ECA Newsletters - *Consulting Ecology*
- Jobs Vacant / Wanted
- ECA Discussion Forum
- ECA History
- Upcoming ECA Events
- ECA Council and Sub-committee details

Upcoming Events in 2012 - 2013

ECA Events

- **LYME'S DISEASE AND OTHER TICK RELATED INFECTIONS: Information day.**
  - December 2012 (date to be advised)
  - Free for members; $100 for non-members
- **ECA 2013 ANNUAL CONFERENCE AND AGM**
  - **July 2013**
- **PROPOSED ECA WORKSHOPS 2012 / 2013**
  - Shorebirds (Feb 2013 at Bundeena)
  - Terrestrial Orchids (Spring 2013)
  - Rainforest Plant ID

The dates and venues for these workshops are yet to be determined. You may register your interest in any of these workshops by emailing admin@ecansw.org.au.

Non - ECA Events

- **Australasian Wind and Wildlife Conference**

Date: 9th October 2012
Venue: Melbourne
Cost: $130
Details: www.windandwildlife.com.au
Contact: windandwildlife@mail.com

- **Jewels in the landscape: managing significant native vegetation remnants workshop**

Date: 20-21 November 2012
Venue: Moree NSW
Contact: http://www.anpc.asn.au

- **Seed collection, storage and use for native vegetation restoration**

Date: 5th November 2012
Venue: The Australian Botanic Garden, Mount Annan, NSW
Contact: http://www.anpc.asn.au

- **Translocation of threatened plants**

Date: 6-7th November 2012
Venue: The Australian Botanic Garden, Mount Annan, NSW
Contact: http://www.anpc.asn.au

August 2012 ECA Membership Report

Amy Rowles
ECA administrative assistant

In total we have 162 members. We have had eighteen new members and two current applicants over the last six months. The new members are introduced below:

- Arne Bishop
- Garon Staines
- Luke Foster
- Mark Branson
- Glenn Muir
- Luke Pickett
- Mark Chidel
- Aaron Mulcahy
- Joel Stibbard
- Lawrie Smith
- Andrea Sabella
- Rebecca Carman
- Gilbert Whyte
- Sian Griffiths
- Ann Goeth
- Gavin Ayre
- Charlotte Erikson
- Vanessa McTyer

Reducing the impacts of development on wildlife

by James Gleeson and Deborah Gleeson, CSIRO Publishing, Collingwood, 2012, 234pp,

ISBN 978-0-643100329, $89.95.

A Review by Martin Fallding

Land & Environment Planning

A book outlining measures to reduce the impact of development on wildlife is long overdue. This book is a good introduction to the subject, providing a starting point for how to design wildlife crossings on roads, suitable fences for wildlife, or options for providing additional flora and fauna habitat.

Ambitious in scope, the book is structured in a way that makes the subject easy to follow and relevant to a wide audience. It introduces fundamental ecological concepts for assessing and mitigating the impacts of development on natural systems and provides a comprehensive review of relevant wildlife research and management measures. Local examples and excellent referencing make it an important resource for ecological consultants.

The information is made accessible through quick reference tables and excellent case studies. Measures described and evaluated in the book include natural habitat bridges, exclusion fences, canopy bridges and glide poles, artificial tree hollows, salvaging habitat features, underpass design and much more.

Although the book provides an excellent overview, with such a broad scope, many measures outlined are generic and lacking in detail. Much more is needed to apply many of the approaches in practice and to evaluate their effectiveness. A 'how to guide' providing more species and locality specific information will be the next step in developing situation-specific guidelines and specifications for construction.

Some key questions receive only cursory attention such as design of buffers, connectivity and habitat corridor requirements, biodiversity offsets, and monitoring and evaluation. Other gaps are the effectiveness of restricting domestic animals, measures to protect habitat for invertebrate species, and noise and lighting impacts on wildlife. A glossary might have also helped readers not familiar with ecological concepts.

If nothing else, this book demonstrates why detailed professional ecological investigations should be undertaken for all developments potentially impacting on natural ecosystems. Understanding what is on a site and individual species' requirements is essential for determining future land uses, designing development projects and managing consequential impacts.

The book demonstrates that not only should the impacts of development on natural ecosystems and biodiversity be considered, but that development can be designed to reduce these impacts.

Recent Journal Articles / Literature

McLean M., Bishop J., Hero J. and Nakagawa S. (2012) Assessing the information content of calls of *Litoria chloris*: quality signalling versus individual recognition. *Australian Journal of Zoology* - http://dx.doi.org/10.1071/ZO12014

Carter A., Luck G. and Wilson B. (2012) Ecology of the red fox (*Vulpes vulpes*) in an agricultural landscape. 1. Den-site selection. *Australian Mammalogy* 34(2) 145-154 http://dx.doi.org/10.1071/AM11038

Carter A., Luck G. and Wilson B. (2012) Ecology of the red fox (*Vulpes vulpes*) in an agricultural landscape. 2. Home range and movements. *Australian Mammalogy* 34(2) 175-187 http://dx.doi.org/10.1071/AM11041

McLlroy., Collins J. and Borchard P. (2012) A revised method for estimating population densities of common wombats (*Vombatus ursinus*). *Australian Mammalogy* 34(2) 170-174 http://dx.doi.org/10.1071/AM11028

Smith J. and Coulson G. (2012) A comparison of vertical and horizontal camera trap orientations for detection of potoroos and bandicoots. *Australian Mammalogy* 34(2) 196-201 http://dx.doi.org/10.1071/AM11034

Meek P., Zewe F. and Falzon G. (2012) Temporal activity patterns of the swamp rat (*Rattus lutreolus*) and other rodents in north-eastern New South Wales, Australia . *Australian Mammalogy* 34(2) 223-233 http://dx.doi.org/10.1071/AM11032

Val J., Mazzer T. and Shelly D. (2012) A new record of the dusky hopping mouse (*Notomys fuscus*) in New South Wales. *Australian Mammalogy* 34(2) 257-259 http://dx.doi.org/10.1071/AM11031

Weston M., McLeod E., Blumstein D. and Guay P. (2012) A review of flight-initiation distances and their application to managing disturbance to Australian birds. *Emu* - http://dx.doi.org/10.1071/MU12026

Smith P. and Smith J. (2012) Climate change and bird migration in south-eastern Australia. *Emu* - http://dx.doi.org/10.1071/MU11078

Macdonald J., Tonkin Z., Ramsey D., Kaus A., King A. and Crook D. Do invasive eastern gambusia (*Gambusia holbrooki*) shape wetland fish assemblage structure in south-eastern Australia? *Marine and Freshwater Research* 63(8) 659-671 http://dx.doi.org/10.1071/MF12019

Lessons from the heartland: restoring landscapes for threatened and declining birds in the Southwest Australia world biodiversity hotspot.

Hugget A. (2010). Presentation at the 25th International Ornithological Congress 22-28 August 2010 (www.i-o-c.org)

Abstract

We are living in the "Sixth Great Extinction" - a time of unprecedented decline and loss of species and their

habitats, threatening our own persistence on Earth. Many species have become, or are about to become, members of the "next wave" of predicted extinctions. Globally, one in eight bird species are currently threatened with extinction while 190 species are critically endangered. Once common and widespread species are sharply declining in number and contracting in distributional range as their habitat is substantially reduced, lost, degraded, or becomes increasingly disjunct. In the highly fragmented Western Australian wheatbelt - part of the Southwest Australia global biodiversity hotspot - about 70% of woodland bird species have declined since European settlement. Many of these have been ground-foraging insectivores and hollow-nesters. In this paper, I report on how a ten-year, science-informed landscape design is helping to restore and re-connect key habitat for declining and threatened birds in a 181,000 ha salt-affected wheatbelt landscape of Western Australia - Buntine - Marchagee Natural Diversity Recovery Catchment. I present results on focal bird species abundance, richness and use of woodland and shrubland habitat linkages planted under this design and adjacent remnant indigenous vegetation. I also outline monitoring and evaluation requirements and identify priorities for further research. I conclude by demonstrating the utility of this practical approach for bird conservation in fragmented landscapes worldwide.

Sensitivity of insectivorous bats to urbanization: Implications for suburban conservation planning.

Threlfall C. law B. and Banks P. 2011. ***Biological Conservation.***

Abstract

Effective conservation planning requires an understanding of species–habitat relationships across a diverse array of taxa, yet many studies typically focus on conspicuous fauna. Using systematic acoustic surveys, we examine the response of insectivorous bat species to urbanization and quantify species–habitat relationships to classify species in terms of their tolerance or sensitivity. Surveys were conducted in Sydney, Australia, during spring–summer of 2008 in 29 defined 25 km2 landscapes, across various land

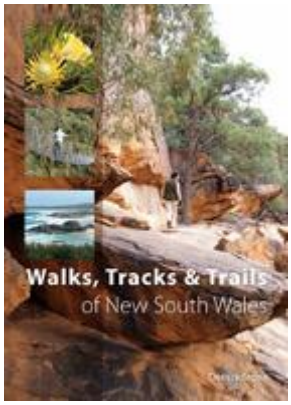
uses. We quantified bat–habitat relationships using local and landscape scale variables. We recorded 17 taxa across the urban gradient, with substantial variation in the tolerance and sensitivity of each species.

The density of houses, landscape geology, the amount of bushland (ha) exclusively on fertile geologies and moth biomass were the most frequent predictors of individual activity, explaining more than 60% of variation in activity for some species. Importantly, the area of bushland on poorer soils was not a good predictor, highlighting the need for caution when interpreting results of large scale studies which do not account for variations in habitat productivity. Species-specific differences existed, although the majority of the assemblage was considered to be urban-sensitive. Many of these sensitive species were most active in fertile suburban habitats, with an average of 12–28% bushland cover within 5 km. Our study demonstrates the necessity to elucidate species-specific habitat relationships, and suggests bats would benefit from the conservation of productive suburban bushland remnants and riparian habitats, while improving connectivity to these areas via the maintenance of tree cover across the matrix.

Recent Book Releases

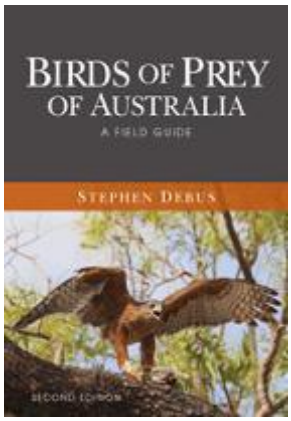
Information Source: CSIRO Publishing
Website http://www.publish.csiro.au

Title: Walks, Tracks and Trails of New South Wales
Author: Derrick Stone
RRP: $39.95
No. Pages: 280
Publisher: CSIRO Publishing
Date: October 2012



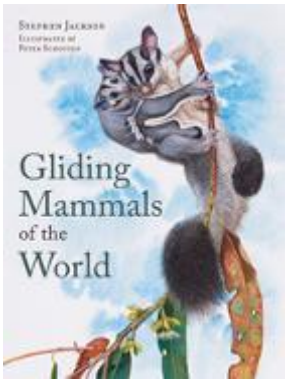
Title: Australia's Fossil Heritage: A Catalogue of Important Australian Fossil Sites
Author: Derrick Stone
RRP: $59.95
No. Pages: 200
Publisher: CSIRO Publishing
Date: July 2012

Title: Birds of Prey of Australia: A Field Guide (second edition)
Author: Stephen Debus
RRP: $39.95
No. Pages: 208
Publisher: CSIRO Publishing
Date: September 2012



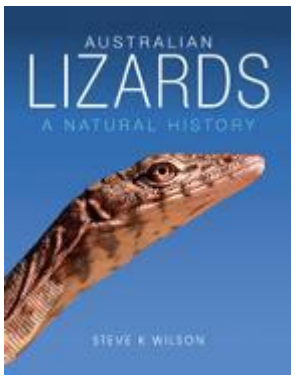
Title: Flood Country
Author: E. O'Gorman
RRP: $49.95
No. Pages: 280
Publisher: CSIRO Publishing
Date: August 2012

Title: Gliding Mammals of the World
Author: S. Jackson and P. Schouten
RRP: $99.95
No. Pages:232
Publisher: CSIRO Publishing
Date: August 2012



Title: Australia's Amazing Kangaroos
Author: K. Richardson
RRP: $49.95
No. Pages: 240
Publisher: CSIRO Publishing
Date: July 2012

Title: Australian Lizards: A Natural History
Author: S. Wilson
RRP: $49.95
No. Pages: 208
Publisher: CSIRO Publishing
Date: October 2012



ROADSIDE ECOLOGY

CONFERENCE

The 2012 ECA Annual Conference 'Roadside Ecology' and AGM held on the 30th July at the City Beach Function Centre in Wollongong was a success, with lots of positive feedback from the delegates. I would like to thank all the presenters and session chairs, who made it a very interesting and informative day. I would also like to thank Stephen Ambrose for managing the pro-

ECOLOGICAL CONSULTING: THE BUSINESS ASPECTS

This is a new section where the ECA Council encourages members to ask questions which relate to aspects of consulting that may not be addressed in a scientific paper. The question and answer/response this time is provided by Elizabeth Ashby of Keystone Ecological, based on her own experience, and hence members are encouraged to seek their own advice accordingly.

It is intended that answer/opinions for this column will be sought from appropriate professionals (e.g. lawyers, accountants) for future questions, where applicable. If you'd like to ask a question, please email the Administration Officer at admin@ecansw.org.au, and allow sufficient time for an answer to be obtained.

Q: I suspect that my business is incorrectly categorised for Workers Compensation Insurance. The paperwork from my insurer shows our Workcover Industry Classification Description as Scientific Research. Is this right for an ecological consultancy?

A: Elizabeth Ashby

It is important to get this right, because each Industry Classification has a different risk profile which translates into different premiums and insurance in its many forms is a big outlay for a small business. Of course, every ecological consultancy is unique, and the Scientific Research classification may accurately reflect your situation or at least accurately reflect the information you provided to the insurance provider in the first place.

I recommend that you speak to your insurance provider, and/or an insurance broker, and/or WorkCover themselves for professional advice. But before you do, arm yourself with some information. Each year, the NSW Government issues an Insurance Premiums Order that includes *inter alia* the Workcover Industry Classification. The latest one (2011-2012) applies to policies that commence or renew on or after 30 June 2011, and you will find it at http://www.workcover.nsw.gov.au/formspublications/publications/Pages/ipo20112012.aspx. In there you will see that the rate applied to Scientific Research is 0.611% but that Environmental Consultancy (which might be more appropriate) has a rate of 0.420%. This may translate into a considerable saving in your insurance premiums.

The ECA Forum Summary

Compiled by Amy Rowles

The ECA Forum on the ECA's website is one of the many privileges of membership, and is intended:

- *To encourage discourse within the membership.*
- *To enable a forum for members to raise issues that affect members, the industry and the ecologist.*
- *To provide a venue for depositing information eg anecdotal sightings, interpretation of legislation, etc.*
- *To inform members of changes to legislation, upcoming events, draft reports, etc on public exhibition.*
- *To reduce some of the emails generated by in-house chat within the membership.*
- *To provide a means of archiving information shared within the membership for future reference.*

The Forum features a range of issues from legal to anecdotal, comments and questions by some members seeking some clarity on some issues or assistance in a work-related matter or some hotly debated issues.

If you haven't had time to log on and catch up, here's a summary of some of the recent topics. See the forum at www.ecansw.org.au for details.

Biobanking

Danny Wotherspoon expressed his view that Biobanking is a failing scheme. Phil Burrell replied in agreement, stating that the concept of biobanking is hypocritical in some aspects. Jason Berrigan also agrees with Danny and Phil, and continued with supporting offsetting, but feels that all development should require offsetting.

General

Kathryn Chesnut is interested in buying a second hand copy of Flora of NSW Volume 4 - if anyone is looking to sell one please contact Kathryn.chesnut@urs.com .

Lyme's Disease

There have been a couple of comments from Amy Rowles and Jason Berrigan on the topic of Lymes Disease.

Use of different bait types to determine which is the most effective at luring animals into the field of view of an infrared camera.

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This experiment was conducted as part of an advanced science school project. The structure of the experiment was determined based on both feedback received from several members of the 2011-2012 ECA Council and the consultation of various literature sources.

Introduction

The use of infrared cameras in fauna surveys is increasing as these products become cheaper and more readily available. Infrared cameras provide advantages over other conventional trapping techniques, including the minimisation of survey effort, an increase in sampling time and the ability to detect a wider range of species. Use of infrared cameras also has ethical and safety benefits as the species recorded do not requiring handling.

A review of the literature indicated that several bait types are currently being used to lure species into the field of view of these devices, these including the "standard" rolled oats, peanut butter and honey mixture (hereafter referred to as oat mix), truffle oil and meat products (Engel and Burcher 2009, Davis 2011, Paull *et al*. 2011, Sloane 2011). Various combinations of these are also used, such as the addition of pistachio oil or sardines to the oat mix (M.Couston, Footprint Green Pty Ltd, pers comm., Davis 2011).

This experiment was established to determine if there was one particular bait type that was most effective at attracting the greatest diversity of species into the field of view of an infrared camera. The baits tested were the oat mix, white truffle oil (Vilux™) and chicken carcasses.

Study area

The experiment was undertaken within Royal National Park, which is located approximately 25km south of the Sydney Central Business District in the Sutherland Local Government Area. Within this reserve, three sites were selected for sampling, these being known locally as "Flat Rock Creek", "The Saddles" and "Tall Timbers" (Figure 1).

Each of these sites were selected as they have been mapped as being vegetated by "Coastal Sandstone Sheltered Peppermint-Apple Forest", this being one of the dominant habitat types within Royal National Park (DECCW 2011). Ground truthing undertaken during the course of the experiment confirmed that the mapping was accurate. The sites were found to be dominated by an overstory of Broad-leaved Scribbly Gum (*Eucalyptus haemastoma*), Red Bloodwood (*Corymbia gummifera*) and Smooth-barked Apple (*Angophora costata*), whilst the understorey and groundcover layers feature species such as Tea-trees (*Leptospermum spp.*), Banksias (*Banksia spp.*), Wattles (*Acacia spp.*), Bracken (*Pteridium esculentum*), Mat Rush (*Lomandra longifolia*), Gymea Lily (*Doryanthes excelsa*) and Common Hop Bush (*Dodonaea triquetra*). Tree heights were approximately 10 metres (m), with the shrubs up to 3m in height and the ground cover plants to 1m. Rocky outcrops, boulders and benches are common, as is the presence of leaf litter and natural ground debris.

The sites sampled have an elevation of around 120m above sea level and are underlain by the Hawkesbury Sandstone geological unit.

The sites established at Flat Rock Creek had either an east or west facing aspect, whilst the Saddles and Tall Timbers locations are both relatively flat.

None of the sites sampled exhibit any evidence of recent fire activity, with the last major wildfire experienced by the locality being in 1994.

Not to scale. Source: Google maps 2011.

Figure 1: Survey locations.

GPS coordinates of each site surveyed, along with the orientation of the camera at that site, are provided in Table 1.

Survey method

Camera setup

Four cameras were established at each location sampled, consisting of a control site (no bait used) and sites at which truffle oil, oat mix or a chicken carcass was placed.

At Flat Rock Creek the cameras were established along a linear transect that followed the site's contour, these cameras being placed at intervals of between 100m and 150m apart. At both the Saddles and Tall Timbers sites, a square shape was adopted, the sides of these again being between 100m and 150m long. At each site the cameras were secured to the trunk of a mature plant at a height of 0.8m above the ground.

The cameras used employed a passive infrared (PIR) system, in which the camera is triggered by an animal traversing an IR beam. The cameras operated diurnally and nocturnally, and were set to a sensitivity of high and a photo interval of 3 per ten seconds. Any photographs taken were saved in JPEG format and were downloaded once collected to a standard personal computer.

The orientation of the cameras at each site was randomly determined.

The cameras were operated for two nights at each site during the month of July 2012, the following sequence being adopted:

Sites 1 and 2, Flat Rock Creek, 1st to the 3rd of July; and
Site 3, the Saddles, and Site 4, Tall Timber, 3rd to the 5th of July.

Table 1: GPS coordinates and orientation (to nearest cardinal point) for cameras.

	Camera 1 (control)		Camera 2 (truffle oil)		Camera 3 (oat mix)		Camera 4 (chicken meat)	
	Easting	Northing	Easting	North-ing	Easting	Northing	Easting	Northing
Transect 1								
Session 1	321739 (west)	6223348	321723 (west)	6223218	321678 (south west)	6223082	321621 (west)	6222926
Session 2	321739 (west)	6223348	321739 (south)	6223212	321680 (west)	6223098	321637 (south east)	6222925
Session 3	321739 (west)	6223348	321747 (west)	6223222	321694 (south west)	6223094	321639 (north west)	6222939
Transect 2								
Session 1	321943 (north west)	6223415	322613 (east)	6223320	322055 (east)	6223258	322060 (north east)	6223145
Session 2	321943 (east)	6223415	322014 (South)	6223347	322046 (east)	6223260	322050 (north)	6223154
Session 3	321943 (north west)	6223415	322018 (north east)	6223332	322055 (east)	6223258	322054 (east)	6223177
Transect 3								
Session 1	323422 (north)	6223325	323413 (north west)	6223418	323308 (north east)	6223413	323213 (north west)	6223377
Session 2	323422 (north)	6223325	323433 (south)	6223205	323525 (east)	6223201	323538 (north)	6223295
Session 3	323422 (north)	6223325	323440 (south east)	6223259	323503 (south west)	6223199	323537 (north east)	6223328
Transect 4								
Session 1	325628 (north east)	6224711	325515 (north)	6224650	325499 (south west)	6224549	325604 (south)	6224515
Session 2	325628 (north)	6224711	325605 (North)	6224766	325768 (south)	6224784	325669 (north)	6224844
Session 3	325628 (north)	6224711	325579 (east)	6224765	325741 (east)	6224845	325667 (west)	6224834

This sequence was repeated two more times, with three sampling sessions totalling six nights per site being accumulated.

When re-establishing cameras at which a bait was used, the unit was placed approximately 50m from the previous sampling site in order to overcome any influence of the previous sampling session(s). In addition, to further reduce the influence of the previous baits, an interval of three days was maintained between when the cameras were collected, and later re-deployed, at a sample site.

Where used, the bait was placed 1.9m in front of the camera; the unit being angled down at around 10 degrees to ensure that the bait was within its field of view.

Baits

Approximately 10mm of white Truffle Oil was poured into a length of PVC piping 250mm long and 50mm wide, with absorbent foam inside. The ends of this piping were capped and numerous holes have been drilled along its length. This piping was secured to the ground with a large metal peg.

One hundred and fifty grams of the oat mix was placed within a small mesh container that was 180mm long, 110mm wide and 70mm high. Half a fresh chicken carcass was placed within a 200mm long, 150mm wide wire mesh enclosure that was specifically constructed for this experiment (Plates 1 and 2). Both of these were secured to the ground by a metal peg, permitting any animals to investigate the baits without removing them.

Weather

The weather conditions experienced at the time the cameras were set out were recorded and are provided in Table 2. Moon phase was also noted as its influence on the detection of some native species has been documented (Read and Moseby 2001, Spence-Bailey *et al*. 2010).

Table 2: weather conditions experienced at the times of the experiment.

Date	Sites	Tempera-ture (°C)	Cloud cover	Wind speed	Moon phase	Precipitation
1/7/12	1&2 out	12	10%	Light breeze	Waning gib-bous	None
3/7/12	1&2 in 3&4 out	16	40%	Medium breeze	Full	Light rain over night
5/7/12	3&4 in	11	30%	Light breeze	Waxing gib-bous	Light rain
6/7/12	1&2 out	12	100%	No wind	Waxing gib-bous	Wet but no rain
8/7/12	1&2 in 3&4 out	17	70%	No wind	Waxing gib-bous	Rained during evening
10/7/12	3&4 in	16	10%	No wind	First quarter	Wet but no rain
11/7/12	1&2 out	18	30%	Very light breeze	First quarter	Rained during evening
13/7/12	1&2 in 3&4 out	22	40%	Very light breeze	Waxing crescent	Patchy rain in the morning
15/7/12	3&4in	17	5%	Strong breeze	Waxing crescent	No rain

Survey results.

A total of 591 identifiable images were collected by the completion of the experiment, several of which are provided (Plates 1 to 4). A review of those images obtained confirmed the detection of four birds and six mammals (Table 3).

The bait that attracted the greatest diversity of animals into the field of view of those cameras employed was the chicken carcass: these cameras recording 80% of all species detected. Looking at the results in Table 3, truffle oil attracted 6 and a greater number of shots; with chicken carcass attracting 8 species (less shots) – unlikely to be a significant difference.

Though considered a "universal bait", the oat mix only attracted half of the species recorded into the camera's field of view. In regards to those animals photographed, none were unique (i.e. were not detected by use of another bait). Though relatively cheap and easy to produce, the findings of this experiment suggest that the use of this bait in association with infrared cameras is not appropriate, with other bait types being more efficient at attracting animals into the unit's field of view.

The images obtained from those cameras set up with chicken meat as the lure showed all animals, bar the Eastern Pygmy Possum (*Cercartetus nanus*) and White-throated Treecreeper (*Cormobates leucophaeus*), actually investigating the bait station. The shots that were taken of both the Eastern Pygmy Possum and White-throated Treecreeper show these animals occurring within approximately 0.5m of each bait station (Plates 1 and 2).

The Eastern Pygmy Possum is listed as a Vulnerable species under Schedule 2 of the NSW *Threatened Species Conservation Act 1995*. This animal is known to forage upon nectar and pollen, but will also consume a variety of insects (Evans and Bunce 2000, Van Dyck and Strahan 2008). The chicken meat is unlikely to present a food source for this animal, and the lack of photographs indicate that the individual recorded did not remain within the field of view of the camera for an extended period of time. It is unknown why this animal was detected at this site or why (and if) it was attracted to this bait type.

Though the White throated Treecreeper hardly ever forages on the ground, the winter timing of the study and the presence of ants - their main food source (Frith 1997) - on the meat may have attracted this species to investigate the bait station.

Regardless as to the reason of why the Eastern Pygmy Possum and White-throated Treecreeper were recorded, as the objective of this experiment was to identify a bait that attracts the greatest diversity of species into the field of view of the infrared camera, chicken meat appears to be a suitable product. It was through use of this bait type that these species were detected, one of which is a State-listed threatened animal.

The Eastern Pygmy Possum is a cryptic species that is difficult to detect through use of standard survey techniques (Harris and Goldingay 2005, Harris *et al.* 2007). The method currently recommended for its detection is the establishment of nesting boxes (P.Burcher, Aquila Ecological Surveys, pers.comm.). Given the objective and timing of some flora and fauna surveys, this level of survey effort and its associated cost may not be practical, hence use of infrared cameras may be a cheaper, more efficient alternative. Use of infrared cameras to detect the Eastern Pygmy Possum is currently being investigated (P.Burcher, Aquila Ecological Surveys, pers.comm.).

The two species not recorded at the chicken meat sites were the Sugar Glider (*Petaurus breviceps*) and New Holland Honeyeater (*Phylidonryis novaehollandiae*). When photographed, both of these animals were recorded on the ground and both were inspecting the bait containers (Plates 3 and 4). The Sugar Glider was also photographed investigating the oat mix.

Weather variables, moon phase and camera orientation do not appear to be factors that reduced or influenced the results obtained.

There is the possibility that the winter timing of the experiment negated the detection of some reptiles, such as the Lace Monitor (*Varanus varius*), which are known to scavenge on carrion.

Though known to be present within Royal National Park (DECCW 2011), no photographs were taken of any of the larger possums. Similarly, though characteristic diggings were seen, no photographs of bandicoots were obtained.

Discussion.

From the perspective of ecological consulting, if the objective of using infrared cameras during a fauna investigation is to record the greatest diversity of fauna species present, the use of several cameras and two types of baits is recommended. Based on the results of this investigation, the use of alternate meat and truffle oil bait stations is recommended. The use of two attractants, even for short duration investigations, would increase the potential of recording the greatest diversity of species present, as opposed to employing one bait type only.

By identifying a wide range of species, the habitat requirements of these can be used to identify other animals that could occur, particularly cryptic, nomadic or migratory species. Potentially occurring threatened animals with similar habitat requirements can also be highlighted, and a precautionary approach adopted when conducting any assessments.

Table 3: Results of animals photographed in the test.

	Camera 1 (control)		Camera 2 (truffle oil)		Camera 3 (oat mix)		Camera 4 (chicken meat)	
	Species	# of shots	Species	# of shots	Species	# of shots	Species	# of shots
Transect 1								
Session 1	Swamp Wallaby (*Wallabia bicolor*)	3	Bush Rat (*Rattus fuscipes*) Brown Antechinus (*Antechinus stuartii*)	14 4	No results		Bush Rat	18
Session 2	No results		Bush Rat	9	Bush Rat	11	Bush Rat Australian Raven (*Corvus coronoides*)	15 3
Session 3	No results		Bush Rat	13	Bush Rat	13	Australian Raven	3
Transect 2								
Session 1	Swamp Wallaby	15	No results		No results		Brown Antechinus	2
Session 2	No results		New Holland Honeyeater (*Phylidonryis novaehollandiae*) Bush Rat	3 22	No results		Brown Antechinus	4
Session 3	No results		Bush Rat	18	Bush Rat Australian Raven Brown Antechinus	6 33 6	No results	
Transect 3								
Session 1	Swamp Wallaby 1 Swamp Wallaby 2	7 12	No results		No results		Brown Antechinus	8
Session 2	Australian Raven	5	Australian Raven Swamp Wallaby	4 1	Bush Rat Pied Currawong Sugar Glider (*Petaurus breviceps*)	21 3 1	Pied Currawong (*Strepera graculina*) Swamp Wallaby	6 6
Session 3	Swamp Wallaby	29	Brown Antechinus Bush Rat Australian Raven Sugar Glider New Holland Honeyeater	50 51 47 5 3	No results		Australian Raven White-throated Treecreeper (*Cormobates leucophaeus*)	15 2
Transect 4								
Session 1	No results		No results		No results		Swamp Wallaby Fox (*Vulpes vulpes*)	9 12
Session 2	Swamp Wallaby	9	No results		Brown Antechinus	5	No results	
Session 3	Fox Swamp Wallaby	1 1	No results		Brown Antechinus Bush Rat	2 3	Australian Raven Eastern pygmy possum (*Cercartetus nanus*)	80 2

Obviously, if infrared cameras are being used to specifically target one species of animal, use of an attractant that reflects the dietary needs of that species is recommended (Stevens *et al.* 2010, Sloane 2011, Paull *et al.* 2012).

A study was undertaken at Frenchs Forest, New South Wales, in a remnant patch of native vegetation that occurs within an urban area (LesryK Environmental Consultants 2011). This study was carried out to determine the presence of the Long-nosed Bandicoot (*Perameles nasuta*). To attract this animal, known to feed upon fungi (Van Dyck and Strahan 2008), approximately 10mm of truffle oil was poured into the PVC piping containers mentioned previously. The cameras were operated for seven evenings and not only recorded the target species (i.e. the Long-nosed Bandicoot), but also the Common Ringtail Possum (*Pseudocheirus peregrinus*), Common Brushtail Possum (*Trichosurus vulpecula*) and introduced Black Rat (*Rattus rattus*) (LesryK Environmental Consultants 2011).

Considering the results obtained at the control site, when employing infrared cameras, the use of an attractant is recommended. The results obtained suggest that the use of a bait, in association with an infrared camera, increases the probability of luring species into the unit's field of view. The use of a camera by itself will record species, though its effectiveness would be increased through use of bait.

Conclusion.

As they become cheaper and more readily available, ecological consultants are increasingly using infrared cameras as a non-invasive ethical approach to recording those species that occupy a proposed development site. These cameras are being used in conjunction with other fauna identification techniques, such as hair tubes, to determine the diversity of species present at a site.

If the objective of employing infrared cameras during the course of a fauna investigation is to identify a broad range of species, based on the results of this experiment, the use of chicken meat is recommended. The effectiveness of the infrared cameras can also be increased by using a second bait type, such as truffle oil.

The use of multiple cameras and two bait types is recommended if this survey method is to be used by ecological consultants.

The results of this experiment indicate that the use of infrared cameras for less than a period of forty eight hours is not recommended. Infrared cameras should be used for at least two nights, though if the scope of the study permits it, longer durations are recommended.

Acknowledgements.

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Plate 1: Eastern Pygmy Possum (*Cercartetus nanus*) (red circle) photographed at chicken carcass site (blue circle).

Plate 2: White-throated Treecreeper (*Cormobates leucophaeus*) photographed at chicken carcass site (blue circle).

Plate 3: Sugar Glider (*Petaurus breviceps*) (red circle) photographed at oat mix site (blue circle).

Plate 4: New Holland Honeyeater (*Phylidonryis novaehollandiae*) photographed at oat mix site.

Plate 5: Bush Rat (*Rattus fuscipes*) investigating truffle oil container.

Plate 6: Swamp Wallaby (*Wallabia bicolor*) photographed at control site.

Janet Cosh: an Amateur Botanist from the Southern Highlands of NSW .

Belinda Pellow

Janet Cosh is one example of a number of women from the mid 1900s with independent means and a keen interest in natural history who contributed to our knowledge of science in a quiet but significant way.

Janet Cosh was a resident of the Southern Highlands of New South Wales with a passion for natural history and botany. Inspiration for this passion may well have come from her grandmother Louisa Atkinson, a naturalist, author and artist who collected plant specimens for well known botanists of that era including the Rev. Dr. W. Woolls and Ferdinand von Mueller.

Janet turned her energies to the study of botany in the late 1960s when she was nearly 70 years of age. She taught herself to use a flora key and to assist with this task made many notes, sketches and paintings of plant species (see following examples). The flora most extensively used by Janet was the 1972 edition of the *Flora of the Sydney Region* (Beadle, Evans and Carolin) a copy of which she split in half to make it easier to carry in the field. Her botanical fieldwork, notes and sketches were thorough and precise. She was often in contact with the National Herbarium of NSW and the NSW National Parks and Wildlife Service reporting new records of rare species. During the last 17 years of her life, she made significant contributions to plant taxonomy and ecology, providing scientists with information which increased their understanding of native flora species in the Southern Highlands of New South Wales.

On her death, Janet bequeathed funds and her collection of resources to the University of Wollongong to establish a regional Herbarium. Her hope was to encourage botanical research and teaching, and to provide expertise in plant identification and the management of native vegetation in a regional context. Janet's collection include 1600 plant specimens, nearly 2000 botanical illustrations, a library of botanical references, numerous field notebooks, photographs, vegetation surveys and maps. It contained some excellent examples of recycling as Janet used old envelopes, note paper, Christmas cards, stocking inserts, and even the reverse side of her father's watercolour paintings to record notes, make sketches and to mount specimens.

The Janet Cosh Herbarium established in 1992 now holds over 10,000 specimens. It facilitates the teaching of undergraduate students and provides support for post graduate students and research staff. It contributes to the wider community by providing facilities for the use of Government agencies and information for community based environmental groups. In the recent past, it has also provided professional services to ecological consultants.

Figure 1: ***Rulingia hermanniifolia***

Figure 2: ***Grevillea barklyana*** **now** ***G. macleayana***

Figure 3: ***Dampiera lanceolata***

Lymes: The Family Disease

Jason Berrigan
Darkheart Eco-Consultancy

Since my article in *Consulting Ecology #28*, there have been some significant developments in both my diagnosis, and knowledge and treatment of Lymes and its associated diseases in Australia.

Firstly, my diagnosis of Babesia has been thoroughly confirmed. I shortly began the treatment for this disease, which fortunately involved oral (not IV) doses of an antibiotic for about a month, followed by a 48hr break, and then 4 days of taking an anti-malaria drug called Riamet. The choice of anti-malaria drug (from about 3) was based on price (cheap in a relative sense) and less side effects.

The antibiotic dosage rate is high (with a month's supply, you will walk out of the chemist carrying a cardboard box like you've been grocery shopping), and the result is you may feel like you're rowing a boat across the Tasman during a low pressure system, while being forced to sit on a porcelain throne (for good reason, believe me). I was also given strict advice to take serious note of any side effects (predominantly psychological eg hallucinations) from the Riamet. Fortunately I didn't have any significant side effects, but I herxed. Oh, how I herxed.

I have to admit until that first time I took the Riamet, a part of my mind still doubted I had Lymes or its associated diseases (often referred to as the Lymes Disease Complex). As I said in my first article, the symptoms I display could so easily be put down to other things such as a chronic spine injury and work stress (ie poor sleep leading to poor concentration, etc). I'd seen, heard and read horror stories of pile-driving migraines, crippling muscle spasms, etc, yet apart from appearing vague and washed out when talking to you, you wouldn't think I had a serious illness. Anyone

who saw or spoke to me at the ECA conference would've walked away with that impression (and that I was a bit vague).

For the first 18 hours of taking Riamet, I felt completely fine and I laughed at my doctor's stern warning.

About 2am the next morning, after taking the first 2 doses, I woke up with the feeling like I was on fire – on the inside. I was literally boiling in my skin with a severe Babesia night sweat. I inhaled (not drank) about 2 litres of water, and managed to somehow cool down (mostly via sleeping with basically just a sheet on me – in May).

I woke up the next morning to the sensation of being completely soaked – as if someone had doused me with a bucket of water. For a hazy second there, I thought I'd had a little 'accident', till I realised that the sheet covering my face had formed the Shroud of Turin, and I don't think I have that level of bladder control or hydraulic capacity. I had literally soaked my pyjamas, the sheet under and over me, and the mattress overlay, with sweat.

Then the pain began.

My first mistake was opening my eyes. I immediately found the sunlight has turned into white hot needles jabbing into my eyes. My second mistake was moving. Apparently I'd run the Olympic marathon in my sleep *and* been run over by a steam roller. The muscles in my back running up my spine and my legs felt like I'd over-trained to the point of muscle-meltdown, and someone had replaced the bones with broken glass. I felt like that guy who was the polar opposite of Bruce Willis in that movie "Unbreakable". On top of this, I had a headache which felt like my brain was swollen (a 'pressure' headache) – which is another typical Babesia symptom.

I've never hated stairs until that morning, or architects that design these medieval torture devices. I would have rather pulled my fingernails out with pliers than walked down that stairwell to the lounge room (and back up again that night), but I couldn't stay in bed. I managed to make it to the lounge room without screaming/swearing too loud; barked at the kids to shut the blinds; and proceeded to discover that being alive was going to be agony whether I laid down, sat up, stretched or curled up in the foetal position. This wonderful sensation gradually eased but lasted till the final dosage, and I had another big sweat on the following night after the bed-wetting one. I lost all doubt that I may have been misdiagnosed, and I also recalled having a milder version of these very symptoms about 3 times in the last two years. I thought it was some strange variation of the flu.

Since then, I've had 4 more courses of Riamet. Amazingly, I only herxed on the first month. It seems my luck has held, and I've fallen into the elite group who have a huge die-off in the first treatment, and pretty much sail through the remainder of the course. I finish the current treatment in August, and then I go onto another antibiotic (Septrin) for two reasons.

Firstly, the latest research suggests Septrin 'closes the door' on Babesia, which is critical to beating Lymes, given the two diseases have such a close and sympatric relationship that battles with your immune system. Secondly, it will also determine if I have Bartonella, which is also killed by this drug.

Bartonella is a serious issue for me, given my partner has been diagnosed with Lymes and this disease, and Bartonella and some drugs associated with the treatment can be dangerous ie cause adverse changes to the cardiac rhythm (widen the gap between beats to the point your heart forgets what its meant to do ie beat), or the rare but horrendous and potentially fatal Steven Johnson Syndrome. Have a look on this page if you have an empty or strong stomach: http://en.wikipedia.org/wiki/Stevens%E2%80%93Johnson_syndrome. This condition is extremely hard to treat successfully.

My partner had to cancel her initial Bartonella treatment which caused the first problem (heart beat irregularity) which was detected by compulsory cardiac tests. Only recently recommencing treatment, she is now using an antibiotic which has been linked to Steven Johnson Syndrome.

In the last article, I mentioned my concern for my family given Lymes can be passed on via a range of means. Consequently, my entire family had the preliminary CD-57 blood test as an indication of whether they may have Lymes. The results have

simply been devastating.

As noted above, my partner has Lymes and Bartonella. This indicates she's been bitten by another tick, probably via me bringing it into the house on work clothes. Adding misery to woe, the CD-57 tests for all 3 of my daughters have also returned positive. My oldest (13) was bitten by a tick on a school camp 3yrs ago. She developed Bell's Palsy within 48hrs of that bite. This is a key symptom of Lymes. Unknowingly at the time, we rushed her to the base hospital where she was successfully treated with steroids (the doctor also remarked how unusual it was for a child to have Bells Palsy). She was lucky that this treatment did not result in her death, as steroids suppress the immune system, which can allow these diseases to explode, as happened to a man on the south coast late last year who was treated with steroids after a car accident. Unbeknownst to all, he had Babesia. He died of organ failure a few months later (http://www.smh.com.au/environment/origin-of-lethal-tick-infection-a-mystery-20120318-1vdse.html).

My 13yr old recorded the lowest CD-57 (in the 20s), but amazingly, is asymptomatic. Due to her low CD-57, we got a specific test for Lymes (only the PCR – couldn't afford the full screen) done which is now available in Australia and considered reliable. It came back negative. It suggests that her immune system is suppressing the disease which is not uncommon, but we have the responsibility now of watching her closely. Treatment is not recommended for an asymptomatic person as it can inflame the disease, and of course long term treatment with antibiotics carries it own risks and issues with it – issues we'd like to avoid in a pubescent teenager. Some people can carry the disease and it never manifests. Saying that, it will pose challenges to her later life ie bearing children.

My youngest (5 and 7) recorded CD-57's in the 30s (mine was around 40). It is highly likely they have contracted the disease *in utero* from their mother. Up until a few weeks ago, both were asymptomatic. My 7yr old has recently acquired a peculiar face twitch, and we have been progressed with her blood testing (again, not the full screen due to finances) for further diagnosis. The 5yr old had a trial on Batrim, to see if she herxed, to indicate if she had Bartonella. No reaction, so lucky on that front.

The reason we trialled her on the anti-Bartonella drug is due to suggestions that the available testing may not be capable of detecting the Australian strains of Bartonella. Its possible that a similar case exists for Babesia. Hence why I am taking Septrin, as it also kills Bartonella, and if I herx, then it will indicate I also have that disease.

The other treatment I am taking for Lymes is a naturopathic treatment called the **Cowden Support Program**. Its not cheap (several hundred dollars a month, varying per month), and it has to be imported from the US (tip: don't import more than $1000 worth at any one time including postage unless you want to pay GST and duty on top). It consists of a range of patented extracts (some anti-microbial, some immune support, etc) which are taken as per a prescribed regime 4 times a day (mixed in water, taste okay) for at least 6 months (it's a 6 month program – I will be taking it until I'm cured). There appears to be limited published scientific evidence verifying its effectiveness, but a plethora of Lymies (what people with Lymes call themselves) swear by it. Anything that will reduce the time I spend as a pin cushion, I'm willing to try. Some people herx just taking this program: I didn't. So far, none of my family have started on this (mostly due to cost but also as herxing for more than one disease at a time presents its own issues), but my partner will after she finishes her Bartonella treatment, and later on the girls.

My partner was advised not to do both as the herxing may be too severe, and due to the associated risks she currently faces. These risks include death.

You'll also have noted above that I've mentioned 'cost' a few times. It's the other negative aspect of these diseases. I've been burning about $700/month on my treatment, and spent >$10 000 (including dental work) for my partner and I. We've still got a long way to go (IV is also significantly more expensive than injections), and the kids to treat. We won't be having any luxurious (ie anything that doesn't involve a tent) holidays for a while, and shopping is only for essentials. The fact that my personal productivity is down, adds insult to injury.

Finally, another measure to avoid ticks I've been made aware of is a clothes wash containing pyrethrum. A commercial variety available for about $22 a bottle at camping shops is called *Equip*. You can buy a range of products such as mosquito nets embedded with pyrethrum (doing your sleeping bag could be a good idea too). The claim is that the ticks are killed on contact with the pyrethrum which is embedded in your clothes (obviously don't do your undies or socks in it) which you've soaked in a bucket of water with the recommended dosage, and dried in the shade. Its reported to last 6 months or up to 30 washes. I did my winter work clothes in it prior to some fieldwork in tick country in June, and had no leeches or ticks. However, I haven't tested it in peak tick time (late Spring to early Autumn). Regardless, I'll be using it from now on as a standard practice. I've heard similar practice is being adopted by bush regenerators and relevant government departments.

In relating all the above, my objective was not to vent, seek pity or act out some Munchausen fantasy; but to increase the awareness of these diseases, and impress upon you how **serious** the risk and the implications must be considered. As I've said before: you **really** want to avoid these diseases, for you own health, and as I've demonstrated, for your children's. There's no denying that these diseases are here, and they pose a direct threat to **you** and **yours**.

So take care.

A Report on the 2012 Lyme Disease Symposium Sydney

Dr Stephen Ambrose
Ambrose Ecological Services Pty Ltd

On the 8th July, the Karl McManus Foundation (founded by the wife of Karl McManus, whose death is argued to have resulted from complications associated with Lyme Disease) held the Lyme Disease Symposium, which I attended.

The Symposium was in two sessions: morning and afternoon. An afternoon session was open to the general public, and generally consisted of an introduction to the disease and the various treatments available, as well as a discussion about the complexity of diagnosis. The morning session was reserved for the medical profession and delved more deeply into the clinical and scientific side of diagnosis and treatment (a subject of great debate), and the disease's rise in Australia and hence the need for doctors to be aware. An even more detailed workshop for the medical fraternity is planned for 2013.

The symposium was extremely informative and promoted a lot of discussion. I received an email from Mualla McManus (symposium organiser) after I registered my interest in attending, saying that she had placed me in the audience for the morning session (for health professionals), rather than the afternoon session (for others). She saw Dr in front of my name, so assumed incorrectly that I was a medical doctor! But that was okay, because the morning session dealt with all the science, which did not feature much in the afternoon session (which I also attended). So the mistake turned out to be beneficial.

It looks like there are three main research teams investigating the ecology of Lyme Disease in Australia: Sydney University (Team Leader: Dr Ann Mitrovic), Newcastle University (Team Leader: Professor Tim Roberts) and Murdoch University in Perth (Team Leader: Dr Peter Irving, who has also been researching a possible link between Lymes in patients and their dogs). There are several more research teams set up to investigate the clinical side and I expect a lot more to come to light in the near future as the sudden expansion in research on this disease continues.

There were about 80 health professionals who attended the morning session, but I would say that close to 300 people attended the afternoon session. As to be expected, most of the people who attended the afternoon session were confirmed victims or suspected victims of Lyme Disease.

I left the symposium with a much deeper appreciation and concern about this disease, and its many complexities and uncertainties that still required research. I had a good chat with some of the research scientists and GPs who presented papers at the Lyme Disease Symposium, and subsequently emailed some thoughts to them on ecological issues that were discussed, particularly in regards to how Lyme Disease could have been introduced into Australia by animal vectors. Here are my thoughts on the latter for your interest.

It was mentioned at the symposium that Lyme Disease

is also a sexually-transmitted disease. Coastal areas of NSW, particularly north of Sydney, are largely rural areas containing cattle, horses and sheep. Ruiz-Fons *et al*. (2012) found that tick densities in Spain were higher in regions containing cattle. I'm aware that semen of thoroughbred stock is sometimes imported into Australia for horses and cattle (maybe sheep too?) to improve Australian livestock gene pools. If the imported semen is not screened for *Borrelia* and other co-infections, perhaps Lyme Disease may have been accidently introduced into coastal areas of Australia? I don't know if livestock densities in coastal NSW have increased over the years, but I suspect it has, particularly as a result of the establishment of hobby farms and the increased desire of city- and town-dwellers to seek a tree-change lifestyle. Macropods graze in livestock paddocks, so it would not be difficult for infected *Ixodes* ticks to introduce the pathogens into local wildlife populations.

A number of deer parks and farms have also been established (and provided a source for feral populations) in coastal areas of NSW. Most of these parks were set up in the early 1980s. Dr Richard Schloeffel stated at the symposium that he probably came across a case of Lyme Disease in NSW as early as 1981, which is around the time that interest in the establishment of deer parks took off along the southern, central and northern coasts of NSW. The most abundant deer species in these farms and parks is the Red Deer (*Cervus elaphus*). I don't know where foundation stocks came from for the establishment of these farms and parks, but Red Deer are native to Europe and North Africa.

Deer have also been imported into Australia since European colonization, and feral populations currently occur in coastal to inland areas of NSW (www.feral.org.au/wild-deer-density-2007-new-south-wales/). The main species that have been imported for hunting are Red Deer, Fallow Deer (*Dama dama*) and Wapiti Deer/Elk (*Cervis canadensis*). The Fallow Deer is native to western Eurasia but has been introduced to many areas around the world. The Wapiti Deer is native to North America and eastern Asia.

Therefore, I think there is a possibility that importation of deer from overseas could have also resulted in the importation of Lyme Disease pathogens, especially given the well known association of the disease with deer (particularly in the US). Jason Berrigan recently remarked to me about the abundance of feral deer in the lower Hastings, and also in the Nambucca Valley, and that he suspected that it is possible that the imported deer may have even borne infected ticks or carried the infection in their blood, and these animals could provide a reservoir for the disease if native species are unsuitable.

The Ostrich farm craze of the 1980s may have also been another vehicle by which the Lyme Disease could have been introduced into Australia. Ostriches were farmed worldwide at that time and it would be interesting to find out where Australian stocks were originally sourced.

At the Symposium, there was a lot of discussion about the possibility of migratory shorebirds from along the East Asian-Australasian Migratory Flyway introducing Lyme Disease into Australia. If this was the case, you might find Australian colonial nesting waterbirds which share the same habitats as migratory shorebirds (e.g. Australian Pelicans, some waterfowl species & freshwater terns) are potential substantial reservoirs for the pathogens. I argued at the Symposium that this could be the case in inland wetlands, particularly where Australian Pelicans, waterfowl (ducks and swans) and freshwater terns establish large breeding colonies after extensive flood events. These species move to inland lakes from temperate and coastal areas of Australia and try to breed as many times as possible during a single flood event. However, nest sites and chicks have such high tick-loads that 2nd or 3rd broods often don't survive to fledging and the parents desert the nest. The waterbirds return to coastal and other temperate habitats at the end of the breeding event. Therefore, it is possible that infected birds (and infected ticks that they are carrying) could introduce the disease to coastal areas.

While the avian hypothesis may be valid, I have a number of reservations about it. First, there are about 65 species of migratory shorebirds that visit Australia each year. Only a small proportion of these species are relatively large, most are small (weighing less than 40 g). In my experience, smaller birds are usually infested with mites, lice and fleas, with tick infestation being much less common or absent. However, I'm not ruling out the possibility of high tick loads on larger shorebirds such as curlews, godwits and the larger plovers, etc.

Secondly, if shorebirds are responsible for transporting the pathogens to Australia, one may expect epicentres of Lyme Disease infection to be around or near wetlands, but as far as I understand from last Sunday's

symposium, that does not appear to be the case. If the distribution of Lyme Disease among the Australian human population in relation to wetland distribution has not been investigated, I suggest that it should be done.

Thirdly, although I don't know very much about ticks, I understand that many tick species are host-specific or at least specific to particular animal groups. If this is true, I suspect that there would not be many tick species that are ectoparasites of both birds and mammals. So I wonder if non-specific host vectors that feed on animal blood (mosquitoes, lice, fleas etc) could be assisting the spread of the pathogens (the March Fly is currently one suspected vector). If not, then I suspect that if the pathogens were introduced into Australia, that they were introduced by mammals – either infected humans entering Australia (or humans carrying infected bed lice or ticks) , mammalian livestock (cattle, horses, deer etc) or livestock products (semen).

Overall, it is very clear that there is much to research about Lyme Disease and other tick-borne infections, and I for one, will be sure not to forget the insect repellant.

Reference:

Ruiz-Fons, F., I.G. Fernandez-de-Mera, P. Acevedo, C. Gortazar & J. de la Fuente (2012). Factors driving the abundance of *Ixodes ricinus* ticks and the prevalence of zoonotic *I. ricinus*-borne pathogens in natural foci. *Applied and Environmental Microbiology* 78(8): 2669. DOI: 10.1128/AEM.06564-11.

Discovery Journey of a Lymie: Fight Like A Girl

Kazz Wallace
Fauna Ecologist

They say you learn something new everyday... but nothing prepares you for that something that is actually life-changing...

My husband and I were married in March this year. Standing true to my nature, I did things a little differently, and we were married twice: a quiet ceremony at Murray's Beach, followed by a "mock" wedding in Brisbane three weeks later which we successfully managed to pull off as the actual wedding!

We started our honeymoon on Hamilton Island for the first five days, followed by a mid-way stop on the north coast of NSW, before spending the last week in the Barrington Tops. We had been to this particular destination a few times before, so there was nothing really new to us – the wildlife, the "too friendly" birds from people feeding them, not to mention the leeches and ticks.

About two days into our stay and a couple of bushwalks later, I noticed that I had a persistent itchy spot on my knee. After a close look, I saw a tiny pin-prick sized red dot in the middle of a swelling about the size of a 50 cent piece. I initially thought nothing of it, simply passing it off as being spiked by a plant somewhere along one of our walks.

Later that night, I began to itch on the side of my right thigh, and also around my middle on my left side. I started to panic as I could see small welts and I knew I was allergic to ticks, having suffered from similar and also extremely larger swellings from past bites. It turns out I had around a dozen tiny nymph ticks on me!!

If I had the knowledge back then about ticks that I do now, my panic would have most certainly turned into an all out anxiety attack...

We managed to remove them all, but found the one on the outside of my right thigh quite difficult to remove as it was well embedded. This area swelled to the size of a half-closed fist and was extremely itchy and very warm to the touch. My husband, Ben, noticed that it had a bull's eye like appearance – a significant red halo around the outside of the swelling.

Due to my allergy to ticks, my usual reaction caused symptoms such as extreme fatigue, lethargy, nausea and malaise. These effects usually lasted for around seven to ten days after initially being bitten, with the worst occurring in the first 72 hours. Little did I know that this was the last straw for my already severely depleted immune system, which has been battling for a long time without me really comprehending the reasons why…

Looking back, I had noticed my health significantly declining over the past 18 months to two years. I started not feeling myself and would get quite frustrated and irritable very easily, to the point of outbursts of rage. I went to a doctor and was

diagnosed with anxiety and given medication. Following this, my mild gastrointestinal issues I'd been having for the past few months became exacerbated to the point that I was referred to a gastroenterologist, who suspected I had coeliac disease.

Months later (at the end of last year), my results turned up nothing. A friend recommended a biochemist who I saw for about a month. He informed me there was nothing left of my immune system and gave me a strict vegan diet to follow and a bunch of expensive herbal "goodies". I started feeling better, but was given no light at the end of the tunnel for this diet. It did not take me long to realise this was not the answer for someone who is closer to a carnivore than an omnivore!

In January this year, I started seeing a naturopath. I was tested for 93 different food allergies. A lot of the positives were what I had expected as I had started eliminating stuff from my diet months earlier that I knew caused me grief. One of the real surprises was apple! How many ecologists venture out for a long field day with an apple!? I was one, and always put the uncomfortable "off" feeling down to inhaling my food due to a full field schedule and no real time to stop and eat. I turned up 11 allergies in total including cow's milk, soy, malt, barley and oat.

I strictly cut these allergens out of my diet and my gastrointestinal issues started to subside within a few weeks. However, there was still a general feeling of unwellness that lurked. I started to find myself struggling to get to the gym to do cardio and weights classes. When I did, it would often take two or three days for me to recover – and I'm about as fit and active as they come!

From around February 2012, I found it increasingly hard to get through five days a week at work – especially if I was office bound. I found myself turning up later to work when it was convenient due to undertaking nightwork the night before; leaving early as I'd worked extra hours in the field; or just starting to take a couple of hours off sick here and there.

After returning from our honeymoon in March this year, having had three weeks off, I found it was impossible for me to get through more than four days of work a week. My sick days became frequent and when I was at work, I was a tired, sore and unproductive employee. I also found it took me longer to undertake my usual tasks due to a persistent brain fog and accompanying short term memory loss. Things frustrated me more easily, and I had extremely restless legs and could not stand sitting in my desk chair for long periods, despite the arrival of a new chair more accustomed to my tall build.

Shortly after returning from our honeymoon, I picked up the *Consulting Ecology* newsletter, which had managed to slip through our mail holding request and end up in our mail box. Normally, I would not spend much time reading various articles. However, as I knew Jason Berrigan, his article on Lyme Disease caught my eye – so I began to read with increasing interest.

Before reading Jason's article, I can honestly say that I had never heard of Lyme Disease. I have been working in the field for over seven years and been over much of eastern and south-eastern Australia, and had never even heard *mention* of it. Nowadays, I wonder whether my lack of enthusiasm for politics has contributed to this – given Lyme Disease in Australia is such a highly debated topic.

I made contact with Jason for some advice and symptom comparisons, and two months later, Dr Peter Mayne clinically diagnosed me with Lyme Disease (and the most common co-infection, Babesiosis).

It is extremely likely given my symptoms and history of tick bites, that I originally contracted Lyme when I was working in Natural Area Management with Brisbane City Council, back in 2006. I received several bites that year, a few from the smaller "scrub ticks", and a bite to the head from a paralysis tick that made that whole side of my head, half of my forehead and all my neck swell up. I was confined to bed for nearly three days.

In 2007, I can recall that I had begun to notice that I was feeling sore and achy when getting out of bed. Like most people, I just put it down to getting older and the physical demands of essentially working as a bush regenerator. I often spent two or three days at a time felling, chainsawing and chipping trees, days on a

brushcutter, back-pack spraying and constant bending down planting trees. I was also making it to the gym three or four days a week.

Looking back now, I realise a pattern for the bouts of unexplained illness I've suffered over the years. At the end of 2007, I relocated from Brisbane to Mildura. Immediately following this, I was sick for two weeks – and it was averaging 40°C each day!!! A month later, I worked in the semi-arid area of south-west NSW for three weeks conducting pitfall surveys. The days were long and hot: *hard* on the body.

Upon returning, I again fell ill. I became concerned as I had three weeks to recover before spending a month in the Tanami Desert – again conducting pitfall surveys, but this time the pits were 600mm deep and had to be dug by hand: and there were lots of them! For a couple of days, I could barely sit or stand due to excruciating pain through my back, despite never having had any back problems or injuries. On top of this, I was extremely sensitive to light and could hardly open my eyes, and was confined to my dark air-conditioned house until it passed.

By the time I left for the Tanami, I was feeling better but still had a persistent snotty nose and intermittent lethargy. The days were long and the digging was hard, even on the guys – sometimes we were having to deal with calcrete, resulting in blisters even through gloves.

My passion and enthusiasm during this arduous fauna survey however paid off, and I subsequently landed a job in the riverland in South Australia. I had less than two days "home" in Mildura to unpack and re-pack, and make the three hour drive across to begin work.

A few weeks later, I ventured back to Mildura with a box trailer to move all my gear out of the house I had been renting – or essentially storing my gear as I was hardly ever home. Again soon after, I fell ill and never fully recovered.

Over the next two or three months, I fell sick another three times during which I had been undertaking physically demanding work and interpretation activities, losing my voice on each occasion – which had never happened to me before. I could not work out why I was getting sick so often.

In September 2009, I developed extreme lower rib pain in my left side and was diagnosed two months later (and several kidney tests later), with twelfth rib syndrome.

Whilst conducting fauna surveys in a remote area in the Gulf of Carpentaria in 2010, I fell extremely ill after four weeks of a six week survey. The Royal Flying Doctor Service did not even know what was wrong with me and recommended I be flown back to civilisation at the first opportunity, which was a week and a half later. I visited a local doctor upon my return, who could not diagnose my condition either. I eventually became 'well' again.

Since then, I have really noticed that my health would suffer whenever I placed physical stress on my body, such as week-long fauna surveys requiring early starts and late nights. Looking back, I have realised that those times when I was sick coincided with extreme amounts of physical stress on my body. It is well known that this suppresses the immune system (its why athletes are prone to the flu).

Fortunately, I now know that all those flu-like illnesses that I have been suffering since the end of 2007, were in fact due to Lyme Disease, which suppresses the immune system.

Lyme Disease has completely changed my life. I have been reduced to doing jigsaw puzzles – Suduko is no longer an option as my neurological symptoms are affecting my cognitive abilities. I can no longer perform my duties as a Fauna Ecologist due to fatigue, brain fog, memory loss, extreme myalgia, nausea, headaches... the list goes on. My symptoms are many and varied and are not always present at the same time. Some days I have a clear head but suffer from nausea and muscle soreness. Other days I will have very bad brain fog, but only have a small amount of pain.

My husband was not working at the time I was diagnosed. Realising the expensive medical bills ahead and the uncertainty of the duration of my inability to work, he has had to seek employment that would financially support us. This situation is catch 22 as his new job will require him going away at times when I often need him around to help due to my condition.

Lyme is hard on all aspects of your life.

It's poorly understood by both doctors and non-Lyme sufferers that the symptoms and severity of Lyme Disease differs at times widely among those infected. Some only experience the neurological/psychological symptoms, whilst there are others that are in a wheelchair due to crippling joint pain.

One of the hardest things I have struggled with since my diagnosis, is helping people to understand the severity and deviousness of this illness. I have spoken to people that have tried to compare my "fatigue" to how they felt when they had glandular fever; spoken to several people about "Have you tried this...?"; been referred to immunologists who smile smugly and say, "Lyme Disease does not exist in Australia"; and many people that come out with every Lymie's favourite - "You don't look sick…" THAT'S RIGHT!!! I don't *look* sick because LD is an invisible illness! It is also known as "The Great Imitator". Many people go through so much of their lives having been misdiagnosed with Multiple Sclerosis, fibromyalgia and chronic fatigue, just to list the common ones. Lyme is an extremely debilitating disease and I struggle with the psychological effects (as well as physical, neurological and emotional) everyday. It frustrates and angers me that I am unable to work – critters are my life!

Currently, my life is in limbo. On top of being initially diagnosed with Lyme and the most common co-infection, Babesia, I may also have Bartonella (another co-infection). I am trialling antibiotics to determine this, but it will be a few weeks before anything can be determined.

AND if that wasn't enough, my local GP was going through my medical records a couple of weeks ago and realised that I also have coeliac disease! This was incorrectly overlooked when I was tested for it nearly 12 months ago!!! This perhaps also goes some way to explain the extreme hold that Lyme has managed to acquire on my body, as all the damage due to having coeliac disease directly affects your immune system.

Today I received fantastic news (well, to a Lymie's ears anyway). My DNA test results for Lyme Disease are back and – POSITIVE! Now starts the saga of chasing any insurance claims...

Since June this year, I have been unable to work. I am a fauna ecologist turned Lymie whose job description is now: "*Fight Like A Girl Against Lyme Disease*".

I would not wish Lyme on anyone. It is an extremely debilitating disease that takes its toll on not only the patient, but family and friends. If you know a Lymie, please stay strong and continue to support them through the good days AND the bad days. And don't forget...

LYME DISEASE **DOES** EXIST IN AUSTRALIA!

Motion X-GPS

Deryk Engel

LesryK Environmental Consultants

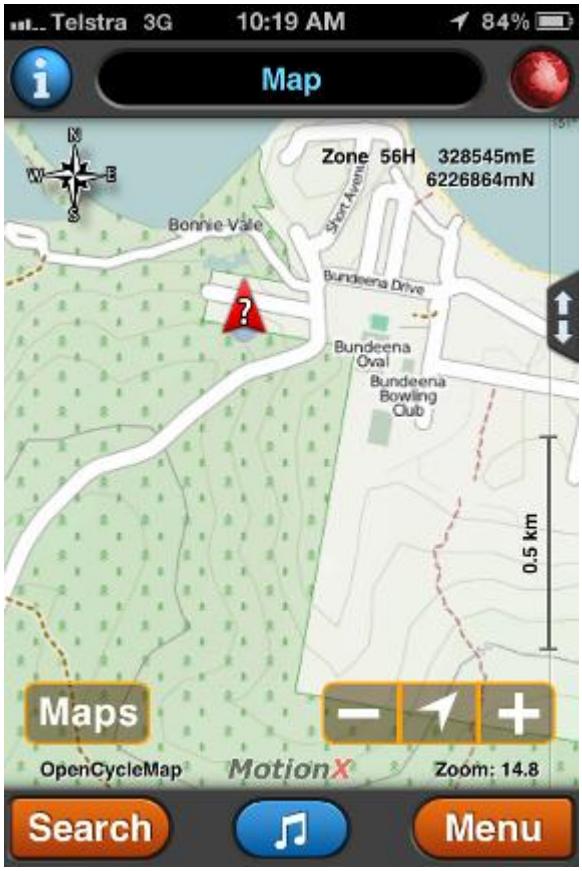
If you're looking to purchase a new GPS and possibly considering a GIS system to assist with your mapping, can I suggest you first look at this program.

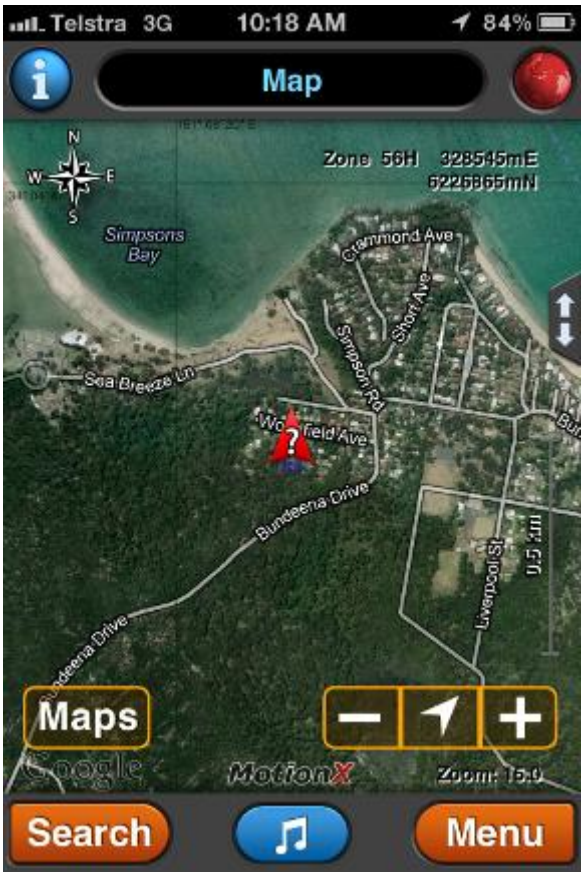
MotionX-GPS is a downloadable application for the Apple iPhone. In the field I have held my Garmin GPS next to my iPhone whilst MotionX-GPS is running, and found the coordinates to be almost the same (the same variation was present as holding two hand held GPSs next to each other).

As opposed to a standard GPS, the advantage of the MotionX-GPS program is that you can overlay your position onto one of a series of internal maps. These include topographic maps, satellite imagery and the Google Earth satellite/standard hybrid. The application lets you log not only your track (or in our case "transects"), but waypoints as well (trap locations, sites where threatened species are recorded etc). Once logged, the name automatically given to the waypoint can be changed in the "viewing details" option. This application also gives you the option to take a photograph of the site, plant, whatever you're marking.

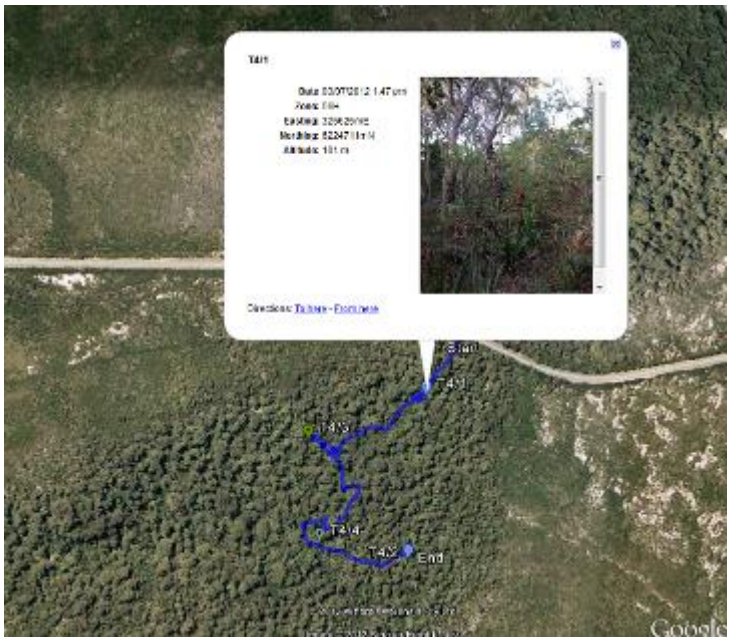
Once these are logged onto your phone, they can then be "shared" (emailed) to your home computer. The file that is sent has a .kmz extension, which can then be opened in Google earth. From here it's just a matter of inserting this into your report and you have your transect, trapping/threatened species locations, etc, overlain onto an aerial.

The following are several examples of what this application provides.





Note that the red arrow is my location in the first two screen shots - this will turn blue once a solid GPS fix is made. I was indoors when I took these phone screen shots. Like any GPS, getting a satellite signal indoors was an issue..



Once emailed, in Google earth, click on either the transect or one of your waypoints, and the following information is provided. Note the presence of the georectified photograph that was taken at the first waypoint.

The approximate cost of a new GPS is around $180.00, whilst costs for GIS systems are in the thousands: this application will set you back 99 cents.

Disadvantages with this program are that it chews through your mobile phone's battery power; and when emailing your locations, you can only do one at a time, not a group. If you have 100 trees you want mapped, this could be time consuming. Whilst setting out two transects, these taking around an hour per transect, I went from 88% battery power to 5% whilst using this program. The other disadvantage is that you need phone reception to access the aerials. You'll still have GPS capabilities, but, if no phone coverage, your aerials won't be there. A way around this is to ensure you have the aerial loaded before dropping out of mobile coverage. Once the aerial is down, it will remain on your phone even if you have no coverage.

Unfortunately, this application is not yet available for Android phones.

Having field tested this application and seen its advantages over my hand held GPS', I am impressed with this program, especially its accuracy and mapping capabilities. MotionX-GPS is a user friendly application and we all take our phones into the field anyway. If you're in the market for a new GPS and GIS system, can I suggest a cheaper option may be buying an iPhone and spending $0.99, or add it to your iPad that you bought 'for business purposes'.

Sex in the Sun: A promiscuous dragon, feral goats and the approval of the largest wind farm in the Southern Hemisphere.

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The Project

Once constructed, the Silverton Wind Farm will include the operation of up to 598 wind turbines across 30,000 hectares in the Barrier Ranges, north-west of Broken Hill, western NSW, making it the largest wind farm in the Southern Hemisphere and one of the largest in the world (SWFD n.d). Based on the 598 turbine layout, the wind farm would generate approximately 4.5% of the NSW's total electricity consumption (SWFD n.d).

The Constraint

While undertaking the field surveys for the initial Biodiversity Assessment, an unknown population of the Tawny Crevice Dragon (*Ctenophorus decresii*); a species listed as Endangered (E1) under the NSW *Threatened Species Conservation Act 1995*, was detected (NGH 2008b). Previously, the extant population in NSW was known only from within and adjacent to Mutawinjii National Park approximately 150km east (Swan and Foster 2005). The presence of this E1 listed species was considered by both the environmental consultancy preparing the assessment and the proponent as a potentially high constraint for the project, resulting in the commissioning of a specialist study to develop a greater understanding of the population. The population is now referred to as the 'Silverton' population (Sass and Swan 2010).

The Specialist Study

With 20 years' experience with herpetofauna and as the Senior Ecologist of the environmental consultancy preparing the assessment, I was given the responsibility for the design and implementation of the specialist study. The study developed a greater level of understanding of habitat preferences (that were previously unknown in the NSW population), and more specifically, the extent and current threats of the Silverton population (Sass 2008). Given the paucity of scientific literature relating to the ecology of the Tawny Crevice Dragon, the results are now being disseminated throughout the scientific community (Sass and Swan 2010, submitted).

Plate 1: A male Tawny Crevice Dragon (Ctenophorus decresii) basking on a rock outcrop in the Barrier Ranges *(Photo courtesy of Steve Sass)*

Feral goats were identified as a major threat to long-term viability by directly impacting rock crevice availability and quality, as well as vegetation condition (Sass 2008). With consideration of both the low fecundity and low vagility of the Tawny Crevice Dragon, there was a high likelihood of a catastrophic collapse of this population should the feral goat population remain. The specialist study concluded that the site was of significance for the species and of extreme importance to their long-term survival (Sass 2008).

The specialist study along with the biodiversity assessments for the project formed appendices to the environmental assessment (NGH 2008a) and the preferred project and submissions report (SWFD 2009a).

The Solution

The specialist study resulted in the development of an excellent understanding of the extant population and confirmed that the Tawny Crevice Dragon is a rock obligate species, with habitat relationships associated with the level of grazing and rock/crevice size. In summary, the study also revealed that the species is seemingly absent from suitable habitat. However, given that rock outcrops (suitable habitat) characterise the Barrier Ranges landscape, an innovative approach to managing impacts to the species was critical.

My strategy was to identify areas of higher importance to the species within the project area and I did this by developing the 'hotspot' approach. How the 'hotspot' was defined is detailed within Sass (p.12, 2008), but in effect, the 'hotspot' approach allowed individual Tawny Crevice Dragons themselves to define areas of habitat of higher importance to the local population. This provided an opportunity to protect important resources and the interactions of Tawny Crevice Dragons particularly in the context of the prolonged

drought and goat grazing pressure where these specific areas may be acting as important refuge.

We also regularly observed dragons using the road 'spoil' on each side of the graded tracks for basking and displaying. This use of artificial habitat provided both a serious threat to the population during project construction as well as a tremendous opportunity.

With hundreds of personnel and associated vehicles and machinery associated with the construction (SWFD n.d), and Tawny Crevice Dragons basking on roadsides, the Silverton population would likely suffer decline if the road kill rate exceeded the rate of reproduction and immigration. For that reason, and with conduction of the low fecundity and low vagility of the species, road management zones (RMZ) were formulated to reduce vehicle speeds to as low as 15 km/h providing both dragons and drivers with longer reaction times in an attempt to avoid road kill.

The opportunity was that the field survey confirmed that the Tawny Crevice Dragon would use artificially created habitat and that the specialist study had identified that both rock size and rock crevice width contributed most to habitat occupancy. With these factors in mind, habitat creation by using the rock spoil from the footing excavations of each wind turbine provided significant opportunity.

Plate 2: Steve noosing a Tawny Crevice Dragon for the purpose of collecting genetic material (*Photo courtesy of Claire McLean)*

The early identification that feral goats were impacting habitat quality for the Tawny Crevice Dragon provided a significant opportunity. The habitat occupancy work undertaken during the study provided the framework for the development of a number of commitments by the proponent including the development and implementation of a goat management plan. The study concluded that the successful implementation of such a plan would likely result in a substantial gain for not only the Tawny Crevice Dragon, but all biodiversity.

With the development of a number of innovative mitigation measures and offsets to improve the long-term security of what is now regarded as a 'state significant' population, the proponent fully incorporated these into the Statement of Commitments (SWFD 2009b).

Approval

On 24 May 2009, the Silverton Wind Farm received Project Approval for the construction and installation of 282 wind turbines and associated infrastructure (NSWGovt 2009b). In addition, Concept Approval for the entire site, comprising 598 wind turbines and associated infrastructure was also granted (NSWGovt 2009a).

There is little doubt that a major constraint to site development was the presence of the E1 listed Tawny Crevice Dragon. However, the commissioning of a herpetofauna specialist to conduct a specialist study and the subsequent identification of opportunities to provide long-term security for this state significant population is likely to have contributed substantially toward project approval.

Further Reading

The reference list provides internet links to the public records for the biodiversity assessments, specialist study, environmental assessment, statement of

commitments and project approvals.

Plate 3: Steve with a male dragon in hand *(Photo courtesy of Claire McLean)*

Plate 4: Close-up of a male Tawny Crevice Dragon in breeding colour (*Photo courtesy of Steve Sass)*

Acknowledgements

To undertake a field survey across such a vast project area as the Silverton Wind Farm, required the assistance of a number of field personnel which I am indebted. But most importantly I wish to thank Gerry Swan for his years of mentoring and 'good times chasing herps'. I also wish to thank the following persons/organisations for their advice, assistance or involvement during this project: Donna Bolton and Andrew Durran (Epuron), Peter Ewin (OEH), various staff at NGH and finally, the lessees at 'Nine Mile', 'Belmont', 'Purnamoota' and 'Eldee' for site access, orientation and hospitality.

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Post-breeding habitat use by Australian Frogs: Something to Consider in Impact Assessment

Frank Lemckert

Niche Environment and Heritage

The majority of frog species that have been studied around the world have been recorded moving away from breeding sites once breeding has been completed (Lemckert 2004). The distances moved vary depending on the species and time of year, but usually range from 50m-300m from the breeding site. The types of habitat a frog will move to also depends on the species, with some moving to other water bodies, but most head to terrestrial environments. These alternative non-breeding habitats provide food and shelter that are not available at the breeding sites. Sometimes these habitats are critical to survive extremes in weather conditions, particularly in areas with very cold winters. This has not yet been demonstrated in Australia, but this may be a requirement for highland species. There is enough evidence to strongly suggest that many species of frog will only occur where there are breeding sites that also have suitable non-breeding habitat available within hopping distances.

The post-breeding habitat requirements of most Australian frogs generally remain a relative mystery beyond anecdotal reports, but there is sufficient information to indicate that they follow similar patterns. Giant Barred Frogs (*Mixophyes iteratus*) are known to stay around their breeding streams as some of the specialist northern Queensland stream frogs, many of which have undergone serious declines. Some of the coastal sedge frogs (eg *Litoria olongburensis* and *Crinia tinnula*) also may remain generally within acid swamplands, although information on year-round movements and habitat use remains sketchy. Most species that have been tracked however, move into new habitats. The Bell Frogs (*Litoria aurea/raniformis*) seem to be one of the few that move to other water bodies as their main non-breeding habitat, although they will still cross over land at times. All of the other species appear to prefer to move to areas of native vegetation where they may roam widely. As examples, the two SE Australian species of stream frogs (*Litoria lesueurii* and *L. wilcoxii*) and the Great Barred Frog (*Mixophyes fasciolatus*) and Stuttering Frog (*M. balbus*) are commonly seen long distances from any suitable breeding sites. A study of the smaller Green-thighed Frog (*Litoria brevipalmata*) indicated that in the short term, individuals will move up to 50m from their ponds and will probably move further away still through time. Detailed tracking studies of the Giant Burrowing Frog (*Heleioporus australiacus*) have shown all individuals to move away from their breeding streams, often over 100m, with females ending up significantly further away than males.

Where exactly a frog moves to within this post-breeding environment is also of some importance, as it can indicate what activities might impact them in terms of habitat disturbances. Frogs that require dense low vegetation and leaf litter for foraging and shelter (eg *Litoria brevipalmata* and *Mixophyes balbus*) clearly may be affected by actions that remove that form of habitat (eg regular fire). Many tree frogs however, appear to spend their time living in the canopy areas of trees, with individuals of Peron's Tree Frogs (*Litoria peronii*) and Bleating Tree Frogs (*L. dentata*) often being heard calling from tree tops, and I have tracked Red-eyed Tree Frogs (*L. chloris*) into the canopy of wet forests. Dwarf Tree Frogs (*L. fallax*) are commonly heard calling from smaller trees some distance from any water, but they can also be heard in low shrubs and long grass. The considerations of what may impact on frogs using trees thus may be quite different from

those dependent on ground cover. It is all dependent on the actions being considered.

I would also note that it is important to be very careful not to assume what part of the habitat a species may be using. The Heath Frog (*L. littlejohni*) is a large tree frog with prominent toe-pads and so it would seem likely that it also climbs trees on a regular basis. However, anecdotal reports have generally found these frogs sheltering on the ground and unpublished radio-tracking work on female frogs found three individuals to always sheltered under vegetation or deep litter and not within trees. They may move to trees at times, but clearly were capable of living like a ground frog during the day.

So, when considering the impacts of a development or action on frogs, it is important to consider not only the water bodies present within an area, but also the available terrestrial habitats; how they may be used by frogs of specific interest; and how that habitat may be affected by any proposed disturbances. Frogs listed under the *Threatened Species Conservation Act* and *Environmental Protection and Biodiversity Conservation Act* are typically habitat specialists (bell frogs just have to be different), although we do not know the specifics of how they use that habitat. They probably need retained areas of native vegetation close by to their breeding sites if they are to survive, and this is something that should always be taken into consideration when assessing the impacts of a proposal on the frogs present in the area.

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Top : Green and golden bell frog *Litoria aurea*.

Above: Green-thighed frog *Litoria brevipalmata.*

Left: Perons tree frog *Litoria peronii.*

(*Photos courtesy of Frank Lemckert*)

Leafless Tongue Orchid *Cryptostylis hunteriana* Nicholls: its habitats throughout its known Australian distribution

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Funded by the NSW Environmental Trust

Summary

Rare or threatened species, and especially cryptic ones, are, by their nature hard to detect and often missed or overlooked in many field surveys. In addition, while surveys that specifically target rare or cryptic plant species and potential habitats are an important approach in their conservation and management, they are expensive and time-consuming, and sometimes fail to provide much useful information. Furthermore, given their cryptic nature, rates of habitat loss for these plants are poorly known or not known at all. This project set out to improve our understanding of what conditions and habitats that cryptic species like the Leafless Tongue Orchid prefer, and so improve the way we manage our activities to help protect and conserve them.

As a general rule of thumb, a plant species' natural distribution is a consequence of variations in landscape factors (as well as biotic interactions). There is often good correlation between observed species distribution patterns and climate, geology, and soil variables. In this study of the Leafless Tongue Orchid, we analysed plant census data and landscape variations at known sites across the entire range of the species. The results include the preparation of habitat information and a predictive map.

Although modelling and habitat profiles – such as the ones produced by this project - may be used for estimating the probability of occurrence of a range of threatened cryptic plant species, it is important to note that unknown populations may occur that have not been predicted because their habitat was not represented in the sample data. Additionally, outlier populations, particularly those at the limit of a species' range, may be very important in enabling that species to adapt to future alterations to habitat, including those produced by climate change. Given the foregoing, and the limited nature of the study, we emphasise that total reliance should not be placed on our research in defining potential habitat for the Leafless Tongue Orchid. Instead, the suitability of an area to provide habitat for the Leafless Tongue Orchid should be determined using our research along with other tools, such as the scientific literature and local knowledge.

Introduction

The Tongue Orchids (*Cryptostylis*: Orchidaceae) are a genus of about twenty species, occurring in Malesia, New Caledonia, Melanesia and Australia (Jones 1993; Weston 1993): of the 5 that occur in Australia, 3 are endemic (Weston 1993). Unlike all other *Cryptostylis* species, the saprophytic Leafless Tongue Orchid (*Cryptostylis hunteriana* Nicholls) is particularly hard to detect outside of its short reproductive period due to its subterranean habit and the lack of persistent foliage.

The species is listed as Vulnerable on Schedule 2 of the NSW *Threatened Species Conservation Act 1995* (TSC Act), and also as Vulnerable under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It has a RoTAP coding (Briggs & Leigh 1996) of 3VC-, indicating that the species is vulnerable, has a geographic range greater than 100 km, with at least one population (population size unknown) occurring in a conservation reserve. The main identified threats to the Leafless Tongue-orchid are disruption or loss of natural habitat through development pressures in many coastal regions (NSW DECC 2005a; Department of the Environment 2008).

Lack of knowledge on preferred habitat can place species at risk, especially in areas undergoing rapid

and intensive development, areas subject to mining and forestry, and where fire management alters fire intervals such that they limit the long-term perpetuation of some species. Additionally, under current guidelines for impact assessment and assessments relating to Biodiversity Banking and Biocertification in NSW, there is no requirement to provide seasonal surveys for cryptic, deciduous or otherwise hard to detect threatened species. Therefore adequate, up-to-date knowledge is imperative when areas of land are being assessed for potential impacts from land-use changes, so that tests of significance can be applied using the best-available information whilst reducing the potential for unmeasured loss of diversity. A better understanding of what constitutes preferred habitat for such species can improve our ability to meet conservation objectives for threatened species and their habitats.

With financial support from the Environmental Trust, this project examined the realised habitat of the Leafless Tongue Orchid throughout its entire Australian distribution. Two earlier papers had addressed localised habitat requirements for populations of this species in two regions of NSW: on the NSW Central Coast (Bell 2001) and in the NSW Shoalhaven area (Clarke et al. 2004). One of the aims of the current study was to extend the earlier work, and to assist determining authorities and other agencies in locating where this threatened cryptic plant species is likely to occur. This has been done through a combination of detailed data collected from sites known to support the species, numerical classification analysis to define occupied vegetation communities, and predictive mapping of potential habitat. The article provides a summary of habitat types know to support the Leafless Tongue Orchid in Queensland, New South Wales and Victoria; full details of the complete study, including the results of predictive mapping, will be published in the ecology journal *Cunninghamia* in the near future.

Methods

Locations of known populations of the Leafless Tongue Orchid were extracted from a range of sources for each state, principally from databases maintained by State and Federal government conservation agencies. Field sampling was undertaken at as many locations as possible (generally excluding records older than 30 years due to uncertainties in positional accuracy). At each site, floristic sampling was completed within 0.04 ha sample plots (nominally 20 x 20 m), where estimated cover abundance data was scored for all vascular plant species based on modified Braun-Blanquet cover abundance scores (1-6 scale) (Braun-Blanquet 1928). Some pre-existing data was already available from previous studies (including Bell 2001; Clarke et al. 2004); however, only some of these studies collected cover abundance data and of those that did cover-abundance scoring systems varied. Consequently, prior to numerical analysis, all data were transformed into presence-absence format so that existing samples could be incorporated.

Two routines in PRIMER (Plymouth Routines in Multivariate Ecological Research: Clarke & Gorley 2006) were used to draw out apparent vegetation communities or habitat groups for sites where the Leafless Tongue Orchid occurred. Cluster analysis and non-metric multidimensional scaling (nMDS) on the combined dataset were performed, and diagnostic species lists for each defined floristic group were generated. Plant nomenclature for sites in NSW followed Harden (1990-1993), Harden & Murray (2000) and revisions accepted by the National Herbarium of New South Wales. South-eastern Queensland taxonomy follows Stanley & Ross (1986), and in Victoria Foreman & Walsh (1993) and Walsh & Entwistle (1994, 1996, & 1999) were the authorities. In the rare cases where recognized synonyms operate in adjacent States for the one taxon, nomenclature for New South Wales was used. The lack of floristic data from areas immediately surrounding known Leafless Tongue Orchid sites presented the risk that

vegetation communities described would lack local context. However, as the purpose of this study was to describe and map known habitat of the Leafless Tongue Orchid, this was not considered a major hindrance to the project's overall aims.

Results

Figure 1 (see end of the article) shows the location of sample plots at sites known to support populations of *Cryptostylis hunteriana*. Analysis of 108 sample plots comprising 660 native plant taxa (weed species were removed from the analysis) resulted in 17 major groups being defined, with one additional group added from anecdotal notes. As far as possible, data collection was completed by the same observers to reduce variability in preparing an inventory of co-occurring species. However, where orchid populations occurred on private lands this approach was not always possible, and data collected previously by other survey teams was required.

Within the 18 defined floristic groups 10 are based on single samples only, which may be considered outliers within the larger dataset. While the authenticity of these Leafless Tongue Orchid records are not disputed, their occurrences in otherwise unreported habitats raises questions regarding habitat variations associated with this species. The validity of records in three of these groups (communities 12-14) is further questioned due to uncertainties associated with the precision of spatial data and the accuracy ascribed to the data as held by relevant authorities. These groups should be treated with a lower confidence than the other defined groups.

Brief summaries of the eighteen vegetation communities supporting the Leafless Tongue Orchid in Australia are included in the following text:

1. Banksia/ Mahogany Wallum Heath (QLD)
Description: Low open woodland or Wallum heath on coastal sands in the Fraser Island hinterland of south-east Queensland. Scattered low trees of Wallum Banksia (*Banksia aemula*) and Bastard Mahogany (*Eucalyptus umbra*) over a diverse range of shrubs and sub-shrubs. A common vegetation type along the eastern Australian coastline. Most *Cryptostylis* plants observed along the side of an earthern culvert at the time of field sampling, which had also been subject to recent fire. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 10 m ASL. **Geology:** Pleistocene Sands. **Regional Veg Types:** *Banksia aemula* Woodland on Dunes and Sand Plains (RE 12.2.9: Neldner et al. 2005) and/ or *Banksia aemula* Woodland on Alluvial Plains near Coast (RE 12.3.14: Neldner et al. 2005).

2. New England Blackbutt Grassy Forest (NSW)
Description: Open forest on steep volcanic sediments in the Nowendoc area of the Northern Tablelands, New South Wales. Canopy dominated by New England Blackbutt (*Eucalyptus campanulata*) over a sparse-to-dense shrub layer of *Bursaria longisepala, Leucopogon lanceolatus, Monotoca scoparia* and *Podolobium ilicifolium*, and an open grassy ground layer. **Confidence:** Medium (previous record of *Cryptostylis hunteriana* reliable) but no plants located during field investigations. **Elevation Range:** 1226 m ASL **Geology:** Tertiary Basalt. **Regional Veg Types:** Dry Open New England Blackbutt (FE41: NSWNPWS 1999).

3. New England Blackbutt Shrubby Forest (NSW)
Description: Steep open riparian forest at high elevation in the Nymboida National Park, Northern Tablelands of New South Wales. Canopy layer dominated by New England Blackbutt (*Eucalyptus*

campanulata), and to a lesser extent Tallowwood (*Eucalyptus microcorys*) and Blue Mountains Mahogany (*Eucalyptus notabilis*), over a dense smaller tree layer of Black She-oak (*Allocasuarina littoralis*). A moderately dense shrub layer of Black Wattle (*Callicoma serratifolia*), Ti-tree (*Leptospermum trinervium, L. polygalifolium*) and Saw-sedge (*Gahnia sieberiana*), *Lepidosperma elatius* and *Schoenus melanostachys*. Original record reliable (specimen lodged at North Coast Regional Botanic Gardens, Specimen No 28333). Notes accompanying original collection state that *Cryptostylis hunteriana* occurred on a lower slope/ stream bank. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 930 m ASL. **Geology:** Granite. **Regional Veg Types:** Moist Escarpment New England Blackbutt (FE88: NSWNPWS 1999).

4. Large-fruited Blackbutt/ Strawberry Gum Woodland (NSW)

Description: Open forest or heathy woodland at high elevations on granite, on the northern Tablelands of New South Wales. Canopy dominated by Large-fruited Blackbutt (*Eucalyptus pyrocarpa*), with other species including Strawberry Gum (*Eucalyptus olida*) and *Eucalyptus williamsiana*. A diverse shrub layer including several granitic endemics is present, and rocky outcrops of Permian-aged granites are common. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 1000-1100 m ASL. **Geology:** Permian Granites. **Regional Veg Types:** Dry Heathy New England Stringybarks (FE39: NSWNPWS 1999); *E.olida–E.ligustrina–E.cameronii* Forest/Woodland (Hunter & Sheringham 2008); *E.olida–E.pyrocarpa–E.planchoniana* Forest/Woodland (Hunter & Sheringham 2008).

5. Scribbly Gum/ Bloodwood/ Apple Woodland (NSW)

Description: Heathy woodland on gently undulating topography on the Lake Macquarie lowlands in northern parts of Wyong LGA and the southern parts of Lake Macquarie LGA, New South Wales. Scattered canopy species include Broad-leaved Scribbly Gum (*Eucalyptus haemastoma*), Red Bloodwood (*Corymbia gummifera*), Charmhaven Apple (*Angophora inopina*) and Brown Stringybark (*Eucalyptus capitellata*). *Cryptostylis hunteriana* typically present as single flowering spikes or in small groups **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 30 – 60 m ASL. **Geology:** Triassic Narrabeen series. **Regional Veg Types:** Coastal Plains Scribbly Gum Woodland (MU31: NSWNPWS 2000).

6. Bloodwood/ Apple/ Mahogany/ Peppermint Forest (NSW)

Description: Open forest on Permian or Carboniferous sediments of the Central Coast of New South Wales, on low hills in close proximity to the coast. Known areas include Catherine Hill Bay (Lake Macquarie LGA), Nelson Bay (Port Stephens LGA) and Bulahdelah (Great Lakes LGA). Canopy composition can vary, but commonly includes Smooth-barked Apple (*Angophora costata*), Red Bloodwood (*Corymbia gummifera*) and Bastard Mahogany (*Eucalyptus umbra*). At Bulahdelah, other associates include Sydney Peppermint (*Eucalyptus piperita*), Blackbutt (*Eucalyptus pilularis*) and Forest Oak (*Allocasuarina torulosa*), while Brown Stringybark (*Eucalyptus capitellata*) is also present at Catherine Hill Bay. Large to very large populations of *Cryptostylis hunteriana* present in this habitat type. Variation in habitat includes moderately tall open forest on sediments and low coastal open forest on sediments and volcanics. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 30 – 110 m ASL. **Geology:** Permian Newcastle Coal Measures; Permian Bulahdelah Formation; Carboniferous Volcanics. **Regional Veg Types:** Nerong Smooth-barked Apple Forest (MU32: NSWNPWS 2000); Coastal Headland Complex (MU51: NSWNPWS 2000); (?) Dry Heathy Sandstone Blackbutt (FE40: NSWNPWS 1999).

7. Dwarf Apple/ Banksia Scrub (NSW)

Description: Scrub to heath on a broad plateau in Garigal National Park, Sydney. A tall shrub layer is dominated by Dwarf Apple (*Angophora hispida*) and Heath-leaved Banksia (*Banksia ericifolia*), with a diverse low shrub layer including *Darwinia fascicularis* and a range of Ericaceae and Proteaceae taxa, and a sparse groundcover layer composed mostly of species from the Cyperaceae and Restionaceae. One record at this site, with an additional (historic) record further north in Ku-ring-gai Chase National Park, in a similar vegetation unit. **Confidence:** Medium (previous record of *Cryptostylis hunteriana* reliable, but not seen at time of survey). **Elevation Range:** 150 m ASL. **Geology:** Triassic Hawkesbury Sandstone. **Regional Veg Types:** Dwarf Apple Scrub (MU28a: NSWNPWS

2000); Hinterland Sandstone Dwarf Apple Heath-Woodland (S_HL10: NSW DECCW 2010).

8. Grey Gum/ Bloodwood/ Stringybark Forest (NSW)
Description: Open forest or woodland on a broad ridge on the western side of the Georges River, in Georges River Nature Reserve, Sydney. Typical canopy species are Grey Gum (*Eucalyptus punctata*), Red Bloodwood (*Corymbia gummifera*) and Narrow-leaved Stringybark (*Eucalyptus sparsifolia*), above a diverse shrub stratum of various Proteaceae, Fabaceae and Ericaceae shrubs, with a groundcover stratum of Wiry Panic (*Entolasia stricta*), Kangaroo Grass (*Themeda australis*) and *Cyathochaeta diandra*. **Confidence:** Low (*Cryptostylis hunteriana* record reliable but precise location uncertain). **Elevation Range:** 100-120 m ASL. **Geology:** Triassic Hawkesbury Sandstone (Mittagong Formation). **Regional Veg Types:** Hinterland Sandstone Transition Grey Gum Forest (S_DSF18: NSW DECCW 2010); Upper Georges River Sandstone Woodland (MU32: Tozer 2003).

9. Banksia/ Hakea Wet Heath (NSW)
Description: Wet heath of *Banksia ericifolia* and *Hakea teretifolia* with a groundcover of dense sedge species form the Cyperaceae (*Lepidosperma, Chorizandra, Schoenus*) and Restionaceae (*Empodisma, Lepyrodia, Leptocarpus*). One site only, occurring on gently-sloping but poorly-drained site in the Vincentia – Erowal Bay area, on the Shoalhaven Plain of New South Wales. Positional accuracy of this site in question. **Confidence:** Low (*Cryptostylis hunteriana* record reliable but precise location uncertain) **Elevation Range:** 15 m ASL. **Geology:** Undifferentiated (unknown - alluvium, gravel, swamp deposits and sand dunes). **Regional Veg Types:** Northern Coastal Tall Heath (VG140: Gellie 2005).

10. Peppermint/Bloodwood/Stringybark/Silvertop Ash Forest (NSW)
Description: Open forest with a shrubby understorey on shallow soils on low ridges and dry slopes in coastal foothills of the Shoalhaven Plain, New South Wales [also occurs in Eden area (Keith & Bedward 1999)]. Common upper canopy species are Sydney Peppermint (*Eucalyptus piperita*), White Stringybark (*Eucalyptus globoidea*) and Red Bloodwood (*Corymbia gummifera*). All records of *Cryptostylis hunteriana* in this Group occur as individual plants or small groups. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 65-120 m ASL. **Geology:** Permian (Shoalhaven Group/ Snapper Point), Ordovician (Adaminaby Group). **Regional Veg Types:** South Coast Lowland Dry Shrub Forest (VG2: Gellie 2005).

11. Bloodwood/ Scribbly Gum/ Silvertop Ash Forest (NSW)
Description: Heathy woodland to open forest on gentle rolling slopes and plains, on sedimentary Permian landscapes of the Shoalhaven coastal plain, New South Wales. This community occurs as a mosaic of woodland and scrub-heath forms throughout the northern coastal plain in the Shoalhaven LGA: these two forms may (given the similarities in floristic composition) be more developed or more disturbed forms of the same community. High abundance of records of *Cryptostylis hunteriana* occur in both forms, as both individual plants or large populations. Typical canopy species are Red Bloodwood (*Corymbia gummifera*) and Hard-leaved Scribbly Gum (*Eucalyptus sclerophylla*) with occasional Silver-top Ash (*Eucalyptus sieberi*), and occasional small trees of Black She-oak (*Allocasuarina littoralis*), above a diverse heathy understorey. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 30-160 m ASL. **Geology:** Shoalhaven Group (Wandrawandian Siltstone, Snapper Point, Nowra Sandstone). **Regional Veg Types:** Northern Coastal Hinterland Heath Shrub Dry Forest (VG139: Gellie 2005).

12. Silvertop Ash Forest/ Yertchuck/ Spotted Gum Forest (NSW)
Description: Open forest on the south coast of New South Wales, supporting a canopy of Silver-top Ash (*Eucalyptus sieberi*) with Yertchuk (*Eucalyptus consideniana*) and Spotted Gum (*Corymbia maculata*), a mid-dense small tree layer of Black She-oak (*Allocasuarina littoralis*) and a shrub layer of *Dillwynia sieberi* and *Pultenaea retusa*, above a groundcover of grasses (predominantly Wiry Panic *Entolasia stricta*), sedges (*Cyathochaeta, Lepidosperma*) and various graminoids (*Lomandra*). One plant found in January 2008 in this community near Batemans Bay; sampling plot was centred on this record. **Confidence:** High (*Cryptostylis hunteriana* record reliable). **Elevation Range:** 10 m ASL. **Geology:** Ordovician (Wagonga Group). **Regional Veg Types**: Coastal Lowlands Cycad Dry Shrub Forest (VG 9: Gellie 2005).

13. Woollybutt/Bangalay/Stringybark/Roughbark Apple Forest (NSW)

Description: Low open forest on a coastal headland in Ben Boyd National Park, southern New South Wales, with a canopy dominated by Bangalay (*Eucalyptus botryoides*) and Woollybutt (*Eucalyptus longifolia*), above a small tree layer of Black She-oak (*Allocasuarina littoralis*) and Hickory (*Acacia implexa*), and a groundcover layer of sedges (*Gahnia radula*), graminoids (*Lomandra* spp., *Dianella, Patersonia*) and various herbs and twiners. Positional accuracy may be in question for this record. *Cryptostylis hunteriana* not detected during plot data collection. **Confidence:** Low (*Cryptostylis hunteriana* record reliable but precise location uncertain). **Elevation Range:** ~40 m ASL. **Geology:** Devonian (Merimbula Group, Ben Boyd Formation). **Regional Veg Types:** Lowland Gully Shrub Forest (MU 37, Keith & Bedward 1999); South-East Lowland Gully Shrub Forest (WSF e37: Tozer et al. 2010).

14. Spotted Gum/ Woollybutt/Paperbark Forest (NSW)

Description: Open forest of Spotted Gum (*Corymbia maculata*) and Woollybutt (*Eucalyptus longifolia*) above a small tree layer of White Feather Honeymyrtle (*Melaleuca decora*) and Black She-oak (*Allocasuarina littoralis*), on the Shoalhaven Plain of New South Wales. A sparse shrub layer includes *Daviesia ulicifolia, Pultenaea villosa* and Ball Honeymyrtle (*Melaleuca nodosa*). A sparse groundcover includes grasses (*Entolasia, Aristida*), herbs (*Brunoniella, Goodenia*) and graminoides (*Lomandra*). Positional accuracy under question: this is an unusual vegetation community for *Cryptostylis hunteriana* in the Shoalhaven, and the species was not detected during plot data collection. **Confidence:** Low (*Cryptostylis hunteriana* record reliable but precise location uncertain). **Elevation Range:** ~50 m ASL. **Geology:** Permian (Shoalhaven Group – Berry Siltstone). **Regional Veg Types:** Jervis Bay Lowlands Dry Shrub-Grass Forest (VG 5: Gellie 2005); Currambene-Batemans Lowlands Forest (DSF p85: Tozer et al. 2010).

15. Coachwood/ Lily Pily/ Bangalay Rainforest (NSW)

Description: One site located on the south coast of New South Wales, in a gully with forest of *Eucalyptus botryoides* and a closed mesic small tree layer, including Coachwood (Ceropetalum apetalum), Lily Pily (*Acmena smithii*), *Hedycarya angusifolia* and *Acacia maidenii*. Common understorey species include *Synoum glandulosum* subsp. *glandulosum*, Bolwarra (*Eupomatia laurina*), *Sticherus flabellatus* var. *flabellatus* and Gristle Fern (*Blechnum cartilagineum*). Positional accuracy of the record is questionable. **Confidence:** Low (previous record of *Cryptostylis hunteriana* reliable). **Elevation Range:** 130 m ASL. **Geology:** Permian (Shoalhaven Group – Snapper Point Formation). **Regional Veg Types:** Coastal Hinterland Ecotonal Gully Rainforest (VG 20: Gellie 2005).

16. Banksia/ Hakea Dry Scrub-Heath (NSW)

Description: Tall heath 1-2m with patches of dense scrub to 3-4m, on sedimentary Permian landscapes on the northern coastal Plain of the Shoalhaven, New South Wales. Structure varies from low damp heath (*Banksia ericifolia* and *Hakea teretifolia*) to drier heath-scrub (*Lambertia formosa, Hakea laevipes* and various Epacrids), to dense scrub (*Banksia ericifolia*). Occasional stunted canopy species are *Corymbia gummifera* and *Eucalyptus sclerophylla*. This and community 11 (see above) occur as a mosaic of often intergrading forms throughout the coastal plain in the northern Shoalhaven LGA, and may (given the similarities in floristic composition) be more developed or more disturbed forms of the same community. High abundance of records of *Cryptostylis hunteriana* occur in both communities, as both individual plants or large populations. Note that this group has not been included in numerical analyses. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 15-150 m ASL. **Geology:** Shoalhaven Group - Wandrawandian Siltstone or Snapper Point Formation. **Regional Veg Types:** Northern Coastal Tall Heath (VG 140: Gellie 2005).

17. Yertchuck/ Stringybark Woodland (VIC)

Description: Open forest or modified open forest (along slashed powerline easements) on gently undulating topography in the East Gippsland area of Victoria. Dominated in the canopy by Gippsland Peppermint (*Eucalyptus croajingolensis*), Yertchuck (*Eucalyptus consideniana*) and Stringybarks (*Eucalyptus globoidea, Eucalyptus baxteri*). Understorey vegetation tends to be open, although in some locations dense stands of *Melaleuca squarrosa* and *Leptospermum* spp are evident. Some locations

support dense shrub layers of *Melaleuca squarrosa* and *Leptospermum trinervium*, over a moist ground layer including sedge species and ferns, which differs from the more typical open forest with a heathy understorey. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 35-120 m ASL. **Geology:** Cainozoic (undifferentiated consolidated sedimentary rocks); Devonian (Tonghi Granodiorite). **Regional Veg Types:** Banksia Woodland (EVC14: Davies et al. 2002); and/ or Lowland Forest (EVC16: Davies et al. 2002); Timbillica Dry Shrub Forest (MU46A: Keith & Bedward 1999).

18. Grasstree Wet Heath (VIC)

Description: Open heath in broad depressions on lowlands of the East Gippsland region in Victoria, often dominated by Grasstree (*Xanthorrhoea resinosa*) and sedge/ grass species. Small trees, Saw Banksia (*Banksia serrata*) and Yertchuck (*Eucalyptus consideniana*) may be present as widely scattered individuals. Some locations (e.g. Cape Conrad) support little or no *Xanthorrhoea resinosa*, but are instead dominated by *Allocasuarina paludosa* and other heath species. **Confidence:** High (*Cryptostylis hunteriana* observed during field sampling). **Elevation Range:** 30m-200 m ASL. **Geology:** Quaternary sands, Cainozoic (undifferentiated consolidated sedimentary rocks), Emsian (Yeerung Volcanics), Devonian (Tonghi Granodiorite), Ordovician (Adaminaby Group, Holocene alluvium. **Regional Veg Types:** Clay Heathland (EVC7: Davies et al. 2002); and/ or Wet Heathland (EVC8: Davies et al. 2002); Coastal Lowland Heath (MU55: Keith & Bedward 1999).

Discussion

The Leafless Tongue Orchid occupies a wide range of habitat types throughout its known distributional range. Floristically, the species has been recorded from high elevation grassy forests on Tertiary basalt, through a range of open forests and heathy woodlands on various sedimentary geologies, to wet heaths and wallum scrubs on Quaternary sands. This range of habitats extends from elevations of 10 m ASL in south-eastern Queensland, to over 1200 m ASL at Nowendoc National Park (NSW Northern Tablelands). The Shoalhaven area of New South Wales still appears to be a stronghold for the species, with data collected from 59 locations, with East Gippsland (17) and Lake Macquarie (16) the next most populous regions. The largest recorded populations occur in New South Wales at Bulahdelah (Bulahdelah State Forest and private land), in the Shoalhaven (mostly on private land) and in Port Stephens (within Tomaree National Park). Protected populations of the Leafless Tongue Orchid are known from Gibraltar Range, Washpool, Nowendoc, Nymboida, Tomaree, Wallarah, Blue Mountains, Ku-ring-gai Chase, Jervis Bay, Jervis Bay Nature Reserve, Conjola, Meroo, Murramurrang and Ben Boyd National Parks in New South Wales; and Croajingolong National Park, Cape Conran Coastal Park and William Hunter Flora Reserve in Victoria.

For a cryptic plant species which is rarely encountered during field surveys, the Leafless Tongue Orchid is represented within a surprising number of habitat types across an extensive geographical distribution. One of the aims of this study was to identify those vegetation communities that have been shown to support populations of the species throughout its full geographic range. For practical application, it is sensible to equate these defined communities with existing regional vegetation classifications, so that the findings of this study can be readily applied to management and decision making at finer scales. Pre-existing classifications of native vegetation within regions and in all three states vary extensively in the level of detail presented, and because of this it has not been possible to apply a consistent classification for all populations across all states.

A number of limitations have become evident throughout the course of this project, including issues relating to the comprehensiveness of data obtained from a number of sources. The age of some records, and their poor location accuracy (to only 200 m or worse), may mean that field data collected at the locations of these older records may not accurately reflect the floristics of the actual locations of these Leafless Tongue Orchid populations. This limitation gives rise to particular difficulties of assigning correct habitat types in landscapes with high degrees of habitat variability within limited spatial ranges (e.g. in the NSW Central Coast and in the Shoalhaven regions).

Conclusion

Given the rate of species extinction and habitat loss in Australia, there is an urgent need for land managers and consent authorities to understand preferred habitat for rare plant species, and especially cryptic species. The default assumption of most

environmental impact assessments is that species that are present will be detected during surveys or, where not recorded, that the site represents low quality habitat for the species. However, a growing body of evidence recognises that this is not the case, either because an observer fails to detect a species that is present at a particular survey location or the growing habits of the plant make it impossible to detect for most of the year. Predictive modelling of potential habitat allows land managers to be better informed on the locations in which cryptic and rare species are likely to occur.

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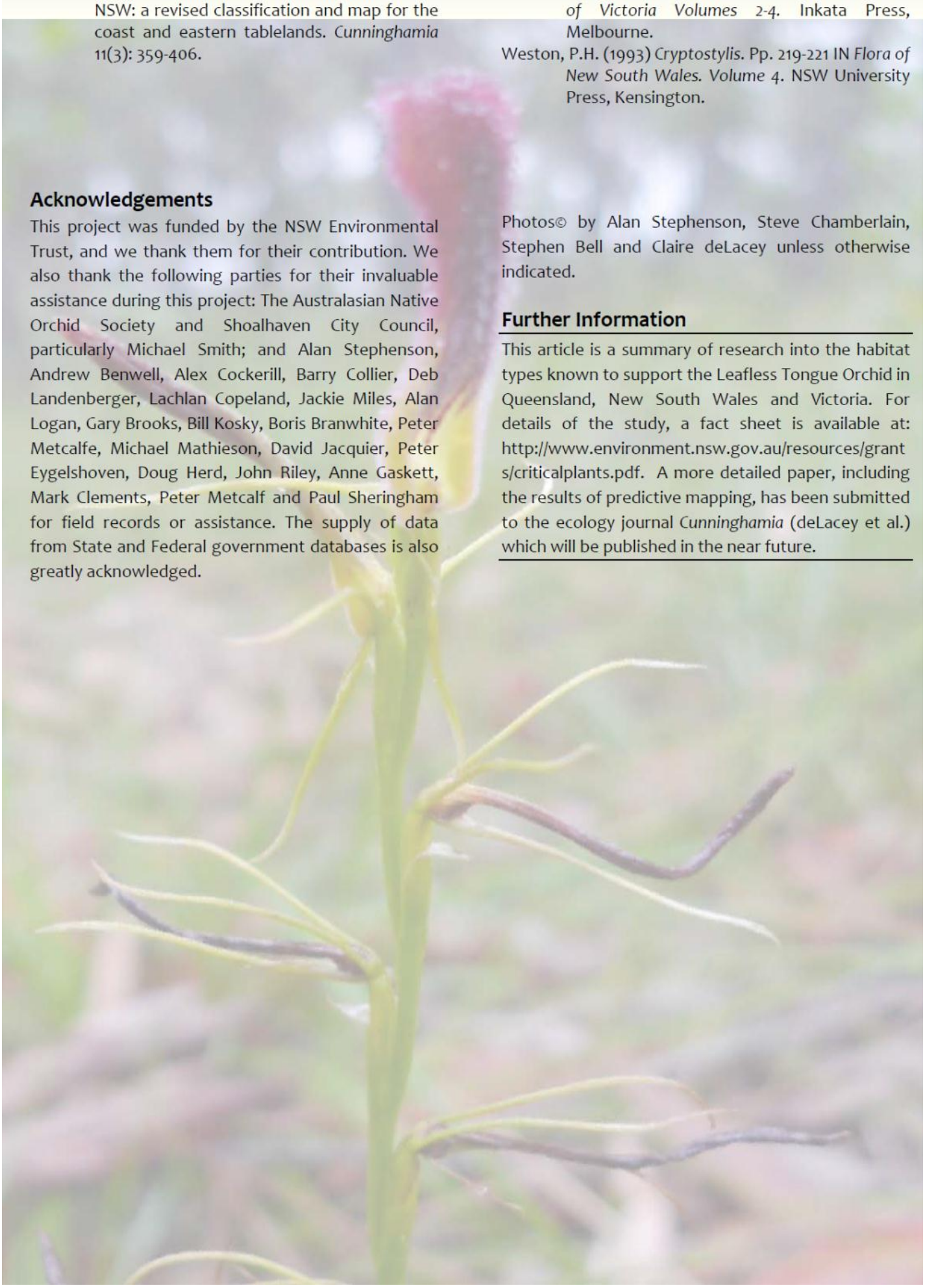
Further Information

This article is a summary of research into the habitat types known to support the Leafless Tongue Orchid in Queensland, New South Wales and Victoria. For details of the study, a fact sheet is available at: http://www.environment.nsw.gov.au/resources/grants/criticalplants.pdf. A more detailed paper, including the results of predictive mapping, has been submitted to the ecology journal *Cunninghamia* (deLacey et al.) which will be published in the near future.



Predictive Distribution for the Leafless Tongue Orchid *Cryptostylis hunteriana*

Leafless Tongue Orchid

- Point location records for *C. hunteriana*
- *C. hunteriana* May Occur
- *C. hunteriana* Likely to Occur
- Bioregions

Note
MaxEnt modelled projection restricted to the following bioregions: New England Tablelands; NSW North Coast; South East Corner; South Eastern Queensland; and Sydney Basin

If you find a Leafless Tongue Orchid, you should report a record of its location to the NSW Herbarium at the Royal Botanic Gardens, or to the nearest National Parks and Wildlife Service office.

Interested in more information? Visit www.website.com to download a copy of the Environmental Trust publication or www.website.com to read the associated scientific publication.

Gladstone
Brisbane
Byron Bay
Coffs Harbour
Nelson Bay
Lake Macquarie
Sydney
Jervis Bay
Batemans Bay
Eden
Mallacoota
Lakes Entrance

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From the Botany Desk

This section is dedicated to sharing of observations, descriptions and any information such as flowers of threatened plants for the purpose of benefiting the science of Botany, especially in its application to ecological consulting and management of threatened species.

This issue, Isaac Mamott shares his valuable insights into two threatened species he's been working with.

Notes on Genoplesium littorale (Tuncurry Midge Orchid), a critically endangered terrestrial orchid listed under the TSC and EPBC Acts: Part of a series on the lesser well known Threatened vascular plants of the NSW North Coast focusing on those taxa that have no detailed species profiles available.

Description of Species

The Tuncurry Midge Orchid (TMO) belongs to a group of terrestrial midge orchids which are known for having tiny, 'upside down' flowers; fused leaf and flower stems; and concave dorsal sepals. The following description of the species is taken from Jones (2006) and from the author's field observations (in parentheses).

Leaf: 100-250mm long; free part 10-18mm long, ending below flowers; (terete, 2-3 mm wide).
Spike: 10-30mm tall, 5-30 flowered.
Flowers: Moderately crowded, semi nodding, 5 x 4mm, green with purple-brown labellum (variation in petal and sepal colour from part green and maroon, to all maroon).
Dorsal sepal: 3.8 x 2.5mm; (ovate and concave); margins hairless; apex sharply pointed.
Lateral sepals: Deflexed, divergent, 4.5 x 1mm, base humped (strongly to weakly); (apex often sharply pointed).
Petals: 3 x 0.8mm, spreading; (ovate to lanceolate); margins hairless; apex sharply pointed.
Labellum – stiffly hinged, 2.5 x 0.8mm, oblong, fleshy, margins hairless; apex sharply pointed and (strongly) recurved. Callus extending nearly to labellum apex.

Taxonomic History

The Type Specimen was first described in Bishop (1996, 2000) as *Genoplesium* sp. aff. *despectans* (Tuncurry), reflecting the TMO's apparent morphological similarity with *Genoplesium despectans*, a species known from southern NSW and Victoria. The TMO was not included in Jones's (1988) seminal publication, *Native Orchids of Australia*, given that the Type Specimen was not collected until 1992. The TMO was subsequently described as a new species, *Genoplesium littorale*, by Jones (2001). Subsequent to this, Jones *et al* (2002) published a revision of the *Genoplesium* genus whereby all but one of the *Genoplesium* taxa in Australia were placed into the *Corunastylis genus* (an old but resurrected genus), with TMO newly described as *Corunastylis littoralis* (Jones 2002; Jones 2006). This major taxonomic revision was justified based on phylogenetic studies (DNA analysis) of three *Genoplesium* taxa which resulted in the re-recognition of the historic *Corunastylis* genus (Clements *et al* 2002).

The *Genoplesium/Corunastylis* revision has not been accepted by the NSW National Herbarium with the species still described as *Genoplesium littorale*, on the Royal Botanic Gardens (RBG) 'PlantNet' website. The NSW National Herbarium refuses to accept this major Genus revision because the revision was based on the analysis of a very small number of *Genoplesium* taxa relative to the total (48) *Genoplesium* taxa in Australia (. Dr Peter Weston, pers. comm., NSW National Herbarium). Further, the results of the subject phylogenetic studies used to justify the genus revision (Clements *et al* 2002) were contradictory to other such studies by Kores *et al* (2001) which concluded that the *Genoplesium* genus had more genetic affinity with the *Prasophyllum* genus (with which *Genoplesium* was historically contained within), than with the *Corunastylis* genus. The results of the study by Kores *et*

al (2001) seem to provide an equally strong justification for re-incorporating the *Genoplesium* taxa back into the *Prasophyllum* genus (the genus was split into *Prasophyllum* and *Genoplesium* in 1989). The debate continues to date (the world of orchid taxonomy is absolutely nutty!).

The taxonomic history summarised above has led to a large degree of confusion amongst consultant botanists, Australian Herbaria and regulatory authorities regarding the scientific name to be used when referring to the TMO. This confusion about the species taxonomy has resulted in, for example, the species being listed as *Corunastylis littoralis* under the EPBC Act (critically endangered) by DSEWPC and *Genoplesium littorale* (critically endangered) under the TSC Act by OEH. The Australian National Herbarium in Canberra refers to the species as *Corunastylis littoralis* (having accepted the genus revision) whilst the RBG Sydney remains sceptical and has retained the *Genoplesium* genus to date.

Life Cycle

During late summer and autumn, the TMO produces a single erect stem with the flower spike emerging through the leaf near the apex of the stem, leaving a small free portion of leaf beneath the flowers. The leaves and flowering stems are essentially fused and develop simultaneously as a single unit. Individual stems have been observed by the author to flower for up to 2-3 weeks and are usually open during hot sunny days (with high humidity) to coincide with likelihood of pollinator activity.

In recent years, the author has observed the Tuncurry population to flower from as early as mid summer (mid February) to as late as the third week of May. In the case of the Tuncurry Midge Orchid, initial observations suggest that the species flowers 4-6 weeks following good summer rainfall. The proportion of the population that will flower in any individual year is not known and likely varies from year to year (midge orchids are often known to skip years). Successful flowering and reproduction are likely to be dependent on favourable weather conditions, however other factors may also influence flowering such as the extent of native and introduced herbivore browsing. The literature reports that midge orchid seedlings take between 3-5 years to flower, with such timing being dependent on tuber size (NSW NPWS 2002). Seed development and shedding occur about 3-5 weeks and 6-12 weeks, respectively, following pollination. The TMO dies back after fruiting and exists as a subterranean, dormant tuber in the winter until favourable conditions occur for germination in the following year(s).

In a comprehensive literature review of the *Genoplesium* genus, Bower (2001) notes that the flowers of *Genoplesium* are small, inconspicuous and dull-coloured: typical characteristics of myophily (fly pollination). Bower (2001) also comments that limited data suggests that nectar is present in some *Genoplesium* species, indicating that the pollination strategy is one of nectar reward for the pollinators. This is consistent with Jones (2006) who notes that most species of *Prasophyllum* (from which the *Genoplesium* genus was derived) secrete nectar on the labellum and are visited by a large range of insects. Bower (2001) also states that the attraction of flies to some *Genoplesium* species is strong (with swarming behaviour often exhibited with fresh inflorescences for a number of species), and appears to be by odours, not all of which are detectable by humans.

Bower (2001) notes that strong evidence exists that the genus is pollinated exclusively by tiny flies of the closely related families Chloropidae and Milichiidae belonging to the superfamily Chloropoidea.

Habitats of *Genoplesium littorale*

Type Tuncurry Population

The Type population at Tuncurry occurs within a Dry Sclerophyll Shrubland on a Holocene-aged dunefield, on moist to well drained podsolised sands. The vegetative structure and floristics of this TMO habitat is outlined below.

Emergents: *Eucalyptus pilularis* (5% Projected Foliage Cover; to 10 metres height).
Small Trees: *Banksia serrata, Callitris endlicheri* (5-10% Projected Foliage Cover; to 6 metres in height).

Shrubs: *Monotoca elliptica, Acacia sophorae, Persoonia lanceolata, Bossiaea rhombifolia subsp. rhombifolia, Leptospermum polygalifolium subsp. cismontanum, Dillwynia retorta, Conospermum taxifolium, Leucopogon lanceolatus var gracilis, Acacia ulicifolia, Acacia suaveolens, Leucopogon parviflorus, Zieria laxiflora, Gompholobium latifolium* (15-40% Projected Foliage Cover; to 4 metres in height).

Groundcover: Shrub seedlings, *Hibbertia obtusifolia, Pteridium esculentum, Gonocarpus teucrioides, Dianella revoluta, Platysace lanceolata, Eragrostis brownii, Macrozamia communis, Astroloma pinifolium, Euryomyrtus ramosissima subsp. ramosissima* (10-30% Projected Foliage Cover; to 1.5 metres in height).

Lichens: *Cladia aggregata, Heterodea muelleri, Cladonia spp*. (0-15% cover; to 50mm height).

Leaf litter: Comprised predominantly of *Monotoca elliptica, Leptospermum laevigatum, Acacia sophorae, Persoonia lanceolata*. (0- 70% cover)

Miscellaneous Notes: The TMO was often observed in the drip zone of *Monotoca elliptica* (+/- leaf litter and lichen spp.).

Tuncurry Powerline Easement

Within a powerline easement at Tuncurry south of the Type population, the TMO occurs amongst a periodically slashed (artificially low) Dry Heathland community to 300mm height on well drained podsolised sands of Holocene origin. Vegetative structure and floristics of this TMO habitat is outlined below.

Heathy Shrubs: *Caustis recurvata* var *recurvata, Boronia pinnata, Dillwynia retorta, Monotoca scoparia, Monotoca elliptica, Brachyloma daphnoides, Phyllota phyllicoides, Acacia sophorae, Bossiaea heterophylla, Leptospermum polygalifolium subsp. cismontanum, Dillwynia retorta, Ricinocarpus pinifolius, Allocasuarina littoralis, Conospermum taxifolium, Leucopogon muticus, Leucopogon parviflorus, Zieria laxiflora, Hypolaena fastigata, Lomandra glauca, Leptospermum laevigatum, Calytrix tetragona, Ochrosperma lineare, Leucopogon ericoides, Hibbertia obtusifolia, Hibbertia linearis, Astroloma pinifolium* (15-70% Projected Foliage Cover; to 0.5 metres in height).

Lichens: *Cladia aggregata, Heterodea muelleri, Cladonia spp*. (0-15% cover; to 50mm height)

Miscellaneous Notes: This periodically slashed Heathland habitat grades slightly upslope into a *Banksia aemula-Leptospermum polygalifolium subsp. cismontanum* Dry Heathland fringing the eastern side of the easement, and slightly downslope into a *Leptospermum laevigatum* Dry Sclerophyll Shrubland fringing the western side of the easement.

Powerline Easement at Green Point

The Green Point population is also situated within a powerline easement amongst a periodically slashed Intermediate Dry Heathland community on moist to well drained podsolised sands of Holocene origin. Vegetative structure and floristics of this TMO habitat is outlined below. There appears to be some habitat affinity with the Tuncurry powerline easement population although with a greater composition of mixed (dry and wet) heath species compared to the Tuncurry population. The dunes within the Green Point easement may be somewhat deflated with a shallow water table occurring following periods of high rainfall.

Heathy Shrubs: *Caustis recurvata* var *recurvata, Boronia pinnata, Monotoca scoparia, Phyllota phyllicoides, Bossiaea heterophylla, Leptospermum polygalifolium subsp. cismontanum, Conospermum taxifolium, Leucopogon muticus, , Zieria laxiflora, Hypolaena fastigata, , Calytrix tetragona, Hibbertia linearis, Lepyrodia scariosa, Goodenia heterophylla, Bossiaea ensata, Epacris obtusifolia, Melaleuca nodosa, Acacia linifolia, Eriostemon australasius, Dillwynia floribunda, Acacia brownei, Gonocarpus teucrioides, Actinotus helianthi, Pimelea linifolia, Leptocarpus tenax,*

Tetraria capillaris, Isopogon anemonifolius, Baeckea imbricata (30-50% Projected Foliage Cover; to 0.3 metres in height).

Lichens: *Cladia aggregata, Heterodea muelleri, Cladonia spp*. (0-15% cover; to 50mm height).

Miscellaneous Notes: This habitat grades slightly upslope into a *Banksia aemula-Leptospermum trinervium* Dry or Intermediate Dry Heathland fringing the northern side of the easement.

Other Genoplesium Taxa

The author has recorded 2 other *Genoplesium* taxa in identical habitats to that of *Genoplesium littorale* within its known distribution, these being *Genoplesium rufum* (syn. *Corunastylis rufa*) and *Genoplesium filiforme* (syn. *Corunastylis filiformis*). As a result, careful inspection of the flowers with at least a 10x hand lens is required to distinguish between the 3 taxa (just watch out for the bull ants before you lay your body on the ground to inspect). The easiest distinguishing feature for *G. rufum* is the presence of conspicuous vestigial glands on the apices of the lateral sepals (appear as white balloons with a 10x hand lens – see photo below) which are not present on *G. littorale* nor *G. filiforme*.

The distinguishing features for *G. filiforme* are the conspicuous cilia (hairs) on the margins of the labellum and dorsal sepal, and the dark marking of the labellum callus (see photo below) which are not present on *G. littorale* nor *G. rufum*.

Miscellaneous Notes

Other post disturbance colonisers/sun worshipping terrestrial orchids situated on the lower and mid NSW North Coast who don't mind the blade of a slasher and just love the full sun exposure and minimal light/plant competition that powerline easements provide include the threatened *Diuris arenaria*, *Diuris praecox* and *Diuris flavescens*.

Were these taxa and *Genoplesium littorale* on their way to extinction before humans started clearing vegetation for powerline easements and sand mining operations?

Prior to anthropogenic disturbance, these taxa presumably would have relied on recruitment by taking advantage (at least temporarily) of gaps or openings in Heathland and Dune Forest habitats resulting from fire, lightning strikes, disease or natural senescence.

And now, the best bit.....Photos

Flowering spike of Genoplesium littorale (Type Tuncurry population)

Flower spike of *Genoplesium rufum* (zoom in a bit reader to see the conspicuous white glands on the apices of the lateral sepals.

Flower spike of *Genoplesium filiforme*. Note the dark Callus marking that takes up about two thirds of the labellum and the short hairs along the margins of the labellum (appear in plate as tiny white hairs).

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Contributions to the Newsletter, Volume 30

Contributions to the next newsletter should be forwarded to the administration assistant Amy Rowles admin@ecansw.org.au by the

15th of January 2013.

- Articles may be emailed in WORD, with photos included or referenced in an attached file as a jpg.
- Please keep file size to a minimum, however there is no limit on article size (within reason)
- Ensure all photos are owned by you, or you have permission from the owner
- Ensure that any data presented is yours and you have permission from your client to refer to a specific site (if not please generalize the location).
- All articles will be reviewed by the editorial committee, and we reserve the right to request amendments to submitted articles or not to publish.
- Please avoid inflammatory comments about specific persons or entity

The following contributions are welcome and encouraged:

- ◊ Relevant articles
- ◊ Anecdotal ecological observations
- ◊ Hints and information
- ◊ Upcoming events
- ◊ Recent literature
- ◊ New publications (including reviews)
- ◊ Member profiles
- ◊ Photographs

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MEDIA RELEASE

9 July 2012

Birds on Farms Info Day

Improving Habitat and Connectivity in the Farming Landscape for Birds in the Moore River Catchment

On a perfect winter's day, about 20 people gathered at Calingiri Hall for Moore Catchment Council's Birds on Farms information day, as part of the State NRM funded project: Improving Habitat and Connectivity in the Farming Landscape for Birds in the Moore River Catchment. Ornithologist, Andrew Huggett*, gave a presentation of his bird work on the project. There was plenty of local knowledge within the audience as well. This was followed by a site visit to Sarah and Geoff Mason's excellent rehabilitated saline drainage lines, where the older plantings have been shown by Andrew's bird surveys to function in a similar way to remnant vegetation as habitat for birds.

Andrew has four key messages from his work in the Moore River catchment: (1) the high value of remnant native vegetation for bird habitat; (2) local bird communities are still reasonably diverse; (3) revegetation (planted vegetation) is providing important supplementary bird habitat, and; (4) there is good potential for re-connecting bush remnants with strategic plantings.

Andrew was asked the obvious question "but can't birds just fly from one patch of bush to another?" on the previous evening at his talk in Gillingarra. He explained how some species are reluctant to cross open ground due to the danger of predators. Connecting isolated patches of bush with corridors of vegetation allows these birds and other native animals to utilise larger and more diverse areas of habitat to live and breed. He showed real-life examples of how this can be achieved.

*Andrew Huggett has conducted numerous bird surveys in the sub-region through several different projects, including three projects with MCC. Northern Agricultural Catchments Council (NACC) paid for Andrew's services for the day, thanks to Greg Burrows and Marieke Jansen. NACC's contribution is greatly appreciated.




NACC Managing Natural Resources

THE GOVERNMENT OF WESTERN AUSTRALIA

CARING FOR OUR COUNTRY

Information brochure provided by Andrew Hugget.

ECA Photo Gallery

Photo Competition Entries

Far left: Australian Bustard. Observed between Broome and Port Headland. *Photo courtesy of Kathryn Chesnut.*

Left: Australian Reed Warbler in full song along a Sydney creekline. **Right:** The Tawny Crevice Dragon (*Ctenophorus decresii*) is listed as endangered under the NSW TSC Act. This male was counted during a monitoring program of the Silverton population in western NSW. *Photos courtesy of Steve Sass* .

Clockwise from Above Left *:* Giant barred frog *Mixophyes iteratus* and Squirrel glider *(photos courtesy of Deryk Engel); Mixophyes iteratus* from Bangalow (*photo courtesy of Veronica Silver);* This Red-crowned toadlet *Pseudophryne australis* was captured in pitfall buckets during a recent biodiversity survey north-west of Wollongong, NSW (*photo courtesy of Steve Sass)*; *Tetratheca juncea* and *Cryptostylis hunteriana* (*photos courtesy of Isaac Mamott)*; *Myotis macropus* from a culvert at Binna Burra, west of Bangalow (*photo courtesy of Veronica Silver)*; Perons Tree Frog (*Litoria peronii*) was photographed during surveys near Merimbula, NSW (*photo courtesy of Steve Sass)*; Penguin (p*hoto courtesy of Millicent Engel).*

ECA Photo Gallery

Photo Competition Entries

Top left [runner up]: This male Zebra Finch had just been in for a dip near the Murrumbidgee River east of Hay. *Photo courtesy of Steve Sass.*

Top right: *Genoplesium littorale. Photo courtesy of Isaac Mamott*

Mid - right: A moth. *Photo courtesy of Deryk Engel.*

Mid left: *Myotis macropus* from a culvert at Binna Burra, west of Bangalow *Courtesy of Veronica Silver*

Bottom Left: Nankeen Kestrel. *Photo courtesy of Daniel O'Brien.*

Bottom Right: Golden-headed Cisticola. *Photo courtesy of Daniel O'brien.*