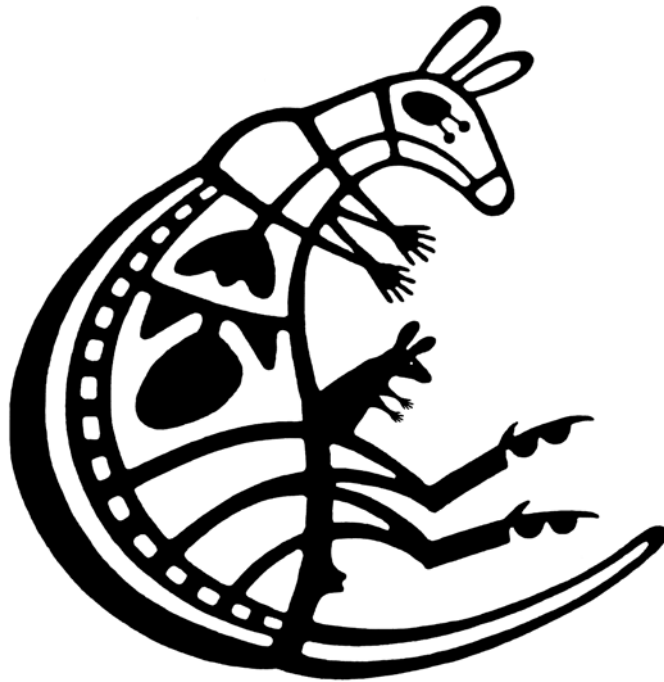

**NEWSLETTER OF THE
AUSTRALIAN MAMMAL SOCIETY INC
October 2008**



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Common Wombat

The wombat is unsociable
And not at all inclined
To any sort of fellowship
With those of its own kind.

If wombats meet each other
When foraging at night,
They grunt most impolitely
But do not stop to fight.

Each individual turns aside
And takes a new direction.
If such behaviour leads to peace,
Why bother with affection?

- Ronald Strahan



(reprinted from Strahan, R. and Conder, P. 1997.
The Incomplete Book of Australian Mammals. Kangaroo Press, Kenthurst.)

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Tasmanian Devil ©G. Körtner

AMS 2008 CONFERENCE – “WRAP UP”



This year’s Australian Mammal Society Conference was held in Darwin – the first time in the Top End since the mid 1980s. True to Darwin form, the build-up season was kicking-in in late September, but skies were clear and blue. We had 105 registrants at the conference, including a strong contingent of students, and a total of 58 spoken papers and 15 posters was presented. These covered a wide variety of topics relating to Australian (or North American!) mammals. I lament the lack of papers on bats, and thank Peter Shaughnessy for keeping marine mammals in the picture.

One session of the conference was devoted to northern Australian mammals, but other papers from the north were scattered through the program, including one by John Woinarski *et al.* detailing the distressing decline of small mammals from large areas of the north. The range and quality of presentations throughout the two-and-a-half days were excellent, and as always judges of the student prizes had a difficult job. Congratulations to Lisa Warnecke (Bolliger Award) and Martin Breed (Lyne Award) for their outstanding presentations. Congratulations also to the students that were awarded Travel Awards. As with past conferences, there was a long list of nominations for the coveted scruffy award, but past-La Presidenta Lynne Selwood put in an outstandingly scruffy effort and stole the show. There were also many excellent entries to the Limerick competition – I don’t actually remember who won, but I believe the topic of the winning entry contained an unfair attack on my dear friend Graeme Coulson (“sad bad old fart”, indeed!).

The conference was also notable for an excellent series of social events, all with a Darwin flavour. The ice-breaker at Mindil Markets the night before the conference allowed participants to watch the sunset over Darwin Harbour and taste some of the multiculturalism that is Darwin. I heard good reports about the student

dinner in Town on Monday night, but us old buggers had a quieter gathering in the suburbs. Tuesday afternoon was spent at the Territory Wildlife Park, including a very swish BBQ, and the Conference Dinner was at an excellent restaurant in the city on the last night.

As with any conference, there was an enormous amount of work being done behind the scenes, both in the lead up to the event, and during the conference itself. My sincere thanks to the organising committee: Robyn Delaney, Tony Griffiths, Kirsty Mines, Brooke Rankmore, and Brydie Hill, for their help; also to Mick Gould (Convention Associates P/L) for handling registrations and accommodation. Thanks also to the Session Chairs (Bill Breed, Brooke Rankmore, Tony Friend, Fritz Geiser, Brydie Hill, Roberta Bencini, Kath Handasyde, Tony Griffiths and Robyn Delaney), Bolliger Award judges (Ross Goldingay, Bill Breed, Linda Broome) and Lyne award judges (Lynne Selwood, Mark Eldridge, Stewart Nicol). Finally, thanks to Kormilda College for allowing us to use their auditorium and dormitories.

See you in Perth!

Simon Ward

AMS WEB SITE

Members Access to the AMS web site

Access to the society web site is open to all internet users, however members are able to access a special "Members-Only" sub web by entering a Username and Password.

Rather than having individual logins, financial members of the Society can access the member's site through a single username & password combination. The current valid combination is:

Username: amsmember
Password : mammalogy

Both username & password are case sensitive. Please keep this secure, as it is available only for financial members.

Members are reminded to regularly browse the AMS website (www.australianmammals.org.au) for the most up-to-date information on the Society. For all correspondence concerning the AMS website contact:

webmaster@australianmammals.org.au

Note: Australian Mammalogy is now available since 1978.

2008 AUSTRALIAN MAMMAL SOCIETY INC ANNUAL GENERAL MEETING

MINUTES OF THE 2008 ANNUAL GENERAL MEETING, Darwin, Monday, 1 October 2008.

The meeting began at 17:00 hours with 38 members in attendance.

1. Attendance and Apologies

Councillors present: Fritz Geiser (President), Todd Soderquist (Conservation Officer), Jamie Turner (Membership Officer), Ross Goldingay (Vice-President), Melissa Danks (Student Member)

Councillor apologies: Karl Vernes (Secretary), Stuart Cairns (Treasurer), Nereda Christian (Newsletter Editor), Gerhard Körtner (Ordinary Member), Bill Holsworth (Journal Editor)

Member Apologies: Robyn Delaney, Pat Woolley.

2. Minutes of the last AGM

Proposal to accept the previous minutes of the AGM:

Proposer – Lynne Selwood, Seconder – Marissa Parrott; motion carried.

3. Business

55th Scientific Meeting

Fritz Geiser announced that the next meeting will be in Perth, Western Australia, 6th – 9th July 2009 and will be hosted by UWA.

4. Office Bearers' Reports

See attached reports from the AMS office bearers. The following discussion arose in response to those reports:

President's report

Members were asked for feedback on the request from IMC10 Argentina to make a financial contribution to support delegates from developing countries. Fritz Geiser suggested that delegates from the Australasian/Oceania region apply directly to AMS for travel support.

Members suggested supporting an indigenous Australian to attend.

Noted that IMC does have some funding for delegates from developing countries and other societies also have similar schemes, so would be preferable for AMS either to support an indigenous Australian or to contribute directly to the IMC.

Some members disagreed with sending money to the IMC and would rather support a single applicant chosen by AMS.

Comment was made that we could give money to the IMC on the proviso it was used to support a delegate from our region.

Motion: to provide \$2000 to IMC to support a delegate from the Australasian region and to also provide \$2000 support to a local delegate, selected by AMS. Proposer: Delma Clifton, Seconder: Rodney van der Ree. Motion carried.

FG asked for nominations for the location of the next council. Members to contact Fritz at later time.

Report accepted.

Secretary's Report

FG presented the report. Report accepted.

Treasurer's Report

FG presented the report and noted that overall the society is in a very good financial position and that the major expenditure in the past has been journal production, which will increase next year with the new journal arrangements.

Dan Lunney asked what benefit the society received from FASTS subscription and does the society attend FASTS functions. FG responded that FASTS lobbies on our behalf, we have not attended any functions.

Lynne Selwood asked how the society's funds are invested. Todd Soderquist responded that funds are currently in a managed liquid fund term account and doing okay. Lynne commented that considering the current financial climate it may be better to have a fixed term deposit. Kath Handasyde noted that the previous council's strategy was to invest in multiple small investments.

Action: TS to investigate better investment options and discuss with Stuart Cairns.

Motion: to accept Treasurer's report. Proposer: Lynne Selwood, seconder: Linda Broome. Motion carried.

Report accepted.

Update on Treasurer's Report – Confirmation of President's statement. Currently the AMS has three term deposits of \$100,196.11, returning 8%.

Membership Officer's Report

Motion: to accept report. Proposer: Anne Kerle, seconder: Lynne Selwood. Motion carried.

Student Member's Report

Motion: to accept report. Proposer: Simon Ward, seconder: Kath Handasyde. Motion carried.

Journal Editor's Report

FG presented the report.

Kath Handasyde commented that a lot of honours students present small quantities of data at AMS meetings which may be suitable for our small journal. Supervisors should encourage students to publish.

Stewart Nicol noted that the journal is a great place to publish short notes and technical notes and this encourages readership also. Rodney van der Ree asked if the move to CSIRO will affect ability to accept short notes. FG responded that there will be no change.

In response to questions about the new format of the journal, council noted that there may be a drop in paper quality; the format will be larger, in line with other CSIRO journals; past and current issues will be available online through CSIRO (and many papers are already available online through Google Scholar); Bill Holsworth will remain editor for the time being, with CSIRO doing the text editing and production.

Graeme Coulson noted that the CSIRO arrangement will reduce the cost and effort of editorial production and improve the journal's circulation. Ross Goldingay and others commented that the editing job is too much for volunteers and was a matter of time before the job would have had to be externalised. FG noted that members' entitlements will not change; they will still receive the journal.

Motion: to accept Editor's report. Proposer: Peter Shaughnessy, seconder: Stewart Nicol. Motion carried.

Newsletter Editor's Report

Motion: to accept report. Proposer: Chris Dickman, seconder: Marissa Parrott. Motion carried.

Conservation Officer's Report

Tasmanian Devil Facial Tumour disease

Mark Eldridge informed members that a captive breeding program is going ahead. Dan Lunney reported that he had attended an IUCN meeting on the issue and that there was substantial involvement from government and funding available. The meeting resulted in a draft action plan, which will be published later in 2008. Rod Kavanagh and others commented that there needs to be discussion of the issues surrounding captive breeding and mainland refugia. There was general agreement that the society should be active in lobbying other groups and agencies on these issues.

Savannah Cat issue

Chris Dickman informed members that the importation proposal has been overturned by the federal government.

Christmas Island Pipistrelle issue

Kath Handasyde reiterated that the situation is catastrophic. There was general approval for the conservation officer to take action as noted in report.

Kath Handasyde noted a new issue - the spread of mucor in Tasmanian platypus.

Motion: to accept report. Proposer: Kath Handasyde, seconder: Anne Kerle. Motion carried.

5. Other Business

Macropod Symposium Book

Graeme Coulson gave members an update on the progress of the book. Some members have made pre-publication payments, but also looking for other funding sources. The working title is "Macropods: the Biology of Kangaroos, Wallabies and Rat-kangaroos".

AMS Prizes

FG informed members that council received nominations for the Troughton Award and Honorary Life Membership and had selected a final nominee to be approved by AGM attendees.

Lynne Selwood noted that traditionally previous award recipients meet to select nominee. It was proposed that previous recipients should propose and second award nominations on this occasion.

Motion: Ellis Troughton Memorial Award 2008 to be awarded to Chris Johnson. Proposer: Chris Dickman, seconder: Fred Ford. Motion carried.

Motion: Honorary Life Membership 2008 to be awarded to Ian Hume. Proposer: Anne Kerle, seconder Chris Dickman.

AMS Membership Fees:

FG suggested that the society should freeze membership fees (at \$80 full, \$40 student) for a few years, and keep prices competitive with those of the *American Mammal Society*.

Dan Lunney suggested a concession price for retired members as well as students.

Barry Fox supported the price freeze but commented that the American society is very large and wealthy so would not be a good comparison.

Kath Handasyde commented that \$80 is very good value.

Lynne Selwood suggested full price is floated with CPI and concession is kept at \$35, also membership income is valuable and is given back to members through the annual meeting etc.

Motion: to freeze concession price at \$35, for students and retired, and to increase the full price only with increases in the CPI. Proposer: Kath Handasyde, seconder: Lynne Selwood. Motion carried.

Meeting closed 6.22pm

*Melissa Danks
Student Member*

AUSTRALIAN MAMMAL SOCIETY PRESIDENT'S REPORT AGM 2008

Since July 2007, much of the activities of Council concerned the publication of Australian Mammalogy with CSIRO Publishing from 2009. The original suggestion to publish the journal with Springer did not succeed because of a number of reasons. Council also initiated production of the new AMS Web Pages and the online publication of the Newsletter. Council has met 5 times since the last AGM.

Council received a request from IMC10 in Mendoza, Argentina (9-14 August 2009) for financial support for delegates and students from developing countries. We asked whether these could apply directly to the AMS rather than or in addition to us providing funds to the IMC organizers, but have not received a reply.

Russel Jones and Frank Grützner requested financial support by the AMS for a Boden Conference on "

Beyond the Platypus Genome". They were successful and received the promised \$2,000 contribution.

AMS Council 2009-2012: The term of the current Council will end in July 2009 at the 50 year Anniversary Meeting in Perth and we invite expressions of interest for a potential new Council.

*Fritz Geiser
President*

AUSTRALIAN MAMMAL SOCIETY SECRETARY'S REPORT

The main secretarial duties have been the taking of minutes at Council meetings, and circulating these to councillors after the meeting for finalisation, and then sending these to the Webmaster for uploading on the AMS Website. Council has met five times since the last AGM in Armidale: July 2007, December 2007, February 2008, May 2008, and September 2008. Most meeting run for about 90 minutes, and at all meetings the President kindly supplied the Council with fine wine. All council minutes have been forwarded to Larry Perry for uploading on the members only space on the AMS website, and are therefore available to all members. Council's achievements in the past year, as gleaned from these minutes, can be very briefly summarised as follows:

- An agreement was finalised with Google that has allowed past issues of the journal to be freely available to the world via Google Scholar (spear-headed by Fritz Geiser)
- A major face-lift to the website by Larry Perry and consultant web-designer Sue Rose occurred in early 2008, giving the website a fresh and professional look
- A major change to the journal was achieved through the signing of an agreement with CSIRO that will see Australian Mammalogy become a CSIRO journal from 2009 (following much work from Fritz Geiser, Bill Holsworth and Ross Goldingay)
- Nereda Christian has worked to ensure that the newsletter will be electronic from October 2008 onwards.

Karl Vernes, September 2008

AUSTRALIAN MAMMAL SOCIETY TREASURER'S REPORT

Summary of financial position	2007-2008
Total Income	\$40,110
Total Expenditure	\$26,178
Annual net surplus	\$13,932
Major Income	
Subscriptions & Journal	\$31,159
Major Expenditures	
Journal production	\$ 7,211
Convention Associates	\$ 3,807
Newsletter production	\$ 4,218
Awards	\$ 3,029
Office expenses	\$ 3,492
FASTS subscription	\$ 2,147
Website expenses	\$ 2,122
<i>Net AMS assets at 30.4.08</i>	<i>\$127,774</i>
<i>Net AMS assets at 30.4.07</i>	<i>\$113,842</i>
<i>Net AMS assets at 30.4.06</i>	<i>\$97,841</i>

Auditors Reports

Wendy Burton of Burton Partners, Dandenong (Victoria) has again acted as auditor for the Society.

*Stuart Cairns,
Treasurer
AMS, 23.9.08*

AUSTRALIAN MAMMAL SOCIETY MEMBERSHIP OFFICER'S REPORT

The current total membership of the Society is 468 – one down from July last year. This includes 49 un-financial members, who have not yet paid their fee for 2008. There are currently 109 student members (including 25 un-financial), representing a quarter of the total membership. As in past years, the conference has stimulated an influx of membership applications, with 39 new members joining since April 2007.

*James Turner
Membership Officer*

AUSTRALIAN MAMMALOGY EDITOR'S REPORT

I began as Editor of the journal, Australian Mammalogy, in 2006 and received 37 papers and notes to June 29, 2007. Of these 17 were accepted published in Volume 29(1) (116 pages) in Sept. 2007; 8 papers were rejected. The remainder were with Associated Editors and with the reviewers.

From 1 July 2007 to 31 December 2007 I received 16 papers and 3 book reviews, and since January 2008 I have received an additional 12 papers and 1 book review. The small number of papers received delayed the publication of Volume 29(2) and Volume 30.

Volume 29(2) (132 pages) was published in April 2008 with 9 Research Papers, 4 Notes and 3 Book Reviews.

Volume 30, No's. 1 & 2 (total 103 pages) was published in August 2008 and the Printer, Ligare Ltd. will, on 29 September, be dispatching the print run to our distributor Mick Gould. Volume 30 (1 & 2) are combined and each contains 3 Research Papers and 3 Notes. Also in Volume 30 is a book review, corrigendum, an editorial, and advice on Manuscript Preparation.

I have on hand for Volume 31(1), to be published by CSIRO in March 2009, only 2 Research Papers, 5 Notes. Two papers have been accepted and the others are with Associate Editors and reviewers.

The Journal relies on the volunteer efforts of the Associate Editors and the reviewers. I wish to thank them for their patient cooperation with the process of getting scientific research into print. They will have an additional challenge in the next few months learning the CSIRO Publishing system OSPRey. (Online Submission and Peer Review).

We need to maintain a large group of Associate Editors to cover the many fields of research of interest to the members. Volunteers to join the group are very welcome. We particularly need a special Associate Editor with expertise in statistics that other Associate Editor can consult. The Society should also appoint an Assistant Editor to handle the flow of manuscripts when the Editor is not available (holidaying overseas, etc.).

Last year I proposed that Volume 29 and subsequent issues would be printed in A4 format but that did not happen due to subsequent developments. The smaller B5 format that we have been using for many years was retained for Volumes 29 and 30. The Society has reached an agreement with CSIRO Publishing and the journal will now be printed in the trimmed A4 format used in other CSIRO published journals.

Australian Mammalogy cannot publish papers that are not submitted. Now that papers will be published on-line the time to get your work published will decrease to a few weeks rather than several months. CSIRO's advertising and distribution will mean that your research will also reach a much wider audience. To start the process of improving the standard of the journal we should have several major research papers in Volume 31(1). The OSPRey system of CSIRO Publishing will be ready soon to receive manuscripts for Australian Mammalogy. Make your paper one of the first.

*Dr W. N. Holsworth
Editor, Australian Mammalogy*

NEWSLETTER EDITOR'S REPORT

The Newsletter for the Australian Mammal Society is mailed out to members twice a year in October and April.

Finding new and interesting material to put in the Newsletter is challenging and I would encourage members to submit contributions they feel may be of interest to other members. We have recently introduced a section that gives new members (and particularly students) a chance to introduce themselves and their research interests to other members. Recent editions have also offered the opportunity for members and professional organisations to submit paid advertisements to be included on the last page of the Newsletter.

The October 2008 edition of the Newsletter will for the first time be distributed to members as an electronic document. Members will be sent both an email and a letter containing a hyperlink from which they can download the Newsletter from the Australian Mammal Society website. The electronic format, and the method of distribution, were decided on by members at the previous AGM. I am hoping that there will be several advantages to having the Newsletter distributed electronically. For example, it will free up the format so we can include more coloured text and photographs of member's research interests. I would like to thank Larry Perry for his help in making this possible.

*Nereda Christian
Newsletter Editor*

STUDENT REPRESENTATIVE'S REPORT

I would firstly like to thank Lisa Warnecke and acknowledge her excellent work as student member over the past two years. Many thanks also to the Darwin

organising committee and especially Kirsty Mines for organising the student dinner.

The society currently has 109 student members, which is around one quarter of the society's total membership. My goals are to encourage new student members to join and to encourage members who are completing their studies to continue to be active in the society. I also hope to facilitate more communication between student members, such as through the newly re-furnished website. If you have any comments or ideas, please get in touch with me at amsstudentrep@australianmammals.org.au

Melissa Danks
Student Representative

2008 AUSTRALIAN MAMMAL SOCIETY AWARDS

ELLIS TROUGHTON MEMORIAL AWARD AND MEDAL

Chris Johnson in recognition of outstanding contributions to mammalian biology.



HONORARY LIFE MEMBER

Ian D. Hume, for providing long-standing service to the Society and the advancement of our understanding of mammalian biology.

2008 BOLLIGER AWARD FOR THE BEST SPOKEN PAPER

Lisa Warnecke, Zoology, University of New England, Armidale

For presentation entitled: “**Basking behaviour and torpor use in free-ranging and captive *Planigale gilesi*.**”

2008 LYNE AWARD FOR THE BEST POSTER PRESENTATION

Martin Breed, Department of Evolutionary Biology, Uppsala University, Sweden

For the poster entitled: “**Genetic impacts of culling**”.

JOHN SEEBECK TRAVEL AWARD

Elsa Glanville (School of Biological Sciences, University of Sydney).

For presentation entitled: “**Seasonal acclimatization of body temperature and metabolic capacity in an endotherm (*Rattus fuscipes*)**”.



Lisa Warnecke, Martin Breed and Elsa Glanville.
Photo Fritz Geiser

GENERAL STUDENT TRAVEL AWARDS

Stephanie Amir
Emma Cash
Achim Eberhart
Erin Flynn
Sarah Garnick
Emily Miller

Gemma Morrow
Melinda Norton
Robert Reed
James Turner
Michelle Wilson
Amy Winnard



Fritz Geiser presenting a student travel award to James Turner
Photo Ross Goldingay

SCRUFFY AWARD



Dan Lunney, David Taggart, Mathew Crowther, Lynne Selwood and Fritz Geiser (incumbent).

Photo Melissa Danks

And the winner is...*Lynne Selwood*

A favourite daughter of the society who has managed to snag all the society honours except the real gem – the Scruffy Award.

- (i) Whilst referring to which animal had the shortest gestation said: “In short, only dasyurids are in the running but I’m prepared to listen to accounts of planigales.
- (ii) For saying “There’s a lot of misconceptions about breeding and the girls know it.”
- (iii) For complaining about having to use toilet paper for making notes (for the Lyne Award).
- (iv) for calling Mark Eldridge “Mark Elgar” three times.
- (v) For stating “in dasyurids mating lasts for a long time and the females just sit there like this (while showing a crouching position)”.

Scruffy nominations

These nominations were read at the annual dinner by Kath Handasyde and others (Dan Lunney, David Taggart, Mathew Crowther and Tony Friend). Thank you to Ross Goldingay for collating the nominations.

George Madarni

- (i) For spotlighting a bloke having a leak when hearing a rustle at the NT wildlife Park and then asking him if he needed a hand;
- (ii) For saying “it’s pretty hard to kill a cane toad by kicking – you’ve got to wackem then look out for the back spray.

Dave Taggart

- (i) For spending only 9% of his wombat survey time in a pub;
- (ii) For hiring a crack Al Qaeda hit squad to catch wombats;

- (iii) For suggesting his students change male partners like the rest of us change socks
- (iv) For announcing loudly to his students that it was really important to attend the AGM whilst turning up 10 min late.

Graeme Coulson

For his blatant attempt at the scruffy award using TLAs and little else, which the judges saw straight though.

Lisa Cawthen

Following a discussion with Gemma Morrow & Tags said, and I quote:

“I love animal penises. Penises are the best. Me and my friends want to make a penis calendar to fund our research.”

We suggest she calls it the Wild Willies. They are currently looking for a Mr July!

Tony Friend

For “extracting numbats by various means”.

Helen Crisp

- (i) For saying “it’s not all about cute & furries, it’s about killing stuff.”
- (ii) For running around with cat pee on her.
- (iii) For clubbing bilbies with dead cats.
- (iv) For naming her killing & clubbing program the wild west program.

Roberta Bencini

For saying “PhD students shouldn’t have to know about species management plans”.

Simon Ward

- (i) For introducing Dan Lunney as follows: “Here’s Dan Lunney who is going to talk about stuff.”
- (ii) For telling Graeme Coulson to FOQ.
- (iii) In response to Jamie Turner’s explanation to a question Simon said “In short you don’t know.”
- (iv) For providing 1 glass of water for 50 speakers over 3 days.

Nicole Withers

Somewhat indignantly Nicole made the remark in relation to her PhD work on female reproduction that “what would her two male supervisors know”.

Marissa Parrott

In response to an outrageous question by Dave Taggart that his female students kept changing their male choice, Marissa coolly replied “My dunnarts are more consistent than your students.”

Anne Kerle

For trying to con the society about may be publishing her tree rat data soon.

Ken Aplin

For turning up late, leaving a day early, not giving a talk, and all the while not being a member of the society.

Mathew Crowther

When on our spotlighting tour last night poor old (spotlight leader) didn't know a bat we saw, couldn't sex cane toads and missed a *Litoria rubella* and a Merton's water monitor which a bloke picked up with a mobile phone light. Mathew said "He doesn't deserve that beard and those khaki's, he should shave off that beard and put on a suit, cause that's all he knows about wildlife!"

Dan Lunney

You won't go short of shot brush-tail possums. I know where there's a large number being shot near Hobart and just thrown on a heap!"

Mark Eldridge

- (i) For going over to the dark side and starting to work on tamar wallabies.
- (ii) For suggesting that DNA doesn't lie, but forgetting to tell us that even so it still confuses the shit out of us.
- (iii) For kicking an agile wallaby scavenging scraps at last night's dinner.



An agile wallaby trying to join in on the buffet dinner at the Territory Wildlife Park.

Photo James Turner

Ross Goldingay

For phoning and waking every member of the organising committee at 1am on the night before the conference started,

Fred Ford

For his obsession with Bill Breed's sperm.

Fritz Geiser

- (i) For complaining about democratic process.
- (ii) For his blatant efforts to make it back to back scruffy awards by continually trying to buck legal requirements and official meeting protocols by not putting motions to the general vote at the AGM.
- (iii) For managing to get his photo taken 15 times in the last 10 mins of the conference (when awarding student awards).

Gemma Morrow

- (i) For giving male echidnas access to females whilst asleep.
- (ii) For showing the recovery team "full arousal" before 9pm.
- (iii) For placing cameras over arousing females.
- (iv) For using KY gel and anaesthetic to get her animals to relax.
- (v) For perfecting the technique of the "gentle wiggle whilst inserted".
- (vi) For suggesting females are slow & sluggish, whereas males are always ready to go.



Four of the Scruffy judges: Tony Friend, Dave Taggart, Dan Lunney and Mathew Crowther

Photo Fritz Geiser

CONFERENCE LIMERICKS

Winner

The TLA ban at the start
Was obeyed by those who were smart.
Coulson tried to be clever,
But really we never
Saw such a sad, bad, old fart.

Herbert Table

Runner Up

A female echidna asleep,
In the wilds of Tasmania deep,
Had a curious dream,
Then woke with a scream,
“Hey I’m gravid, you lecherous creep!”

Tarsh

Honourable Mentions

A four-headed schlong would be great,
But male echidnas just can’t get a date.
Using nefarious means
Of distributing genes,
He aroused early and she aroused late.

*Chris, Andrew, Erin, Katie,
Lisa, Jamie, Kirsty, Tony & Karen*

If Marissa was working for me,
I could pay her a nice fat fee.
Put my sweat on a plate,
She could suss out a mate,
And send a great woman to me.

Hugh McGregor

There was a young lady called Mariss
Who suggested we choose boys by their piss.
If the smell is not right,
We must hold our legs tight,
And wait for the ultimate kiss.

Linda Broome et al.

“Oh bugger”, cried Fred in despair,
“My story’s gone up in thin air.
The mice that I sought
Have all come to nought.
It’s Bill’s sperm I find everywhere”.

Carol Dickman

CONFERENCE PHOTOGRAPHS



Kath Handasyde, Stewart Nicol and Mathew Crowther
Photo Fritz Geiser



To beer or not to beer... *Photo Emily Miller*



Two of the limerick judges: Graeme Coulson and Robyn Delaney. *Photo Fritz Geiser*



The student dinner, held at Tim's Surf and Turf on a balmy Darwin evening, was a great success - large plates of tasty food, including crocodile, and many cold beverages were consumed by the noisy group. *Photo Melissa Danks*



Wildlife Park. *Photo James Turner*

**2009 AUSTRALIAN MAMMAL SOCIETY INC
55TH MEETING**

Semi-centenary, Perth 2009

The 55th Scientific and Annual General Meeting of the Australian Mammal Society is to be held at the University of Western Australia, Perth, July 6 – 9, 2009. Posters and papers are invited. Field excursions are to be held during and post-conference. Society and student dinners will be held during the conference. As accommodation in Perth is expensive and elusive, reservations have been made at Curry Hall (chbookings@curriehall.uwa.edu.au phone (08) 9273 3333) and Trinity College (enaomis@trinity.uwa.edu.au phone (08) 9423 9423). It may also be available at St Catherines (stcats@cyllene.uwa.edu.au phone (08) 9386 5847). All of the colleges are within easy walking distance to the conference venue. We strongly advise that you book early. The organizing committee is comprised of:

Shelley Barker shelley.barker@museum.wa.gov.au
Roberta Bencini rbencini@animals.uwa.edu.au
Don Bradshaw Don.Bradshaw@uwa.edu.au
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Jacqui Richards jacqui@australianwildlife.org
Phil Withers pwithers@cyllene.uwa.edu.au

Registration forms and a complete conference guide will be included in the April number of the Newsletter or online at the Societies web site.

Shelley Barker



Nocturnal house. *Photo Ross Goldingay*



Cathy Herbert and Julie Old. *Photo Emily Miller*

UPCOMING CONFERENCES



**2009 Australian Mammal Society Conference
University of Western Australia, Perth**

6th – 9th July 2009

The Perth 2009 Australian Mammal Society Conference is the 50 year semi-centenary conference and is a milestone in the history of the Society.

**Ecological Society of Australia
2008 Conference
University of Sydney, Sydney**

1st–5th December

<http://www.ecolsoc.org.au/>



Australian Academy of Science

**2008 Australian Academy of Science Boden Research
Conference, Victor Harbor, South Australia**

"Beyond the Platypus Genome", 23-26 November, 2008.

This conference is also sponsored by the Australian Mammal Society and the Genetics Society of AustralAsia.

Boden Research Conference Organising Committee
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**Australian and New Zealand Society for
Comparative Physiology and Biochemistry**

**25th Annual Meeting 2008
University of Sydney, Sydney**

5-8 December, 2008

<http://www.zoo.latrobe.edu.au/anzscpb/>

**Royal Zoological Society of New South Wales
2008 Forum**

Science under Siege
Saturday, 29 November, 2008 9.00 am - 5.00 pm.

ANZ Conservation Lecture Theatre (top car park)
Taronga Zoo, Mosman.

Directions to the venue: Taronga Zoo website:
www.zoo.nsw.gov.au

The title looks dramatic, but if you ask yourself, "is anything killing the science in your area of interest?", you might be surprised that you come up with a point or two. Then ask a wider set of questions, such as: are there any pressures that preclude people from doing good zoology; do either political/budgetary constraints impact on your field; is science in the media a subject that influences the outcome of your work; are there economic impediments to careers in zoology; is the education mix in Australia right for this century; are the best researchers becoming full-time administrators, or the converse, the poor researchers becoming the administrators; can you place the Australian situation in an international context; are there reduced opportunities for human interactions with the natural world; is the virtual world killing reality; and what are your predictions of the future? To deal with such issues, the RZS has structured the day to emphasize a range of themes, beginning with identifying the issues, including those that are persistent and those that are emerging, and encompassing palpable hits to science.

Direct and indirect hits includes such matters as the withdrawal of funding, subversion of science, death by 1000 cuts, redirection of funding to fashion issues; using the name of science to justify things that are really not justifiable. The name of science is being dragged down. More Inconvenient Truths makes the point that good science is not optional; and the ever-present problem of ignoring the scientifically accurate for the politically correct; and, are basic skills of biology not being studied because of public concern based on extreme animal rights propaganda. What can be done if you are under siege? This includes the philosophy of science, the legal perspective and what scientists are (or should be) doing.

Audience participation will be a central part of this forum. The four plenary sessions will address questions raised by the speakers, and the posters, and debate issues and consider options for future directions. They will be recorded and included in the publication of this forum. Posters are often short versions of papers, and this will apply in this forum as well, but an innovation will be the inclusion of many short contributions. It is widely known that it is hard to pull a major paper together on this theme, but so many scientists know of at least one matter that they would like to draw to public attention. So, a large set of short contributions, as small as an A4 page, can be included. These will appear in the publication that follows this forum, as will all poster presentations. Further, the title of the poster paper and their authors will be put up on the screen for the relevant plenary debate so that others can challenge or support these views. Listen to the speakers present some overarching themes or compelling case studies, contribute to the debate on the day, then examine your stance on a variety of these subjects to see whether the day changed your view of this often cryptic aspect of zoology.

An extensive list of conferences is maintained under the 'events' section of the Science Alert website:

<http://sciencealert.com.au/>

UPDATE FROM THE CONSERVATION OFFICER

Two letters concerning (i) the importation of the Savannah Cat (Domestic Cat X Serval) and (ii) the creation of "insurance populations" for the Tasmanian Devil have been sent to the Federal Government by the Australian Mammal Society's Conservation officer in the past twelve months. Todd Soderquist's letter on the importation to Australia of the Savannah cat and the responses from David Llewellyn, Minister for Primary Industries and Water and Mark

Flanigan, Strategic Approvals and Legislation Branch, Department of Environment and Water Resources concerning insurance populations for Tasmanian Devils are appended at the end of this Newsletter. Todd's original letter (31 August 2007) to the Honourable Mr Malcolm Turnbull MP, Minister for the Environment and Water Resources first raising the issue of insurance populations for the Tasmanian Devil was included in the October 2007 edition of the *Australian Mammal Society Newsletter*.

MESSAGE TO POTENTIAL CONTRIBUTORS TO AUSTRALIAN MAMMALOGY

If you are a member of the Australian Mammal Society you will read in the issue of *Australian Mammalogy* Vol 30 - which you should receive this week - that the Society has made new arrangements for the publication of the journal '*Australian Mammalogy*'. The attachment is the Manuscript Guidelines published in Vol. 30 p. 99-104.

Starting with Volume 31(1) - due to be published in March 2009 - the journal will be published by CSIRO Publishing. Starting now, all manuscripts should be submitted to CSIRO Publishing using their **OSPRey** facility. (**OSPRey** stands for **O**nline **S**ubmission & **P**eer **R**eview. Details can be obtained from the web-site www.publish.csiro.au/journals/.

In the above paragraph I said manuscripts 'should' be submitted to CSIRO. Unfortunately due to the death of a CSIRO staff member the web-site is not quite ready to receive manuscripts but that should be corrected soon. Also, (fortunately for me) I will be overseas until 23 November and I prefer that you do not send any manuscripts to my email address (below). Instead they should be sent to Fritz Geiser (fgeiser@une.edu.au). Fritz will be the acting editor until I return. Shortly after I return the web-site should be operational.

CSIRO Publishing will have several advantages for potential authors, readers, and Society members. The on-line editing process should be quicker and communications should be easier. Shortly after your manuscript is accepted for publication it will be available on-line. Publication will be more regular (March and November) and the distribution of the journal will be increased. It will be published in the same format as *Australian Journal of Zoology*, *Wildlife Research*, *Emu*, and most other CSIRO published journals.

I hope you will be submitting more papers to *Australian Mammalogy*, and will be encouraging your colleagues and students to do the same. If we can attract enough

papers we should soon be able to publish 4 issues per year.

Dr. W. N. Holsworth
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Phone, (and Fax on request)
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MANUSCRIPT GUIDELINES FOR AUSTRALIAN MAMMALOGY

Starting immediately the journal AUSTRALIAN MAMMALOGY will be published by CSIRO Publishing and all papers must be submitted to the journal via the OSPRey facility. The following pages have been prepared for the CSIRO Publishing website for our journal. They are provided here for authors who may be preparing papers before the website is operating. These instructions are similar to the instructions for other CSIRO Publishing journals. They can be found on the world wide web at:

<http://www.publish.csiro.au/journals/>. A similar set of instructions will also be displayed on the website of the Australian Mammal Society Inc. An abbreviated version of these guidelines will be printed on the inside back cover of each issue.

General

Papers will be considered for publication if they make an original and significant contribution to research on Australasian mammals and fit the Journal's scope. Descriptive papers are published if they are placed in an appropriate conceptual setting. The Editor reserves the right to reject poorly prepared or inappropriate manuscripts without sending them for review. A poorly written manuscript may be returned for revision before sending it out for review if the English expression is ambiguous or overlong, analysis of the data is clearly inappropriate, or the style severely deviates from that advocated in this set of instructions.

Australian Mammalogy assumes that all authors of a multi-authored paper agree to its submission, and that the results have not been published nor are being considered for publication elsewhere.

The Journal endeavours to ensure that the work published is that of the named authors except where acknowledged and, through its reviewing procedures, that all published results and conclusions are consistent with the primary data. However, it can take no responsibility for fraud or inaccuracy on the part of the contributors.

Paper categories

Full Papers are complete reports of original research not previously published. Review articles should critically summarise relevant work in a specific field and indicate fruitful lines of further research.

Comments on published papers should be submitted within one year of publication of the paper on which comment is being made and will be refereed. Authors of the original paper will be given the right of reply. Notes should have a short abstract and may present results from a brief but well designed study, important observations not needing lengthy treatment or report on new techniques. The Results and Discussion sections may be merged in a Note.

Presentation

The work should be presented in clear and concise English. All text should be in Times New Roman, 12 point font, with 1.5-line spacing throughout, and with a margin of at least 3 cm on the left-hand side. At least every fifth line of each page must be numbered in the left-hand margin. All pages of the manuscript must be numbered consecutively, including those carrying references, tables and figure captions, all of which are to be placed after the text. Section headings should be clearly visible with each level treated consistently throughout the paper.

Supplementary material, which is not essential in the printed paper (e.g. large raw data files) but which may be useful to other workers, can be lodged with the Editor if submitted with the manuscript for inspection by the referees. Such material will be published online as an accessory publication in association with the published paper and made available free to all users.

CALL FOR UNWANTED MARSUPIAL PLASMA SAMPLES

The scarcity of information on the effects of pesticides on Australian native vertebrates constrains the development of biologically relevant risk assessments in Australia for the registration of pesticides. As part of a larger collaboration between the University of Wollongong and the Australian Plague Locust Commission (APLC) looking at the ecophysiological effects of pesticides used for locust control on Australian native vertebrates, Bill Buttemer and I are investigating the question of whether endemically old and unique Australian vertebrate fauna display high sensitivity to pesticides used for locust control. In turn, this has provoked an examination of the acute oral toxicity of the organophosphorus pesticide, fenitrothion for the fat-tailed and stripe-faced dunnarts which has revealed that these species are approximately 10-14 times more

sensitive to fenitrothion than any other mammals for which LD50 values have been reported. Previous authors have demonstrated that differences in chlorpyrifos toxicity between young and adult Long-Evans rats could be attributed to young rats having less chlorpyrifos-oxonase (an A-esterase responsible for hydrolysing chlorpyrifos-oxon, the active ChE suppressing metabolite of chlorpyrifos) activity and therefore having a lower capacity to detoxify physiologically relevant concentrations of the chlorpyrifos-oxon after exposure. The presence of sufficient A-esterase activity to hydrolyse the oxon components of OP insecticides is a critical step in the metabolism of, in this case, fenitrothion in mammals and differences in the availability or functionality of paraoxonase may likely be the reason why native Australian marsupials studied here differ from other mammals in their sensitivity to organophosphorus insecticides. Examination of how these animals differ in this regard deserves further study and so, to this end, I am currently collecting marsupial plasma samples for analysis of their paraoxonase activity by Professor Clem Furlong (University of Washington, USA). I have samples from the dunnarts, *Sminthopsis macroura* and *S. crassicaudata* as well as several bilby samples. I am, however, keen to get hold of as wide a spread of samples as possible across the marsupial taxa and would be grateful to hear from anyone with spare marsupial plasma from other species before travelling to the USA in November this year. Alternatively if marsupial research was planned investigating an aspect of the RBC component of a blood sample, with the plasma being earmarked for the rubbish bin, I would be more than happy to take the plasma component off your hands. I am happy and willing to travel (within reason) to pick samples up provided they have been kept in either liquid nitrogen or at -80°C. Thanks

Paul Story
Environmental Officer Australian
Plague Locust Commission
Department of Agriculture, Fisheries and Forestry
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NEWSLETTER: CALL FOR ARTICLES & NEWS

The deadline for the next Newsletter from the Australian Mammal Society is:

31 March 2009

Members are invited to submit any articles, photographs, notices of conferences etc., that they believe would be of interest to others.

Please forward articles for inclusion in the April 2009 newsletter to the Newsletter Editor or to the Secretary.

AMS MEMBERSHIP RENEWAL

Existing members of AMS are reminded that subscriptions for 2008 were due on 1 December 2007. If payment of your membership is more than 12 months in arrears, your name will be removed from the membership list. If you have neglected to renew your membership during 2007, the opportunity still exists.

In the next membership year (December 2008–November 2009) membership for the *Australian Mammal Society* will be increased to \$80 for full members and \$40 for student members.

AMS MEMBERSHIP - NEW MEMBERS

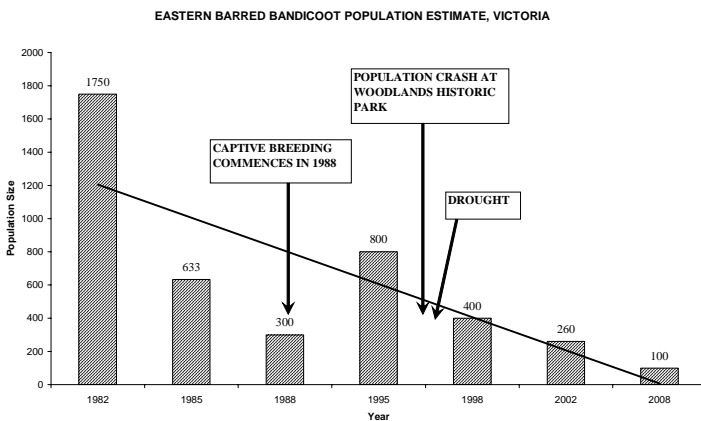
The *Australian Mammal Society Inc* would like to welcome all new members to the Society.

Jennifer Anson	VIC
Brooke Bateman	QLD
Annette Cook	WA
Erin Flynn	TAS
Rebecca Gibson	ACT
Al Glen	WA
Stephen Kolomyjec	QLD
Maria Marklund	SWEDEN
Inneice Nathan	VIC
Graham Thompson	WA
Isabelle Wolf	NSW

OPINIONS

Newsletter editor's note: Opinions appear as contributions from individual members and do not necessarily reflect the views of the Australian Mammal Society Inc.

Eastern Barred Bandicoot CRITICAL – a note from Peter Myroniuk



Despite 16+ years of so-called species recovery and legislative protection (EPBC Act, FFG Act), the Victorian population of Eastern Barred Bandicoots (EBB) is in a precarious state. The graph above (and Table 1) which I have compiled from published as well as authoritative sources shows the state of the population over time. The picture is not good.

Table 1. Victorian Eastern Barred Bandicoot population estimates and source references.

1982	1750	Moon, 1984; Lacy & Clark, 1990
1985	633	Brown, 1989
1988	300	Dufty, 1988
1995	800	Myroniuk et al 1998
1998	400	Myroniuk et al 1998
		EBB Recovery Team Annual Review
2002	260	8 Jan 2003
2008	100	Winnard and Coulson 2008

EBBs have one of the shortest gestation periods of any mammal (12.5 days), females can breed at 3-4 months of age, they can breed about every three months (young are weaned at about 70-80 days), litter sizes can be as high as 5, but on average they have 2 young.

EBBs are a grassland species and once occupied the vast grassland and grassy woodlands of the Victorian volcanic plains (west of Melbourne). These vast grasslands and woodlands have now been converted to agricultural lands. Although over 95% of these

grasslands have disappeared EBBs are able to adapt to introduced grasslands as long as they can provide cover and nesting sites.

With such impressive reproductive performance, non-pristine habitat requirements and they eat insects, why are they on the slippery slide to extinction? Three key factors:

Foxes (and in some areas perhaps cats). Foxes are a major limiting factor for EBB populations. For example, 16 captive bred EBBs were released in 2003, 12 were fitted with radio transmitters. Within 3 days 6 were dead from fox kills. Greater funding and resources are urgently needed to suppress fox predation on EBBs.

Drought – EBBs or more precisely their food resource seems to respond to rainfall. It has been noted that well irrigated areas, lots of EBB digs. Below average rainfall has certainly impacted EBBs and their food resource.

Power and authority, financial and on ground resources are lacking. The Recovery Team has no power, no authority, lacks resources and funding.

I sent the above graph to a senior manager within the Department of Sustainability and Environment; in part this is the response I received:

"I have been in communication with the Recovery Team since October 2007 about the decline in numbers and feel that the Recovery Team are implementing actions in line with the Action Statement and draft Recovery Plan."

We are extremely close to losing this species in Victoria and all that can be said is we are following the Plan. Well I think we need to do a lot more and get real about this species status and the urgency of the issue.

I do not have all the answers, but what we are seeing is bureaucratic responses; *All is well, do not worry we are the government, trust us.* I would like to but the numbers do not show this. I am very concerned.

The EBB I feel highlights flaws in the system we have to conserve threatened species. Legislative protection is there, however, the list of species on threatened lists is growing. The funding and resources to implement recovery and conservation actions is appallingly low. Recovery teams have no real authority or power to influence. Something has to change.

References

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- Dufty, A. C. (1988). The distribution, population abundance, status, movement and activity of the Eastern Barred Bandicoot, *Perameles gunnii*, at Hamilton. Melbourne, La Trobe University.
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- Winnard, A. L. and G. Coulson (2008). "Sixteen years of Eastern Barred Bandicoot *Perameles gunnii* reintroductions in Victoria: a review." Pacific Conservation Biology **14**: 34-53.

Peter Myroniuk, BSc (Hons), MSc
October 2008

A response to - Eastern Barred Bandicoot CRITICAL – a note from Peter Myroniuk

Peter Myroniuk is entitled to his opinion, but some of the information he presents is misleading, I would like to clarify the situation. The graph he presents is deceptive: the x-axis is not a continuous scale, the trend line is therefore invalid and the data for 2008 is inappropriate. The figure of 100 bandicoots present in 2008 comes from a review by Winnard and Coulson (2008), which documents the first 16 years of eastern barred bandicoot reintroductions, from 1989 to 2005 and concludes 'An estimate of the current (i.e. 2005) population size is not available, but it could be as few as 100 individuals.' This is a worst case scenario, not an estimate.

The situation was acknowledged to be serious in 2005, but the recovery team has implemented changes, is coming up with new solutions, and the population is increasing. Predation by foxes remains a major issue,

and the recovery team has accepted that we are unable to win the battle against foxes at present. Therefore, reintroductions will only occur into areas that can be guaranteed fox free, such as areas surrounded by a predator barrier fence or predator free islands. Last week I caught 50 individuals in three days of monitoring at the newest release site. Although the Victorian eastern barred bandicoot is a long way from being secure, the future is looking much brighter.

Winnard, A. and Coulson, G. (2008) Sixteen years of Eastern Barred Bandicoot *Perameles gunnii* reintroductions in Victoria: a review. Pacific Conservation Biology **14**, 34-53.

Amy Winnard,
PhD candidate
Department of Zoology
University of Melbourne

ADVERTISEMENTS



Recent visitor statistics show that Australia's tourism industry is static if not in decline. The internet has opened the whole world to the discerning traveller and no tourism business can afford to stand on its laurels. At a recent Tourism Futures Conference on the Gold Coast, the 450 delegates contemplated the 'Topline Issues for Tourism' and released them in a communiqué (see <http://www.tourismfutures.com.au/2008/Communique.pdf>).

Amongst the upcoming social and consumer trends canvassed was recognition that "Holiday makers are looking for status stories through their travel and experiences – they want to be able to achieve **bragging rights and a 'wow factor' ...**" *The Kangaroo Trail Map* provides a challenge to see all of Australia's 50 species of kangaroos and their kind. Like bird twitchers, completing the trail will be an ambition worth bragging about. Those most likely to take a hop along the trail are the baby boomers. The communiqué notes that "Australia's baby boomers now own 70% of the wealth in Australia, representing a large, travel-ready market. The situation is similar in many other countries and baby boomers are noted as the perfect demographic for Australian tourism product. This market alone has money to travel and, as with the backpacker market, **the**

time available to explore a large and remote country like Australia.” *The Kangaroo Trail Map* offers a goal to see Australia’s wild places including some offshore islands. This aligns with the recognition in the communiqué that “There is a great opportunity for Australia to use its unique combination of **isolation, wildlife and natural assets** to promote amazingly different experiences within the safety of a stable, clean, friendly environment. Rather than shying away from the long haul travel it takes to get to here, Australia could **promote the vast open spaces and diverse natural heritage**. This is quite different to a traditional focus on sun and surf holidays.”

The delegates at the Tourism Futures Conference examined product development and recommended “Ongoing investment in developing authentic and innovative products is required to deliver the experiences sought by consumers. Product development should seek to link interest in **Australia’s unique nature (especially wildlife and landscapes)**, traditional indigenous culture, and social trends such as an interest in wellness and ecological sustainability.” There should be a focus on “...coordination and collaboration at the local/regional level to be able to have some influence at the national and international level. Here “local government has an important role in developing the ‘community’ aspect of the visitor experience. “ *The Kangaroo Trail Map* focuses on the best places to see kangaroos and their kind and most of these are in regional and remote Australia. The gateways are often small regional centres attracting visitors through information centres fostered by local government. Trail hoppers will reward these communities with economic activity generated by following *The Kangaroo Trail*.

As the Tourism Futures Conference identified, the tourism sector needs re-vitalisation and the Australian Government has recognised that Australia’s wild places and fantastically varied landscapes are key attractions. *The Kangaroo Trail Map* reminds us that these places are populated by unique and fascinating wildlife. In this context, the market for the Kangaroo Trail Map project is the wildlife sector of eco- or responsible tourism - a large segment of a market of some \$71.3 billion. Market research by the Sustainable Tourism Cooperative Research Centre (STCRC) has shown that 18.3% of our international tourists are attracted to Australia singularly because of its wildlife with 67.5% of all international tourists wanting to see animals. A \$25.2 billion expenditure by these same travellers equates to between \$2.7 billion and \$5.5 billion of value from tourism with wildlife, especially kangaroos as the most popular fauna. The economics of various studies such as Watchable Wildlife Inc. (USA) and Tourism Research Australia as well as the Australian Bureau of Statistics, backed up by The Australia Institute and the STCRC, support the sustainable value of wildlife viewing. Wildlife tourists

consume goods, services, guide books, binoculars, telescopes, video camera equipment and outdoor clothing. Food and accommodation alone employ over 410,589 persons. Then there is petrol, diesel for bus operators, employment to wildlife managers, guides, and general or specialist tourism operators. All are at the high end of the tourism spending pattern. Bird watchers (twitchers) already pay well to see our diverse avi-fauna. We aim to encourage bigger spending in regional and remote Australia as trail hoppers take to road, rail, air and sea to tick the 50 plus macropods we offer on *The Kangaroo Trail Map* off their life-list. We can even give them the BIG SIX, the six species of large kangaroos which collectively span the country.

So with our *Kangaroo Trail Map* in one hand, both domestic and international tourists can plan a trip across Australia to the **best places** to see some or all of the 50 species and 17 subspecies of macropods. They no longer have to complain that they don’t know where to go to see kangaroos or ferret through obscure fauna lists on national park web sites.

The Kangaroo Trail Map is supported by a web site - www.rootourism.com.au - for the facts that will fill the experience of seeing wild kangaroos, tree-kangaroos, wallabies, rock-wallabies, hare-wallabies, nailtail wallabies, pademelons, quokkas, potoroos, bettongs and rat-kangaroos. The site is thus populated with fact sheets that include the latest research on the behaviour and ecology of the species, the species of the month, and feedback from trail hoppers.

The genesis of *The Kangaroo Trail Map* was a project conducted for STCRC (Croft, D.B. and Leiper, N. 2001 Assessment of Opportunities for Overseas Tourism based on Wild Kangaroos. Wildlife Tourism Report Series: No. 17. Cooperative Research Centre for Sustainable Tourism, Gold Coast). The membership of the Australian Mammal Society provided assistance with that project in nominating their top three opportunities for seeing macropods, so I again thank the respondents for their information. The membership may be concerned that the production costs for the Kangaroo Trail Map project have been funded by an animal rights and welfare organisation, Voiceless. It is easy to dismiss such organisations as a lunatic fringe of radical vegans and disruptive to the genuine business of science (e.g. Banks P.B .2005 Animal welfare zealots put wildlife welfare at risk. Nature 438:559). An alternative is to look for common ground and marshal the support of the substantial memberships of such organisations (e.g. Perry D.A.N., Perry G.A.D. (2008) Improving Interactions between Animal Rights Groups and Conservation Biologists (Conservation Biology 22, 27-35). The Kangaroo Trail Map project explores this middle way; government wildlife and tourism agencies were disinterested.

The Kangaroo Trail Map was launched in Sydney in late August and copies were distributed at the AMS meeting in Darwin. If you would like a copy and/or can assist in distribution to relevant Visitor Information Centres then send an email to info@rootourism.com.

David Croft
Fowlers Gap Research Station
Via Broken Hill NSW 2880

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AUSTRALIAN MAMMALS

KEY TITLES *from* CSIRO PUBLISHING

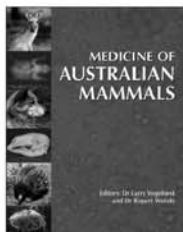


Medicine of Australian Mammals

Larry Vogelneust & Rupert Woods

This book is the first comprehensive text on the medicine of Australian mammals. It presents the most up-to-date information available on the medical management of all taxa of Australian native mammals and is the single most important and useful standalone text on this subject. Appendices include a checklist of the mammals of Australia and its territories and a guide to the identification of common parasites of Australian mammals.

July 2008 CSIRO PUBLISHING 640 pp 9780643091504 HB \$195.00



Australian Mammals Biology and Captive Management

Stephen Jackson

WINNER OF THE 2004 WHITLEY MEDAL

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2007 CSIRO PUBLISHING 548 pp 9780643095076 PB \$140.00



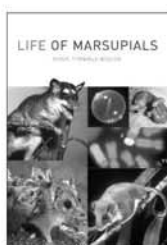
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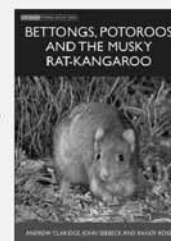


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June 2008 CSIRO PUBLISHING 160 pp 9780643093737 PB \$39.95



**2008 AUSTRALIAN MAMMAL SOCIETY
SCIENTIFIC CONFERENCE - ABSTRACTS**

SPOKEN PAPERS

**INDIVIDUAL AND HABITAT VARIABLES
AFFECTING THE REPRODUCTIVE SUCCESS
OF MALE BOBUCKS (*TRICHOSURUS
CUNNINGHAMI*)**

Stephanie Amir, K.Handasyde, A. Taylor and J. Martin

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In many male vertebrates, morphological characteristics such as body mass and testis volume are correlated with reproductive success. However, recent evidence suggests that environmental factors such as habitat patch shape and resource abundance may also be relevant. I studied bobuck (*Trichosurus cunninghami*) populations in seven forest fragments in the Strathbogie Ranges, north-eastern Victoria: four linear roadside remnants (two with higher and two with lower-resource levels) and three forest patches (one higher-resource and two lower-resource). I took morphometric measurements and DNA samples of the adults and offspring within each population. Using genetic analysis to assign paternity, I examined the relationship between reproductive success and six different variables. While body mass, testis volume and genetic relatedness between male-female pairs were not linked to reproductive success, age was a significant factor, with younger males being more successful. More males in higher-resource or linear remnant sites were polygynous, and males in higher-resource linear remnants had significantly greater reproductive success than those in lower-resource forest patches. This may be due to a more marked effect of resource abundance on female density in the linear sites than in the forest patch. Thus my study emphasises the importance of considering not only how the abundance of resources, but also how the configuration of these resources may affect mammalian behaviour.

**THE BEHAVIOUR AND DEMOGRAPHICS OF
AN URBAN EASTERN GREY KANGAROO
(*MACROPUS GIGANTEUS*) POPULATION**

Teigan Allen, Jenny Martin and Graeme Coulson

Department of Zoology, University of Melbourne, VIC
3010, Australia

Many wildlife species that occur in urban environments display behavioural and demographic characteristics that differ consistently from populations living in non-urban

areas. The eastern grey kangaroo (*Macropus giganteus*; EGK) is becoming increasingly common within urban environments, however we know very little about the characteristics of urban kangaroo populations. My study investigated the behaviour and demographics of an urban EGK population in Anglesea, Victoria. In comparison with previously studied non-urban kangaroo populations, I predicted that population density would be high, the diurnal time energy budget of the population would be altered, that individuals would have smaller home ranges, be more habituated to humans and be in better condition. My results supported all of my predictions. The estimated population density at Anglesea was the highest recorded for an EGK population. The time energy budget differed to that recorded in non-urban EGKs, with a trend towards large males being most vigilant at dusk. Both sexes had smaller home ranges than non-urban EGKs and were highly habituated to humans and all individuals were in reasonable condition. My study provides the first insight into urban kangaroos and demonstrates that the EGK population at Anglesea shares the suite of characteristics found in other urban wildlife populations.

**REPRODUCTIVE PHYSIOLOGY OF THE
FEMALE GREATER BILBY (*MACROTIS
LAGOTIS THYLACOMYIDAE*): EVIDENCE FOR
A MALE INDUCED LUTEAL PHASE**

Katie Ballantyne¹, Phill Matson², Nicole Noakes³, Vere Nicolson⁴ and Stephen Johnston^{1*}

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Endocrinology of the oestrous cycle, pregnancy, and early lactation was investigated in Western Australian captive Greater Bilbies (*Macrotis lagotis*). Initially six females were monitored for changes in urogenital cytology, progesterone (plasma and faecal), peri-cloacal and pouch morphology in the absence of a male. This was followed by the introduction of a male and a reproductive assessment through mating, gestation and early lactation. In the absence of a male, there was no cyclical pattern of urogenital cytology, peri-cloacal or pouch development, and progesterone concentrations

remained basal. Within 5 days of the introduction of a male, all females had a karyopycnotic index of 100%. Five to 9 days after the introduction of a male, there was an increase in plasma progesterone concentration which remained elevated for 14 to 19 days. Six of the 7 females gave birth shortly after reaching peak plasma progesterone concentrations. Plasma progesterone concentrations of the post-partum and early lactation period were lower ($P < 0.05$) than during gestation, but greater ($P < 0.05$) than those recorded before the introduction of a male. This study has provided evidence that in the Greater bilby the luteal phase is induced by the presence of a male. Similar to female reproductive physiology in the Peramelidae, the luteal phase in the Greater bilby was extended into lactation.

DEMOGRAPHICS OF AN ISLAND POPULATION OF KOALAS

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Many Australian mammal species are actively managed, either to conserve declining populations or to control numbers of highly abundant browsers. Knowledge of the dynamics of the target population, particularly those parameters that determine the rate of population change over time, forms the logical basis for many management decisions. Koalas (*Phascolarctos cinereus*) are managed on Kangaroo Island, South Australia, to alleviate browse pressure on their favoured food trees. The Kangaroo Island Koala Management Program (Department for Environment and Heritage) comprises a large-scale fertility control program (tubal ligation and vasectomy) to reduce population growth. In addition, some koalas are translocated from critically damaged areas to suitable habitat on the South Australian mainland. From inception of the program in 1997 to June 2007, 7,981 koalas have been caught for sterilisation from across the island, with information recorded on the morphology, age, reproductive status and condition of each animal. This data set provides a rare opportunity to thoroughly examine the demography of an island koala population over many consecutive seasons. We describe some basic population parameters of the Kangaroo Island koala population, including timing of breeding and maternal characteristics, and provide comparison to overabundant Victorian populations, in particular the founder population on French Island.

A BEHAVIOURAL ANALYSIS OF BURRAMYS PARVUS

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¹Department of Agricultural Sciences, La Trobe University, VIC 3086, Australia, ²Department of Environmental Management & Ecology, La Trobe University, VIC 3689, Australia, ³Department of Sustainability and Environment, East Melbourne VIC 3002, Australia, ⁴Healesville Sanctuary, Healesville VIC 3777, Australia.

Knowledge of the behaviour of an endangered species, such as *Burramys parvus* is fundamental to success in captive breeding and reintroduction. An appreciation of the behaviours an animal uses for its maintenance and foraging activities such as exploratory, feeding, drinking and grooming can provide insights into its general state of health and suggest ways in which its enclosure and diet may be beneficially modified. This paper will focus on a comparison between the behavioural repertoire, time budgeting and activity cycles of captive bred and wild caught *B. parvus*. Behaviour of *B. parvus* was filmed non-invasively under infrared lighting. The animals were kept individually in observation cages containing nest boxes and branches, and were observed over a five day period. Analysis of preliminary data has identified that the actual mechanics of the different behaviours, such as exploratory, feeding and drinking is similar between captive bred and wild caught *B. parvus*. However, there appears to be significant differences in the time budgeting of activities such as nocturnally feeding, exploring and arboreal behaviours between the captive bred and wild caught animals. Differences are also suggested in activity cycles between captive bred and wild caught *B. parvus*, with captive bred animals more active during the diurnal period. It is suggested that these behavioural changes could be associated with prolonged captivity. In the event that a decision is made to release captive-bred animals into the wild, further research is needed to track the animals in the wild to identify the extent to which captivity has modified their capacity to obtain food and shelter and to avoid predators.

DO KOALAS DRINK AND ARE THEY DRUNK?

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The water turnover and metabolic rate of koalas is often measured concurrently using doubly labelled water and the food intake of the animal can then be calculated.

Previous studies of koalas often concluded that the diet of the koala was insufficient to supply its water needs and speculated that extra water was obtained from sources such as dew or stem flow. On St Bees Island, conditions at the time of measurement did not allow free water to be obtained. This result prompted the re-examination of previously published data and individual cases were identified in all studies where the food intake was insufficient to supply the water turnover measured. It is proposed that koalas selectively and differentially alter the retention rates of solutes and particles, and in order to meet their water requirements energy may have been lost by rapid passage of poorly digested matter through the gut.

The activity of koalas was also monitored using telemetry techniques. Contrary to expectations, koalas in open canopy eucalypts moved less throughout the day than those in rainforest trees. This behaviour may lower the metabolic rate and consequently reduce water loss. Further to a study showing that the ability to thermoregulate in high humidity environments may limit the distribution of the koala, this data supports the contention that the requirement for, and availability of, water is the limiting factor in koala distribution.

ALLOMETRY OF EVAPORATIVE WATER LOSS IN MARSUPIALS: IMPLICATIONS OF THE EFFECT OF AMBIENT RELATIVE HUMIDITY ON THE PHYSIOLOGY OF BRUSHTAIL POSSUMS (*TRICHOSURUS VULPECULA*)

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We examined the effect of ambient relative humidity (RH) on body temperature (T_b), metabolic rate (MR), evaporative water loss (EWL) and thermal conductance (C) of the brushtail possum (*Trichosurus vulpecula*) to better understand the effects of RH on physiological variables and the implications of RH-correcting EWL data for marsupials. Correcting EWL data for 27 species of marsupial for water vapour pressure deficit (DWVP) in the chamber during measurement significantly increased the variability of the allometric relationship. For the brushtail possum, both T_a and RH significantly affected EWL. At T_a = 25°C, EWL was independent of RH at =63 % RH, but decreased linearly at higher RHs. At T_a = 30°C, EWL was significantly related to RH from 26-92 % RH. There was a significant effect of T_a on T_b and C_{dry} (higher at 30°C) but no effect of RH. For MR

and C_{wet}, there was a significant effect of T_a (MR higher and C_{wet} lower at 25°C), and RH at T_a = 30°C (MR higher and C_{wet} lower at the lowest RH) but not at 25°C. Our results indicate that brushtail possums do not necessarily show the linear relationship between ambient RH and EWL expected for an endotherm, possibly because of behavioural modification of their immediate microclimate. This may account for the failure of WVP deficit correction to improve the allometric EWL relationship for marsupials. Chamber RH is thus an important environmental factor to be considered when measuring standard physiological variables such as MR and C_{wet}.

MALE-BIASED MOBILITY IN GREY KANGAROOS

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Mobility in grey kangaroos is generally considered to be male biased, but the evidence for this view is limited and equivocal. We compared the mobility of male and female grey kangaroos at two sites to clarify the influence of sex on mobility. At Yan Yean Reservoir, southern Victoria, we captured and marked 76 eastern grey kangaroos (*Macropus giganteus*): 38 adult females, 10 sub-adult females and 29 sub-adult females. We marked each individual with paired colour combinations of reflective ear-tags, and either a radio-collar or bright plastic collar with unique symbols, then monitored their movements for up to 7 years. At Murray-Sunset National Park, north-western Victoria, we captured and marked 30 western grey kangaroos (*M. fuliginosus*): 13 adult females and 17 adult males. We marked individuals with coloured ear-tags as before, and fitted each individual with a radio-collar, then monitored movements for up to 6 years. Females (adult and sub-adult) at Yan Yean were sedentary, their ranges spanning no more than 2 km; sub-adult males showed a spectrum of mobility, with two moving about 20 km in opposite directions from the capture site. Adult females at Murray-Sunset were also sedentary, with range spans up to 4 km; adult males were consistently more mobile, moving up to 25 km in various directions from the capture site. We conclude that mobility is male biased, occurring as natal dispersal by at least some young males, and consistently larger home ranges of adult males.

CONILURUS IN QUEENSLAND: NEW EVIDENCE FROM FOSSILS

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Several lineages of indigenous rodents have suffered decline since European arrival in Australia. One of these is the genus *Conilurus* (commonly called tree rats or rabbit rats). Of two known species, one (*C. albipes*) is now extinct and the other (*C. penicillatus*) is in rapid decline.

Current investigations of cave sites in eastern Queensland indicate that both *Conilurus* species were previously more widespread. Sediments from cave sites were sieved and picked for bones and teeth. Specimens from mid-Pleistocene sites at Mount Etna (eastern-central Queensland) were identified as *C. albipes*. Late Pleistocene-Holocene sites in the Mount Etna region contain teeth of a new species of *Conilurus*, allied to *C. penicillatus*.

Pleistocene-recent sites at Chillagoe (north Queensland) were found to contain *C. penicillatus*, a finding which may shed light on the dispersal of this taxon to New Guinea. Some remains of *C. penicillatus* from Chillagoe seem quite fresh, indicating its persistence in the region possibly into the twentieth century.

In summary, it appears that the decline of the genus was greater than previously thought. Greater understanding of forces driving this decline may assist the conservation of remaining populations.

THE USE OF RETAINED HOLLOW-BEARING TREES, IN LOGGED AREAS, BY THE TASMANIAN COMMON BRUSHTAIL POSSUM (*TRICHOSURUS VULPECULA FULIGINOSUS*)

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Tree hollows provide an essential resource for a range of

fauna. However, timber harvesting can limit the availability of hollows to many species. Forest management agencies prescribe for the retention of hollow-bearing trees in logged areas. Yet little is understood about how effective these measures are. The aim of this study is to investigate the use of retained trees, by the common brushtail possum, and to determine if available den trees become more suitable as the surrounding forest regenerates.

Individuals were radio tracked in unlogged and logged forest of different aged regeneration. Preliminary results indicate that this species rarely uses trees retained within young (3-9 years old) harvested areas with poor regeneration. Instead in such areas the possums denned adjacent to the harvested areas in larger patches of mature forest retained for other reasons (e.g. wildlife habitat strip). In older aged harvested areas (16 years old), however, the possums were found to use trees retained within the coupe. This suggests that the use of retained trees may be related to the age and quality of the regenerating forest surrounding them.

This work highlights the importance of monitoring the use of retained trees to see if they are meeting their objective; that is, providing a usable hollow resource to aid re-colonisation of logged areas and maintain populations of hollow-using fauna. The results of such work can be used to inform the revision of management actions for the retention of habitat for hollow-using fauna.

ATTEMPTS TO RE-INTRODUCE THE GREATER BILBY (*MACROTIS LAGOTIS*) TO THE WILD IN NORTHERN SOUTH AUSTRALIA: AN OVERVIEW

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The Greater Bilby is a nationally threatened marsupial that has been successfully reintroduced into the 60 km² feral-free Arid Recovery Reserve. This study outlines attempts to establish a population of bilbies outside the Reserve in an area where cats and foxes are intensively controlled but not eliminated.

In 2004, 12 bilbies were released outside the Reserve into an area where cats and foxes were controlled through aerial poison baiting in an attempt to increase the regional area of occupancy. Eight of the 12 bilbies were taken by cats within 1 month of release. In 2005,

predator-avoidance training using cat carcasses and urine was trialed inside the Reserve to determine if bilbies changed their behaviour after training. Trained bilbies exhibited a heightened sense of awareness, travelling significantly further, moving burrows more often and using burrows with more entrances than untrained bilbies. Trained bilbies moved burrows after the burrow was sprayed with cat urine but trained animals remained in the same burrow.

In 2007, ten trained and ten untrained bilbies were released outside the Reserve in an area where cat and fox numbers are intensively controlled but still present. The aim of this release was to investigate the survivorship between the two groups. Four months post release, 17 of the 20 bilbies were still surviving with only one death from cat predation. It is still unclear whether training will improve the survival of bilbies in areas where cats and foxes are present and further research is required to determine if the offspring of trained adults will also be more predator-aware.

USING BROAD-SCALE, COMMUNITY SURVEY DATA TO COMPARE SPECIES' CONSERVATION STRATEGIES ACROSS REGIONS: A CASE STUDY OF THE KOALA IN ADJACENT CATCHMENTS

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Managing wildlife populations with a wide geographic range is a challenging problem. The IUCN Red List focuses on a species' geographic range; hence it does not address the issue at what geographic scale should wildlife be managed. Yet managing the wildlife on administrative and political boundaries becomes the immediately pressing task when a status determination has been made. The question then arises as to whether a catchment, or a set of adjacent catchments, is a practical unit of management, and whether the habitat relationships for a set of adjacent catchments can be applied to individual catchments. We addressed this problem using data from a state-wide, community wildlife survey to quantify koala (*Phascolarctos cinereus*) habitat relationships in four adjacent CMAs of NSW, and then tested whether these habitat relationships were similar across CMAs. Although the results were constrained by the coarse-resolution of the community survey and environmental data, we were able to model

broad-scale patterns of habitat use. Model explanatory power and cross-regional predictability was low, but consistent with koala ecology. Elevation had a consistent strong negative effect for the CMAs, both combined and individually, i.e. the koalas selected the low elevation sites in the CMA. The effect and relative importance of forest area and fertile soil varied among CMAs, depending on topography and land use patterns. We concluded that a CMA is probably too large to plan and manage koala populations and a smaller area, such as a local government area (shire or county), is much more appropriate.

THE SWAMP WALLABY, *WALLABIA BICOLOR*, AS A KEYSTONE MYCOPHAGIST IN THE VARIEGATED LANDSCAPE OF THE NEW ENGLAND TABLELAND, NEW SOUTH WALES

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Swamp wallabies, considered generalist browsers, also consume significant quantities and diversities of sequester mycorrhizal fungi ('truffles') which are symbionts with forest trees. The dispersal of truffles by mammals is an important ecosystem process that contributes to the health of forested ecosystems. Despite the importance of truffles in forested habitats, little is known about mechanisms of spore dispersal for these fungi in modified landscapes. Since European colonization, the landscape of the New England Tableland (north-eastern NSW) has been greatly modified and most truffle-eating (mycophagous) mammals lost. Because of its mycophagous diet and its resilience in these landscapes the swamp wallaby may be a keystone species.

This study will assess the importance of swamp wallabies as consumers and dispersers of truffles in modified landscapes by answering the following questions: (1) How does the diversity of fungi consumed by swamp wallabies compare across different habitat types in eastern Australia? (2) How does fungal consumption by swamp wallabies change seasonally in a fragmented landscape? (3) How do population densities and movement patterns of swamp wallabies in a variegated landscape relate to dispersal of fungi in the landscape? and (4) Does consumption of fungi by swamp wallabies increase the likelihood of fungal spore germination?

Here we present preliminary data on truffle diversity and swamp wallaby movement patterns. This will assist us in assessing the role of a non-obligate mycophagist in dispersing mycorrhizal fungal spores in modified

ecosystems.

THE GIANT WHITE-TAILED RAT *UROMYS CAUDIMACULATUS*: A RAINFOREST SPECIALIST IN THE SAVANNA

Gabriela C. Eiris

School of Biological Sciences, University of Sydney, NSW 2006

The Giant White-tailed Rat *Uromys caudimaculatus* is one of Australia's largest rodents, weighing up to 900 g and equipped with formidable jaws capable of opening coconut shells. It is a generalist feeder and, due to its size, is likely to play a vital role in driving ecological processes (e.g., seed dispersal, nest predation) in the rainforests and adjacent closed sclerophyll forests that it inhabits in north-eastern Queensland (Watts & Aslin 1981). Although normally thought to be a rainforest specialist (Williams & Marsh 1998), in the Lamb Range it has also been found to inhabit savanna woodlands, thus raising questions about the factors that limit its distribution and abundance. Comparative population studies are being carried out in both types of habitat, coupled with experiments designed to test the importance of food in the rainforest; and food, water and distance to creeks in the savanna woodland. Furthermore, foraging patterns, micro-and macro-habitat preferences are being assessed in both habitat types, through trapping, spool-and-line and radio-tracking. Microsatellite analysis will be used to examine the dynamics at a metapopulation level, exploring the possibility of a source-sink relationship between rainforest and savanna populations.

The results of this study will contribute to our understanding of the ecology of tropical rodents. Moreover, this locally common species can potentially be used to monitor changes in habitat quality for threatened species with which it shares its habitat, ultimately allowing for the design of improved forest management strategies.

WE KNOW EVERYTHING ABOUT TAMMARS DON'T WE? INTRASPECIFIC DIFFERENTIATION OF TAMMAR WALLABY POPULATIONS IN SOUTH AND WESTERN AUSTRALIA

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The tammar wallaby (*Macropus eugenii*) is one of the most intensively studied of all marsupials and will soon become the first Australasian marsupial species to have its entire genome sequenced. However, comparatively little is known about the amount of genetic differentiation amongst the morphologically distinct allopatric populations of tammars found in Western (WA) and South Australia (SA). Here we compare sequence data from the mitochondrial DNA (mtDNA) control region and Y linked microsatellite genotypes in tammar wallabies from Kangaroo Island (SA), mainland south-west WA, Garden Island (WA), Middle Island (WA) and the Abrolhos Islands (WA). Multiple divergent mtDNA haplotypes were identified in both SA and WA populations. The mtDNA of tammars from SA and WA shows reciprocal monophyly and are highly divergent, with levels of sequence divergence more typical of different species. Within WA tammars, island populations each have unique clusters of highly related mtDNA haplotypes and each is most closely related to different WA mainland haplotypes. Y linked microsatellite haplotypes show a very similar pattern of divergence although levels of diversity are lower.

TASMANIAN DEVIL FACIAL TUMOUR DISEASE (DFTD) IS EVOLVING

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The Tasmanian devil (*Sarcophilus harrisii*) is currently threatened with extinction by a recently emerged contagious cancer -Devil Facial Tumour Disease (DFTD). The disease was first detected in 1996 in the far north-east of Tasmania but has since spread south and west to infect devil populations throughout eastern and central Tasmania. Tumour karyotyping and genotyping has discounted the independent *de novo* origin of DFTD tumours in individual devils and confirms that transmission via allograft of a rogue clonal cell line is the only feasible alternative. Previous cytogenetic examination of tumours has shown that the tumour karyotype (2n=13) is conserved between tumours, yet is dramatically different from that of the normal devil (2n=14) karyotype. In DFTD cells, chromosome 2, the sex chromosomes and one chromosome 6 are missing, as is part of the long arm of one chromosome 1, while four additional marker chromosomes (designated M1-M4) are present. More recently, additional cytogenetic strains of DFTD have been identified. These strains are cytologically distinct but appear derived from the original DFTD cell line. While some of these new strains have remained geographically localised others have become widespread in Tasmania. Here we present cytogenetic and genotypic data on these new DFTD strains and discuss the implications of the apparent ongoing evolution of this disease.

**MITOCHONDRIAL DNA
PHYLOGEOGRAPHY OF TWO
CONGENERIC PETAURIDS
(PETAURUS): A CASE FOR REVISION
AND REVERSION**

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Quaternary climate fluctuations are widely cited as a driving factor in speciation and extinction. While evidence of cyclic contraction and expansion of eastern Australia's widespread sclerophyllous forests are well documented the majority of phylogeographic investigations have focussed on wet forest endemics. Consequently the impact of paleo-climate fluctuations upon broadly distributed open forest biota remains poorly resolved.

We examined the phylogeographic patterns of two open

forest petaurids, the endangered mahogany glider (*P. gracilis*) and its widespread congener, the squirrel glider (*P. norfolcensis*), using mitochondrial ND2 sequence data. Haplotypes assorted independent of taxonomy and supported the recognition of two lineages within *P. norfolcensis* -a northern lineage within northern and central Queensland and a more widespread southern lineage extending from Queensland to western Victoria. Partial distributional overlap of two phylogroups around central Queensland's Burdekin Gap indicated secondary contact, primarily via the northward introgression of the southern lineage. These events appear congruent with Pleistocene 'expansion/contraction' patterns of open sclerophyllous forests and may reflect a distributional association between the forests and the squirrel glider lineages. Unexpectedly, the mahogany glider comprised haplotypes from both the northern and southern squirrel glider lineages. Aside from the immediate taxonomic implications, this evolutionary pattern was hypothesised to be another consequence of cyclic fluctuations of eastern Australia's sclerophyllous forests during the preceding 1.8 million years.

**ENVIRONMENTAL RELATIONSHIPS OF THE
BRUSH-TAILED RABBIT-RAT, *CONILURUS
PENICILLATUS*, FROM TWO MAINLAND
CONSERVATION RESERVES IN NORTHERN
AUSTRALIA AND COMPARISONS WITH AN
ISLAND POPULATION**

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We examined the habitat characteristics and status of *C. penicillatus* from two mainland conservation reserves in northern Australia (Garig Gunak Barlu National Park (GNP) and Kakadu National Park (KNP)), as part of a broader programme aimed at the conservation management of this species. These habitat relationships are compared with those from the Tiwi Islands.

A systematic survey was conducted for *C. penicillatus* across GNP (135 quadrats) and KNP (38 quadrats). A range of environmental variables was recorded for every quadrat. All quadrats were classified by their woody plant and grass species composition. The occurrence of *C. penicillatus* was related to an ordination of quadrats by their floristic composition (woody plants and

grasses). The habitat relationships of *C. penicillatus* were described by generalised linear modelling.

C. penicillatus was not recorded from quadrats in KNP but was most abundant and widespread in eucalypt forests at Cobourg Peninsula. *C. penicillatus* showed no association with variation in tree and shrub species composition in these eucalypt forests. However an ordination of grasses showed that *C. penicillatus* was associated with variation in grass species composition. Environmental models suggested a strong preference for taller eucalypt forests with less cover of annual grasses and bare ground, lower densities of dead trees and where the impact of fires is less severe. These results are consistent with that found on the Tiwi Islands.

ASSESSING THE EFFECTS OF HABITAT TYPE ON MILK COMPOSITION AND PHYSIOLOGICAL PARAMETERS IN THE COMMON BRUSHTAIL POSSUM (*TRICHOSURUS VULPECULA*) IN TASMANIA'S PRODUCTION FORESTS

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Brush-tail possums (*Trichosurus vulpecula*) are one of the most widely recognised tree hollow-users in Australia. This study aims to explore the influence of habitat disturbance upon measures of physiological well-being in adult brush-tail possums and the relationship with tree-hollow availability. Lactation is the major stage of reproduction in marsupials, thus serving as an important indicator of reproduction. Differences in composition may reflect differences in habitat quality or environmental stress (Munks, 1991; Rose *et al.*, 2005). Sites have been established in dry *Eucalyptus* forest disturbed (logged/burned) and control (unlogged) sites in SE TAS and wet *Eucalyptus* forest disturbed (logged) and control sites in NE TAS. Possums are trapped and data (sex, body mass, blood, and milk samples) are gathered at each site twice yearly. Key physiological variables assessed are: stress hormone concentration,

immune system function, and body condition. White blood cell differential results, a secondary indicator of physiological stress, suggest differences between sex, forest type, and control and disturbed sites. Preliminary results indicate that the percentage of fat in late lactation milk from females that live in dry disturbed sites was significantly lower ($p=0.0279$), containing 51.7-61.8% of the milk fat of females in the other environments (dry control, wet disturbed, and wet control). Total milk solids, protein, and carbohydrate did not differ significantly between forest type or treatment. All results are within the range typical of the species during late lactation. These results suggest that habitat disturbance may have significant effects on physiological well being in brush-tail possums.

SECONDARY METABOLITES AND FEEDING IN BRUSHTAIL POSSUMS – FROM LABORATORY TO FIELD

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Plant secondary metabolites are ubiquitous in browse but understanding how they might affect the demography of wild herbivores has remained elusive. Studies over the past decade have shown that formylated phloroglucinol compounds in *Eucalyptus* are major determinants of feeding in captive marsupials. However, these compounds are normally distributed in forests and so animals will encounter high and low concentrations infrequently. When they do it results in a smaller amount of food being eaten from that individual trees but the effects are subtle and detectable only with large sample sizes and intensive studies. Other secondary compounds such as tannins reduce the quality of food eaten rather than just limiting consumption and new methods were developed to quantify the interaction between leaf tannins and foliar nitrogen as “available N”. Using this approach we studied a population of free-living common brush-tail possums (*Trichosurus vulpecula*) in woodland near Townsville. We found that the likelihood of females breeding and the growth of pouch young are strongly correlated with the mean available N in the home range. The strength of the approach is that it is not eucalypt specific but can be applied to any browse and opens the way to new studies linking food quality to demography in herbivores.

A TOP END FOR A TINY TROPICAL RODENT?

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The delicate mouse is Australia's smallest rodent, and is found across much of northern Australia. Current formal taxonomy recognises mainland populations as a single subspecies *Pseudomys delicatulus delicatulus* and those on Groote Eylandt and the Sir Edward Pellew Group as *P. d. mimulus*. In fact, mainland populations belong to three distinct mitochondrial lineages in QLD, the Top End/northern Kimberley, and the Pilbara/southern Kimberley. These genetic lineages are morphologically discrete and diagnosable, and distinction of the Top End from the others is supported by chromosomes and sperm morphology. In addition the described species *P. pilligaensis* in northern NSW is genetically and morphologically synonymous with QLD populations of *P. delicatulus*, although some individuals show evidence of past introgression with the New Holland mouse. The fate of *P. d. mimulus* now hangs in the balance—genetically, individuals from the Sir Edward Pellew group are not distinct from adjacent Top End populations. However, those on Groote Eylandt have a sperm morphology distinct from the Top End, and seem to be morphologically more similar to Pilbara and southern Kimberley animals... is this the end, or will this tiny beast bequest a name to a widespread, but previously unrecognised mainland species?

RECRUITMENT INTO THE NUMBAT *MYRMECOBIUS FASCIATUS* POPULATION AT DRYANDRA WOODLAND, WESTERN AUSTRALIA

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Despite ongoing control of foxes throughout the 13000 ha main block of Dryandra since 1989, the numbat population remains at a low level since a crash in 1993, following a peak in 1992. A program of monitoring radio-collared adult numbats between 1998 and 2004 revealed mortality rates which are not sufficient to explain the continuing low numbers. In 2006 a new study was initiated to determine mortality rates of numbats in their first year and contribute data towards a

population model. Rates of survival during the lactation period have been monitored by regular capture of females while young are attached and by use of video surveillance from the time of first emergence from the nursery burrow. Small radio-collars were fitted to juvenile numbats while they were still nesting with their mothers and their progress followed by weekly checks for six months then fortnightly checks.

In October 2006, 10 juvenile numbats were captured and collared. None survived beyond June 2007. In 2007, 13 juveniles were captured and collared and in July 2008 three survived. Causes of mortality included predation by introduced mammals (foxes and cats), birds of prey and carpet pythons. While this low survival of young can explain the continuing low population numbers at Dryandra, cat control as well as increased baiting efficiency for foxes should increase juvenile numbat survival and allow population increase.

TRADE-OFFS BETWEEN FORAGING EFFICIENCY AND PARASITE RISK: FIELD EXPERIMENTS WITH EASTERN GREY KANGAROOS *MACROPUS GIGANTEUS*

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In most foraging contexts, herbivores must trade-off foraging efficiency with an element of risk. As many herbivores defaecate on their foraging grounds, the risk of ingesting gastrointestinal parasites by foraging near faeces should constrain foraging efficiency. Studies on domestic herbivores indicate animals may lower their exposure to gastrointestinal parasites by avoiding forage near faecal contamination. As faecal deposits are often associated with taller grass, herbivores face a conflict between the benefits of increased nutrient intake and increased risk of parasitism. The aims of this study were to investigate the anti-parasite response of free-ranging eastern grey kangaroos (*Macropus giganteus*) to faecal contamination of foraging patches, and the effects of patch quality on the expression of this response. We observed responses of kangaroos as they foraged on replicate experimental plots at Serendip Sanctuary, southern Victoria. The plots independently manipulated faecal contamination and grass height: tall uncontaminated, tall contaminated, short

uncontaminated and short contaminated. Both sward height and faecal contamination affected the kangaroos' choice of foraging patches. While kangaroos preferred taller grass, they would not trade off faecal aversion for increased nutrient intake. Kangaroos did not actively select less contaminated patches, but rejected contaminated patches as they were encountered, and remained longer in less contaminated ones. This is the first study to examine the trade-off between parasite risk and sward height in a free-ranging herbivore.

VARIABILITY IN DIET AND THE IMPORTANCE OF NECTAR FOR THE MOUNTAIN PYGMY-POSSUM (*BURRAMYS PARVUS*).

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Analysis of 500 faecal samples spanning 12 years and 6 sites quantified the major components of *Burramys* diet. *Burramys* consumed over 30 different arthropod and plant foods, especially Bogong moths (*Agrotis infusa*), *Podocarpus lawrencei* seeds and *Leucopogon* spp. fruits. REML analyses were made of dietary variation between individuals, sexes, sites, years, and seasons (spring and autumn). (1) Diet was found to be highly seasonal, comprising more *Agrotis* in spring and switching to seeds and fruits in autumn at low elevation sites. At high elevation sites, *Agrotis* constituted a larger proportion of the diet in autumn. The diet revealed a response to seasonal availability of different food items. (2) Diet was found to be site specific, reflecting different vegetation compositions and habitat characteristics between sites. (3) Diet was highly variable between years, suggesting that *Burramys* diet responds to resource productivity. Infra-red closed circuit television monitoring revealed that *Burramys* rapidly consume nectar from a variety of shrubs in captivity. The presence of pollen grains in faecal samples suggests nectar is probably an important component of their diet during spring. Traps placed in shrubs near the edge of boulder fields caught *Burramys* with high pollen loads on their faces and in their faeces. These findings suggest that *Burramys* diet is more similar to that of other Burramyidae than had previously been known. It also indicates that the species is much more susceptible to predation from foxes and cats than was previously supposed. This is a major concern

because of the increasing threat from feral cats as snow cover diminishes with global warming.

SEASONAL ACCLIMATIZATION OF BODY TEMPERATURE AND METABOLIC CAPACITY IN AN ENDOTHERM (*RATTUS FUSCIPES*)

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The energetic cost of maintaining the relatively high and stable body temperatures (T_b) of endotherms increases with decreasing environmental temperatures. Small mammals that remain active during winter may offset this cost by decreasing T_b , and may also increase metabolic capacities to facilitate internal heat production. The aim of this project was to determine whether seasonal fluctuations in environmental temperature influence body temperature and metabolic regulation in an Australian rat (*Rattus fuscipes assimilis*). In the wild, winter mean T_b (36.66 ± 0.02) was significantly lower than in summer (37.01 ± 0.06), and T_b amplitude ($T_{bmax} - T_{bmin}$) was significantly greater in winter (3.42 ± 0.10) than summer (3.01 ± 0.12). ATP coupled respiration (state 3) and oxygen consumption in the absence of oxidative phosphorylation (state 4) were significantly higher in winter acclimatized rats, as were cytochrome c-oxidase and lactate dehydrogenase activities. The thermal sensitivity of enzyme activities was reduced in winter acclimatized rats. Hence, rather than regulating to a fixed body temperature, mammals can maintain performance and reduce energetic cost in cooler thermal environments by regulating to a lower body temperature and concurrently increasing metabolic heat production capacity and shifting thermal sensitivities of metabolic pathways.

THE EFFECT OF THE GnRH AGONIST DESLORELIN ON THE RANGING BEHAVIOUR OF FEMALE KOALAS

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Long lasting hormonal contraceptive implants can reduce fertility in animal populations, resulting in decreased population growth. This study investigated whether contraceptive implants containing deslorelin

have any effect on ranging behaviour of free-ranging koalas.

Koalas (9 controls and 9 treatments) were radio-tracked between April and August (non-breeding season) and also between October and February (breeding season), over 2.5 years. Daily positions of individual koalas were recorded at regular intervals over periods of 5-12 days throughout each season to determine broad ranging patterns. Animals were also tracked 5 times during a 24-hour period, 7-10 times a season, to determine finer scale movement patterns of animals (minimum distance moved per 24h).

Before treatment, all koalas except 1 control animal, showed very high site fidelity. No animal was more than 350m (x = 56m) from the geographic centre of location (GCOL: effectively the centre of its home range). By the end of the second breeding season, 5 of 10 deslorelin treated animals had moved their GCOL more than 2km. During the same period only 1 control animal moved a similar distance. Deslorelin treated animals that did not move a long distance showed strong site fidelity and the analysis of daily ranging behaviour indicated that the daily distance moved was not significantly different from control animals. This study showed that while some treated individuals moved considerable distances, others exhibited high site fidelity, similar to patterns in control animals.

IS FIRE A THREATENING PROCESS FOR SMALL MAMMALS?

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Fire is a regular feature of many ecosystems and in Australia and many small mammal species are thought to be at risk from inappropriate fire regimes. However, our understanding of how fire affects small mammal populations is limited. I conducted a review of small mammal fire impact studies published over the last 12 years from Australia and overseas to ask two questions: 1) are the studies adequately designed? 2) Are there patterns among the different species and groups? The review collated 40 peer-reviewed studies containing results on 66 species of small mammals, predominately from the southern hemisphere and dominated by rodents and marsupials. The majority of studies used indices relating to population size as the key response variable,

with only four studies using demographic rates such as survival. In many studies, inference from results was constrained by two common and easily rectified flaws in the experimental design: not accounting for repeated measures when successive sampling of experimental units occurred and the use of relative abundance measures uncorrected for unequal detection probability. No statistical tests were recorded from 18% of the 103 small mammal populations examined. Of the populations that tested the effect of fire, 51% recorded no response to fire events, 25% recorded a positive effect and 24% a negative effect of fire. Some species exhibited an inconsistent response to fire. The response to fire was similar between rodents and marsupials. Fire does impact some species but there continues to be a degree of uncertainty regarding the mechanisms associated with the impact and a need to strengthen experimental designs.

GESTAGEN IMPLANTS FOR FERTILITY CONTROL IN FREE-RANGING KOALAS: EFFECTS ON FERTILITY, GROWTH AND SURVIVAL IN FEMALES IMPLANTED AS JUVENILES

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Management of koala populations in south-eastern Australia, which is conducted to prevent major ecological damage to their woodland habitats, involves very substantial financial and logistical costs to government conservation departments. We previously demonstrated that gestagen implants are safe and effective for reducing fertility in adult female koalas. We have now tested the safety and efficacy of gestagen implants in juvenile female koalas to determine whether they could be treated concurrently with their mothers during management programs. The great advantage of this approach, if successful, would be the improved efficiency of delivering the fertility control program, and a reduction in management costs (effectively treating 2 koalas for every capture event). In February 2006, we inserted 70 mg levonorgestrel (n=5), and control (inert, n=5) implants into juvenile female koalas (weighing between 2.5 and 4.4kg) on French Island, Victoria, and monitored fertility, condition, growth and survival. None of the treated animals have bred successfully in the two years since reaching the age of sexual maturity, while 4/5 controls bred in the first year and 5/5 in the second.

Levonorgestrel did not affect growth or survival of treated koalas. We conclude that levonorgestrel is a safe and successful contraceptive for this age cohort, and we recommend its use in large-scale management programs. The application of fertility control to juveniles will make a major contribution to population control by eliminating fertility in the cohort that makes the maximum future contribution to population growth. This approach will provide major cost savings for government wildlife agencies.

LIVING ON THE EDGE: REPRODUCTIVE ECOLOGY OF TAMMAR WALLABIES INHABITING THE ABROLHOS ARCHIPELAGO, WESTERN AUSTRALIA

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Tammar wallabies (*Macropus eugenii*) are endemic to numerous offshore islands in southern and Western Australia (WA), including Kangaroo Island (KI), Garden Island, the Recherche archipelago, and the Abrolhos archipelago. KI tammars were used to found numerous macropod research colonies in Australia and as a result the reproductive biology of the KI tammar has been well studied. However, the WA populations have received comparatively little attention to date. Tammar wallabies on Kangaroo Is. are strictly seasonal breeders. The majority of females give birth within a two week period in late January/early February, with the timing of breeding closely linked to the summer solstice in late December. Recent studies on tammars inhabiting the Abrolhos islands, however, indicate that although they are also highly seasonal, the timing of reproductive events is advanced by 1–2 months and precedes the summer solstice. Reproductive maturation in females is delayed by at least one year (compared to Kangaroo Is. animals) and female reproductive success varies between years and seems to be linked to body condition and environmental conditions. The variations in reproductive ecology of tammar wallabies on the Abrolhos Islands are likely the result of evolutionary adaptation to the extremely harsh environmental conditions they

experience and represent a species living at the edge of its range.

DEVELOPING MONITORING PROTOCOLS FOR TWO DIFFICULT-TO-DETECT NT THREATENED SPECIES

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Butler's dunnart *Sminthopsis butleri* and the northern hopping-mouse *Notomys aquilo* are both listed as Vulnerable, both are known from small numbers of records and the mainstays of the populations of both species are on NT islands; Tiwi Islands and Groote Eylandt, respectively. In each case, development pressures are important threatening processes. Standard mammal survey techniques used in broad-scale mammal surveys appear unsuitable for these species and this paper describes the testing and development of techniques for detecting the species and developing monitoring protocols. Elliott-trapping, using a variety of baits, was totally unsuccessful, and spotlighting from vehicles and on foot provided very few, and very brief, sightings and was considered inappropriate for standard surveys of both species. Deep pitfall traps in lines of 10 are now used for surveying Butler's dunnarts, and surveys for northern hopping-mice look for distinctive spoil-heaps along 200m-long transects. Determining the detectability of the dunnarts remains a problem, but initial results indicate that transect counts of hopping-mice provide robust estimates of the number of burrow systems, capable of detecting changes in numbers over time.

In both studies, collaboration with Indigenous ranger groups (Tiwi Land Council and Anindilyakwa Land Council) was integral to the success of the project, as was collaboration with Great Southern Limited on the Tiwi Islands.

THE GOLDEN-BACKED TREE-RAT (*MESEMBRIOMYS MACRURUS*): REPRODUCTION, GROWTH AND DEVELOPMENT IN CAPTIVITY

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The Golden-backed Tree-rat is a large arboreal rodent that has suffered a dramatic reduction of range. Understanding the ecological needs for the conservation of this species requires knowledge of its

habitat preferences, diet and breeding biology. In this paper we will be presenting the results from a breeding study of a captive colony of this species. The seven (3 male, 4 female) founding individuals were captured at 'Lone Dingo' on the Mitchell Plateau, Kimberly Region, W.A. at the completion of a study assessing habitat preferences, home range and diet. The animal colony was maintained in aviaries in Alice Springs, N.T.

During a period of 18 months, 17 litters were born with litter size of 2 or 3 and an overall sex ratio close to parity. There was no apparent seasonality in breeding. Oestrus (9.9 ± 0.4 days) and gestation

(46.8 ± 2.8 days) were estimated from known births and birth dates determined from growth curves. Growth of young is rapid and with head length reaching an asymptote at about 40 days and head-body at 50 days. Young were weaned at about 40 days. Reproductive maturity was reached between 14 and 16 weeks. Developmental stages will also be presented. These results will be compared with reproduction and growth of the closely related Black-footed Tree-rat and other rodents. Ecological implications will be discussed.

GENETIC RELATIONSHIPS OF THE PLATYPUS (*ORNITHORHYNCHUS ANATINUS*) WITHIN AND ACROSS RIVER SYSTEMS

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Despite the popular interest and intrinsic scientific value of the platypus (*Ornithorhynchus anatinus*), very little is known about key areas of platypus population biology. In particular, studies of population genetics remain in their infancy at best.

I have characterised a set of unique polymorphic microsatellite loci to study the population genetics of the platypus. These loci were designed using the resources of the platypus genome project.

The platypus has a general distribution that hugs the Great Dividing Range and eastern coastal regions from Melbourne to just south of Cooktown, in north Queensland, and the whole of Tasmania. The primary focus of my project is on the impact on genetic structure of the putative large distribution gaps found in Queensland.

However, a set of samples is already available from several rivers in the Southern Tablelands of NSW. Analysis of these has shown a surprising degree of genetic differentiation between "populations" from the different rivers. Assignment tests almost always correctly place individuals within the population from which they came.

THE CHANGES IN THE DISTRIBUTION OF PLATYPUS (*ORNITHORHYNCHUS ANATINUS*) IN NEW SOUTH WALES THROUGH COMMUNITY-BASED SURVEY DATA BETWEEN 1987-88 AND 2006

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The first state-wide survey of platypus in NSW in 1987-88 concluded that its overall distribution did not appear to have changed significantly since the early-mid 20th Century and probably since initial European occupation. Reported capture and/or sighting of platypuses by fisheries biologists conducting the NSW Rivers Survey, from 1994-96, confirmed the occurrence of the platypus in all of 18 corresponding stream reaches west of the Great Dividing Range identified in the 1987-88 survey, and in 20 corresponding reaches in east-flowing streams, again suggesting maintenance of overall distribution of the species. We examined the 2006 distribution of platypus in NSW using a 2006 State-wide Wildlife Survey of community knowledge. We used estimates of detectability and occupancy. Platypus showed a tight distribution in the eastern quarter of NSW, except for the thin spread heading west along the southern boundary of the state. There were areas with increase, but a larger number of locations identified with declines. The most striking feature of this work is that the platypus has not declined sharply, and that the case for leaving it out of the schedules of threatened species remains. However, the apparent decline gives no sense of confidence that the future of the platypus is assured. This confirms the need to study local populations, take a broad view of river conservation, including climate change, undertake detailed background studies on platypus biology, and to monitor platypus distribution and note any local changes.

THE MEASUREMENT OF LUTEINISING HORMONE (LH) IN THE WESTERN GREY KANGAROO (*MACROPUS FULIGINOSIS*) AND BLACK-FLANKED ROCK WALLABY (*PETROGALE LATERALIS LATERALIS*)

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Methods for the measurement of marsupial LH invariably rely upon the similarity of the LH molecule between different species and usually use anti-ovine or anti-bovine LH antibody and an ovine or bovine labelled LH preparation. Initial attempts to measure plasma LH in the Western Grey Kangaroo (WGK) with assays using antibodies to 4 different isoforms of ovine LH raised in 7 different rabbits were unsuccessful. An enzymeimmunoassay (EIA) developed for the Asian elephant (Zoo Biology 23:45-63) was then applied to the WGK and the Black-flanked Rock Wallaby (BFRW). This EIA has an anti-bovine-LH monoclonal antibody (518B7 provided by Dr Jan Roser, University of California, Davis, USA), biotinylated ovine LH label and bovine LH standard (NIADDK-oLH-26 and NIH-bLH-B10, both provided by Dr Janine Brown and Nicole Abbondanza, Smithsonian Institute, Front Royal, Virginia USA). Technical validation showed that serial dilution down to 1:8 of plasma from 7 individuals of each species showed parallelism to the assay standard curve, and control samples (1.24-5.30 ng/ml) had between-assay coefficients of variation %. Biological validation was achieved by challenging animals with intramuscular GnRH (Fertagyl[®], 2.5 µg/kg) and measuring LH before and 25 minutes after the injection. Significant increases in plasma concentrations of LH (mean ± sem; all p<0.0005) were seen after GnRH for both the WGK (from 5.0 ± 0.8 ng/ml to 9.4 ± 1.2 ng/ml; n=19) and the BFRW (from

6.0 ± 0.7 ng/ml to 10.6 ± 0.6 ng/ml; n=28). In conclusion, this assay can be successfully used to measure LH in these two species.

DEPOT FORMULATION OF DESLORELIN SUPPRESSES REPRODUCTION IN FEMALE WESTERN GREY KANGAROOS (*MACROPUS FULIGINOSUS OCYDROMUS*)

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The control of wild animal populations by lethal intervention is becoming less socially acceptable. We are testing whether Suprelorin[®], a depot formulation of deslorelin, a super-agonist of Gonadotropin Releasing Hormone (GnRH), can suppress reproduction as part of an Australia-wide project, the Koala and Kangaroo Contraception Program. In November/December 2006, we treated 24 free-ranging female western grey kangaroos with 4.7 (n = 8) or 9.4 (n = 7) mg of deslorelin, or a placebo (n = 9) at Harry Waring Marsupial Reserve, in the southwest of Western Australia. All had young, either at foot or about to leave the pouch at the time of treatment. We then monitored them for presence of new pouch young and tested their response to intramuscular GnRH (2.5 µg/kg) in February, May and October 2007. Two kangaroos from each of the deslorelin groups and 4 from the placebo group were already pregnant when implanted and gave birth normally within a month of treatment. One of the kangaroos treated with 4.7 mg deslorelin conceived approximately 14 days after treatment. None of the remaining kangaroos treated with deslorelin conceived after this. Kangaroos treated with a placebo responded to the GnRH challenge with a marked rise in plasma Luteinising Hormone (LH) levels while those treated with deslorelin showed no change in plasma LH on any of the challenge dates. We conclude that Suprelorin[®] blocks the hypothalamic-pituitary-gonadal axis and after a latent period of at least 2 weeks, prevents reproduction for at least 10 months in female western grey kangaroos.

THE MAMMAL FAUNA OF ONE OF THE MOST MODIFIED REGIONS IN AUSTRALIA: THE NSW MURRAY CATCHMENT

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After losing a minimum of six species, the current mammal fauna of the NSW Murray Catchment have had to survive in one of the most modified landscapes in Australia. Conservation of remaining species is difficult as 98% of remaining native vegetation is currently in State Forests, Traveling Stock Routes, and on private land. Such areas have historically been difficult to survey but fortunately changing attitudes in farming communities have opened up many of these areas to wildlife surveys and conservation efforts. Here we present the results of a series of collaborative projects which have aimed to determine the distribution and status of remaining mammals; raise environmental awareness; and promote conservation.

We surveyed for mammals at 180 sites throughout the NSW Murray Catchment spanning the different land tenures and vegetation types. At each site we conducted one hour of spotlighting and set up 50 Elliot traps and a harp trap for 4 nights.

A total of 31 native mammal species so far have been detected outside nature reserves during these surveys. Only the Eastern Grey Kangaroo and Brush-tailed Possum were common. Even mammals typically common elsewhere like the Platypus and Common Wombat had severely restricted distributions and appear to be in a precarious position. Sensitive arboreal mammals like the Squirrel Glider are now largely restricted to the few Grassy Box Woodland patches fringing River Red Gum forests. We will discuss the distributions and status of most remaining mammals, the importance of different vegetation types, and current conservation efforts.

SWIMMING TAMMARS? RELATIONSHIPS AMONGST THE TAMMAR WALLABY POPULATIONS IN THE HOUTMAN ABROLHOS ARCHIPELAGO, WESTERN AUSTRALIA

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The Western Australian tamar wallaby (*Macropus eugenii*) has a fragmented distribution, with populations inhabiting mainland south-western Australia, Garden Is., two islands in the Recherche archipelago, and three islands in the Abrolhos archipelago. Tammars have been intensively managed for conservation on the mainland and were only recently (in 1998) down-graded from the IUCN category of Vulnerable to Lower Risk (near threatened). Tamar wallabies in the Abrolhos archipelago pose an interesting management challenge. Their insular nature and relatively small population size makes them vulnerable to extinction, yet they have reached exceptionally high population densities on one island where they were recently introduced (North Island). This study examined tammars on three islands in the Wallabi group: East Wallabi, West Wallabi and North Is. The aims were to: (i) assess the levels of genetic diversity, (ii) examine whether there is gene flow between East and West Wallabi, (iii) confirm the belief the North Is was founded by animals from East Wallabi and the effect of low founder numbers, and (iv) detect whether the animals in the Wallabi Group are of particular genetic or conservation significance. Nine autosomal and four Y-linked microsatellite loci, and sequence data from the mitochondrial DNA (mtDNA) control region were used to address these questions. Each population had low genetic diversity compared to the mainland, especially North Island. There is no evidence of recent gene flow between East and West Wallabi. The source population of North Is does not concord with local beliefs.

OVERLAPS BETWEEN REPRODUCTION AND HIBERNATION IN THE TASMANIAN ECHIDNA (*TACHYGLOSSUS ACULEATUS SETOSUS*)

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Echidnas are seasonal breeders, and in Tasmania the breeding season follows an annual period of hibernation. The timing of the hibernation period varies with sex, with males entering and emerging from hibernation earlier than reproductively active females, presumably in preparation for reproductive activity). Records from 20 reproductive events demonstrate that in our echidna population mean egg-laying occurs 20.4 days after the final arousal from hibernation, implying a gestation period shorter than reported for echidnas from mainland Australia. While it has long been known that there is a close relationship between hibernation and reproduction,

a new technique that allows sperm to be recovered from the female reproductive tract has revealed that there are significant overlaps between hibernation and reproduction in the Tasmanian echidna. This technique has provided new insights into the mating system: males may attempt to mate with torpid females, females may re-enter hibernation after mating, and females may be able to store sperm for long periods.

NON-INVASIVE RECORDING OF HIBERNATION AND REPRODUCTIVE EVENTS IN THE ECHIDNA (*TACHYGLOSSUS ACULEATUS*)

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Although a number of early biologists speculated on the capacity of the echidna to hibernate there was confusion about when it occurred. Studies by Grigg and co-workers on free-ranging echidnas in Mt Kosciusko National Park using implanted temperature transmitters showed that there, female echidnas hibernated through April-June, and then mated. We demonstrated a very similar timing in Tasmanian echidnas using implanted temperature loggers. Both of these methods require surgical implantation of the temperature sensing device and may affect various aspects of physiology and behaviour. We glued small temperature loggers to the tracking transmitters attached to a number of echidnas and found that these loggers not only provided details of the timing of hibernation, but also allowed us to identify reproductive events. They also indicated that echidnas would sometimes bask during rewarming from hibernation. Our combined data from internal and external temperature loggers showed that egg-laying occurred surprisingly soon after arousal from hibernation.

HABITAT USE OF THE LONG-NOSED POTOROO (*POTOROUS TRIDACTYLUS*) IN THE NEW SOUTH WALES SOUTHERN HIGHLANDS

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Long-nosed Potoroos are a threatened species that

inhabit coastal heath and dry and wet sclerophyll forests with a dense understorey. They are known to have been highly disadvantaged by changes brought about since European settlement and their key threats are believed to be fox predation and habitat loss/fragmentation. However, it is uncertain to what degree fox predation impacts on this medium sized ground dwelling mammal in its natural environment. The presence of dense vegetative cover is suggested to offer virtually total concealment from and limited access by predators.

The aim of this project was to examine the habitat preferences of the long-nosed potoroo and their utilisation of cover during periods of activity. Live-trapping was conducted in autumn and spring, from 2005 to 2008, at 2 sites in the Southern Highlands of NSW. A number of habitat characteristics were examined at each trap site to allow comparison with trap success as an indication of macrohabitat preferences. Further, in Spring 2007 and Autumn 2008 microhabitat use was examined for 5 to 8 animals per site using the spool-and-line technique. The results indicated that trap success was linked with a number of macrohabitat characteristics. However, at the microhabitat level, while most individuals had significant preferences for some habitat characteristics, no clear trends were evident across all individuals spooled.

MAPPING ESU BOUNDARIES USING DNA FROM MUSEUM SAMPLES

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Conservation plans for the brush-tailed rock-wallaby (*Petrogale penicillata*) include reintroductions of animals to locations within their former range in Victoria and southern NSW. In order to preserve the historic geographic integrity of the genetic lineages within the species, it is necessary to first map the boundary between the Southern and Central Evolutionarily Significant Units (ESUs). This will allow more informed management decisions about which lineages should be used to restock specific geographic locations. We have collected bone and tissue samples from museum specimens in the Australian National Wildlife Collection and Museum Victoria. These specimens come from

locations between the southernmost extant colony of the Central ESU (Kangaroo Valley -34¼ 43', 150¼ 27') and the remaining wild colony of the Southern ESU (Snowy River National Park -37¼ 09', 148¼ 24'). We have extracted DNA from these samples and amplified and sequenced the left domain of the mitochondrial DNA (mtDNA) control region using pre-existing and newly designed primers to yield two overlapping fragments approximately 300bp in length each. Preliminary results have extended the range of the Central ESU southwards, into the Orroral Valley in the ACT (-35¼ 43', 148¼ 29') and the Yarrangobilly Caves in NSW (-35¼ 37, 148¼ 57).

MATE CHOICE INCREASES BREEDING SUCCESS IN A CAPTIVE POPULATION OF DASYURID MARSUPIAL

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Devising new non-invasive techniques to maintain natural behaviours and increase breeding success of captive populations is becoming a significant priority in the conservation of endangered species. However, this has rarely been examined in, or applied to, marsupials. We investigated the effectiveness of female mate choice and male scent storage for increasing breeding success of a long-term colony of a small dasyurid, the stripe-faced dunnart (*Sminthopsis macroura*).

Experiments were conducted in captivity using olfactory cues (plastic scent trays marked over 3 days) from males to determine the mate preference of females. At each oestrous cycle, females paired with chosen males following scent trials had significantly more observed matings and sperm detected in their urine than in outbred pairings using pedigree data in 2007, 2006 and 2005. Pairings following mate choice resulted in more than twice the number of pregnancies than outbred pairings using pedigree data. Familiarity between mates did not affect female preferences, but significantly decreased the levels of aggression and minor injuries between mates. Freezing plastic trays marked with male scent did not affect female mate choice and may be a powerful tool for enabling mate preference to be determined before pairings are arranged between captive breeding institutes. The results show that female mate choice can significantly increase breeding success in a captive dasyurid marsupial breeding colony and, potentially, across many species.

POPULATION GENETICS OF SHORT-EARED ROCK-WALLABIES IN THE KIMBERLEY, WA

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The short-eared rock-wallaby (*Petrogale brachyotis*) is found in the Kimberley region of Western Australia, the Northern Territory and offshore islands. This species forms part of the *brachyotis* group within *Petrogale*, along with *P. concinna* and *P. burbidgei*, which are the least understood of all 16 rock-wallaby species (Eldridge and Close 1997). Molecular genetic analyses will be used to investigate genetic diversity and gene flow amongst populations and their phylogeographic structure. Preliminary results indicate high levels of sequence divergence (~5%) amongst mitochondrial DNA control region sequences from *P. brachyotis* populations in the Kimberley. Microsatellite genotyping from ~15 markers and nuclear DNA sequencing will also be utilised to investigate the level of genetic diversity within populations and examine the implications for taxonomic classification and conservation management. These data, together with data from the Northern Territory populations (Telfer 2006) will be used to assist in defining future management and conservation actions for this species.

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ISLAND TRANSLOCATION OF THE NORTHERN QUOLL DASYURUS HALLUCATUS AS A CONSERVATION RESONSE TO THE SPREAD OF THE CANE TOAD CHAURUS MARINUS IN THE NORTHERN TERRITORY

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The northern quoll *Dasyurus hallucatus* has declined rapidly with the spread of the cane toad *Chaurus marinus* across northern Australia, and is now listed as endangered. In response to the collapse of mainland populations in the territory we established two translocated island populations in February 2003. In collaboration with landholders and Indigenous ranger groups, the translocated populations have been monitored at least annually since founding.

This paper presents findings on the progress of the translocated populations. Analysis of mark-recapture data from the most recent monitoring episode shows remarkable population growth.

POPULATION GENETICS OF THE REMNANT SA WARRU (*PETROGALE LATERALIS* MACDONNELL RANGES RACE) COLONIES

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The black-footed rock-wallaby (*Petrogale lateralis* MacDonnell Ranges race), known as 'warru' by Indigenous Owners, is critically endangered in South Australia. There remain approximately 70 individuals in three known colonies, all of which are in the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands. The APY

Lands is freehold land managed by the Aboriginal people of the area, and is located in the far north-west corner of SA, adjacent to the WA and NT borders.

A Recovery Team for this species was established in 2007. Annual trapping at the colonies has been undertaken since 2005, with ear punches taken from all new individuals captured. In 2008, microsatellite DNA analysis was undertaken on 86 samples from the three colonies using 9 previously identified macropod primers. This has provided information on the parentage of the pouch young recently brought into captivity for a captive breeding program. It has also provided insight into the degree of inbreeding in the colonies, mating/population structures, dispersal events and has enabled estimation of colony sizes. Such information will continue to be important in determining how to best manage, and hopefully increase, warru numbers in SA.

INDUCED OVULATION-A CONSERVATION TOOL FOR CAPTIVE BREEDING-REVEALS *SMINTHOPSIS MACROURA* OVIDUCT TRANSIT IS VERY BRIEF AND THE GESTATION PERIOD IS THE SHORTEST OF ANY MAMMAL

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Using our captive colony of *Sminthopsis macroura*, we have developed an induced ovulation protocol that mimics the timing of natural cycles and induces non cycling or non reproductive females to cycle, mate and have embryos or pouch young (PY). This gives a tool that can be used to rescue non breeding animals in captive colonies of endangered polyoestrous and polyovular species. We provide a timetable of development following induction to allow collection of staged oocyte maturation and embryos, time oviduct transit, and obtain viable PY from previously non reproductive females.

The most crucial aspect of the protocol to give precise timing of ovulation was that the equine serum gonadotrophin be delivered in two doses, 2/3 of the dose initially and 1/3 of the dose 4 days later. The regime is robust in that quite high doses can still result in embryos or PY. Following delivery of the first injection at time 0, a 6.5 – 7.0 day follicular phase replicates the 7 days of natural cycling. Oocyte oviduct transit was estimated to be between 40 minutes and 4hrs and the entire ovulation process (multiple ovulation events in each ovary, not necessarily synchronous, oviduct transit and entry to the uterus) was 7.5 hours.

The length of conceptus stages were similar to *in vivo* development and the minimum time of collection from time 0 was 6.9 days to ovulation, 7.2 days to zygote uterine entry and 16.7 days to PY (6) making the minimum length of the gestation period from ovulation to birth to be 9.8 days, the shortest gestation period of any mammal.

A NEW BREEDING SPECIES FOR SOUTH AUSTRALIA: THE AUSTRALIAN FUR SEAL *ARCTOCEPHALUS PUSILLUS DORIFERUS* EXTENDS ITS RANGE FROM BASS STRAIT

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The Australian fur seal breeds on Bass Strait islands in Victoria and Tasmania. In South Australia (SA) the most numerous pinniped is the New Zealand fur seal *A. forsteri*, which produces more than 6,000 pups annually on Kangaroo Island. The Australian fur seal has been recorded in SA for many years as a non-breeding visitor; for example, eight specimens in the SA Museum pre-date 1988. Australian fur seals have been recorded regularly on Kangaroo Island since 1988, mostly in breeding colonies of the New Zealand (NZ) fur seal, particularly in part of the Cape Gantheaume colony on the south coast. Maximum annual counts of Australian fur seals there during summer from 1988-89 to 2007-08 averaged 46 (s.d. 28, range 5 to 109); as their numbers increased, Australian fur seals displaced NZ fur seals from sections of the colony.

Here we document the Australian fur seal as a breeding species in SA. We recorded pups on North Casuarina Island, 400 m off the south-west point of Kangaroo Island (Cape du Couedic); 11 pups were counted in February 2007 and there were 29 in February 2008. They were recognised by their larger size compared to NZ fur seal pups in the same colony. North Casuarina Island has been an important breeding colony of the NZ fur seal, but its pup numbers have decreased since 1992-93 while numbers of the Australian fur seal (all age classes) there increased, from 33 in January 1989 to ca. 500 in January 2008. This is contrary to the trend in SA for NZ fur seal colonies, where pup numbers have been increasing at Kangaroo Island and Neptune Islands and indicates there has been competition for space onshore between the two species.

DIET OF THE RED-TAILED PHASCOGALE (*PHASCOGALE CALURA*) IN ALICE SPRINGS DESERT PARK

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Red-tailed phascogales (*Phascogales calura*) are endangered arboreal dasyurids. A breeding program was established at Alice Springs Desert Park in 2001 to aid species recovery. Twenty five captive-bred phascogales have been released into suitable habitat at the park. The diet of the red-tailed phascogale was investigated by collecting scats from the translocated population August to November 2006 and January to March 2007. Faecal samples were weighed, soaked in hot water and particles separated through sieves before examination under a microscope. The preliminary results from the study found arthropods, feathers, and hair. Further analysis will be undertaken of the area inhabited by the phascogale to identify likely arthropod prey species.

STATUS OF THE REMNANT SOUTHERN HAIRY-NOSED WOMBAT (*LASIORHINUS LATIFRONS*) POPULATION ON THE YORKE PENINSULA, SOUTH AUSTRALIA

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Southern hairy-nosed wombats occur in semi-arid regions of southern South Australia west of the Murray River and in south east Western Australia. In South Australia the distribution of this species is broken up into 5 populations including: the West Coast, Gawler Ranges, Eyre Peninsula, Murraylands and Yorke Peninsula populations. Little is known of the Yorke Peninsula southern hairy-nosed wombat population which is reputedly the smallest and most isolated. A comprehensive field based survey of landholders on the Yorke Peninsula, S.A. was undertaken in 2007 in order to determine the location of remnant colonies of

Southern hairy-nosed wombats in the region. Potential colony sites were visited to confirm identification, location and colony size. Attempts were made to capture a subset of animals from each colony in order to access disease status. Hair samples were collected for genetic studies. Results suggested that few wombat colonies remain on the Yorke Peninsula, with the last remnant colonies spread from Edithburg in the south to Kulpara in the north. Almost all remaining colonies are under significant pressure from intensive agricultural activity. Most animals were concentrated in 3 colonies on the peninsula which comprised approximately 600-800 hundred animals. Sarcoptic mange was confirmed in all three of these larger colonies, and in at least one of these colonies there appeared to be a strong male bias within the population. This data together with previous reproductive studies on wombats from this region suggest that management action is urgently required if the long term viability of the Yorke Peninsula southern hairy-nosed population is to be maintained.

BRUSH-TAILED ROCK-WALLABY HABITAT – MORE THAN JUST ROCKS

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It has been established that rocky refuges from predators are important to brush-tailed rock-wallabies but what about other factors that determine animal distributions? How significant is food availability? Are they influenced by fire history? How affected are they by competition? This study aims to explore the influence of these factors on rock-wallaby distribution.

We surveyed the large rock-wallaby population in Curracabundi National Park (North-east NSW), a mountainous area with diverse vegetation types where hunting by humans and foxes has been minimal. In this 2700 hectare park, we ran approximately 400 transects where rock-wallaby scat densities and a number of habitat variables were measured relating to; food availability, rock complexity, topography, fire history and competitors. For food we considered vegetation type; abundance of grasses, herbs and shrubs; grass quality and fig trees, a favourite food item. We measured rock complexity in terms of height, length, ledges and caves. We measured slope, aspect and elevation in ArcGIS and estimated fire history by eye. Finally, we scored scat densities for potential competitor species: goats and macropods.

Our results scratch the surface of the interplay of factors affecting brush-tailed rock-wallabies, and will show that there's more to rock-wallaby habitat

than rocks.

THE EFFECT OF AMBIENT TEMPERATURE ON THE THERMAL ENERGETICS OF TWO SPECIES OF PYGMY-POSSUM

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The allopatric eastern (*Cercartetus nanus*, 38.9 ± 8.0 g) and western (*C. concinnus*, 14.3 ± 2.5 g) pygmy-possums are small heterothermic marsupials that inhabit mesic and arid environments, respectively. In order to examine the effect of these environmental conditions on their thermal biology, animals were exposed to three different ecologically relevant daily ambient temperature (T_a) cycles representing arid summer (16.5 - 32.5 °C), temperate summer (13.9 - 24.5 °C) and an average winter curve (3.7 - 14.9 °C), as well as their respective stable means (23.6 , 19.0 and 8.7 °C). Metabolic rates, as a function of oxygen consumption, were measured over 1-7 consecutive days, and body temperature (T_b) measurements were obtained from implanted temperature-sensitive transmitters. All animals entered torpor during each measurement, and there was no difference in torpor bout duration between species ($p > 0.5$). Resting and active body temperatures did not differ between Tas for either species; however the minimum T_b during torpor did because it closely followed minimum T_a . The average daily metabolic rate was higher for *C. concinnus* than for *C. nanus* ($p < 0.001$), however it was significantly correlated with torpor bout length for both species for each stable T_a , which underlines the importance of torpor as an energy-saving tool used by these small mammals, regardless of habitat.

QUANTIFYING AND MITIGATING ROAD-EFFECTS ON ARBOREAL MARSUPIALS

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Roads and other linear infrastructure are conspicuous and pervasive components of landscapes throughout the

world. Globally, the road network is continuing to expand as new roads are constructed and existing roads widened. The ecological consequences of the vast road network are only beginning to be understood and mitigation attempted. The aim of our research was to quantify the impacts of roads and traffic on arboreal marsupials and evaluate the use and effectiveness of mitigation works. In this study, we have focused on the impacts of roads and traffic on the movement, dispersal and survival of possums and gliders along the Hume Highway in NE Victoria. The Hume Highway is the major arterial route between Melbourne and Sydney, with approximately 10,000 vehicles per day. The vegetation along the verges and in the median is variable, ranging from high-quality stands of remnant woodland to recent revegetation and mown grass. An extensive program of trapping, radiotracking and genetic analyses of Squirrel Gliders, Common Brushtail Possums and Yellow-footed Antechinus since mid-2005 has shown that the road has a major influence on the spatial organization of these species, restricts road crossing, and reduces survival rates. Aerial rope bridges and glider poles were installed 12 – 15 months ago to restore connectivity. Use of the rope bridges by Ringtail Possums is frequent, but crossings by the other species are yet to be observed. Research on the effectiveness of the mitigation structures at increasing survival rates and population viability is the next critical step.

BASKING BEHAVIOUR AND TORPOR USE IN FREE-RANGING AND CAPTIVE *PLANIGALE GILESI*

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The aim of this study was to examine the importance of physiological and behavioural strategies for the survival of one of Australia’s smallest marsupials, *Planigale gilesi*. Basking behaviour and torpor use were observed in the wild using internal temperature-sensitive transmitters, and the effects of basking and torpor on thermal energetics were quantified in the laboratory.

In the wild, *P. gilesi* used long and deep torpor bouts every night and was observed sunbasking during arousal from torpor. Laboratory studies showed that at an ambient temperature (T_a) of 15°C (similar to T_a at resting sites of wild *P. gilesi*), the metabolic rate of torpid and basking animals was reduced to 7% and 44% of resting rates, respectively. Basking behaviour in their home cages was observed frequently but differed among individuals and basking duration increased after food withdrawal.

This study presents the first body temperature measurement for any free-ranging planigale, and is only the third report of basking in torpid mammals. Torpor and basking are used extensively in the wild, and laboratory studies demonstrate their effectiveness for reducing energy expenditure. These data reveal that the combination of torpor and basking represents an efficient energy conservation strategy, which may play a key role in the survival of these tiny endotherms in their harsh and unpredictable environment.

SUPRELORIN™ IMPLANTS PREVENT REPRODUCTION IN FEMALE BLACK-FLANKED ROCK WALLABIES (*PETROGALE LATERALIS LATERALIS*).

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Isolated populations of black-flanked rock wallabies can increase to the point where they generate problems including crop damage and overgrazing of vegetation in the reserves where they occur, with obvious risks for population persistence. Fertility control using hormone implants has potential for managing population size. We tested whether Suprelorin™, a slow-release implant of the gonadotropin-releasing hormone (GnRH) superagonist, deslorelin, suppresses reproduction in black-flanked rock wallabies. In autumn 2007 we synchronised the reproduction of 66 free-living female black-flanked rock wallabies by removing pouch young (RPY) at Mt Caroline Nature Reserve (wheatbelt, W.A.). We treated females with 4.7 or 9.4 mg implants of deslorelin, or a placebo (n = 22 for all treatments). Females were monitored for 10 months for the presence of new pouch young. We challenged females with GnRH (2.5 µg/kg im) in spring 2007 and summer 2007-08 as a second measure of suppression of reproduction. Deslorelin suppresses pituitary function and we expected that suppressed females would show no hormonal response but control females would show a rise in Luteinising Hormone (LH). Following RPY, diapaused blastocysts reactivated in 5/15 recaptured females treated with 9.4 mg and carried through to weaning. Subsequently, none of these 5, or any of the 33 other recaptured wallabies treated with deslorelin conceived. Wallabies treated with a placebo responded to the GnRH challenge with a

marked rise in plasma concentrations of LH but deslorelin treated females did not. Suprelorin™ blocks the hypothalamic-pituitary-gonadal axis and inhibits reproduction for at least 10 months in female black-flanked rock wallabies.

DEMOGRAPHY AND PATHOLOGY OF AN OVERABUNDANT KANGAROO POPULATION

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Eastern grey kangaroos (*Macropus giganteus*) can reach high densities in peri-urban parks. However, density-dependent effects on survival, growth and reproduction in this species are poorly understood. This paper reports on aspects of the demography and pathology of eastern grey kangaroos at Serendip Sanctuary, Victoria. The kangaroos at this site, reached very high densities (4.5 kangaroos/ha in December 2006) and there was a high mortality rate. We measured age structure, sex ratio, body condition and reproductive success of 114 kangaroos culled for management purposes in May 2007. In addition, we collected 550 skulls from carcasses of kangaroos that died within the park between 2006 and 2008. The culled sample representing the living population was highly adult biased (88%) with a highly skewed sex ratio of 7.4:1 (female: male). Fecundity was very low in adult female kangaroos: only 23% had a pouch young. Sex-age mortality and pathology will be discussed from measurements of the skull sample. There was a high prevalence (approximately 50%) of lesions associated with the jaw disease 'lumpy jaw'. This disease is often reported in captive macropods but there have been few records of it in the wild.

HOME RANGE AND HABITAT OCCUPANCY OF A REINTRODUCED POPULATION OF EASTERN BARRED BANDICOOTS

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Thirty Eastern Barred Bandicoots were reintroduced into Hamilton Community Parklands, in south west Victoria, in 2007. This is a 100-ha reserve containing areas of grassy woodlands and open grasslands, surrounded by a predator barrier fence. Bandicoots are small (kg), cryptic

marsupials that rest in a grass nest during the day and forage on invertebrates at night. It was assumed that grassy woodlands are the optimum habitat for bandicoots, so all releases occurred into these areas. Population density and habitat occupancy was monitored in five seasons, by trapping and counting foraging digs, on a grid of 60 plots covering the entire reserve. Male bandicoots, on average, were found to be occupying a larger home range area (11.6 ha) than females (2.1 ha) and had a greater range span (747 m and 272 m for males and females respectively). The number of plots occupied, based on captures and dig counts increased from 47% in winter 2007, to a maximum of 95% in winter 2008. The majority of grassy woodland plots (92%) had been occupied by spring 2007 and most grassland plots (83%) were occupied by summer 2008. The increase in number of plots occupied was not correlated with the number of bandicoots known to be alive, which has ranged from 22 to 33 individuals, suggesting that habitat selection has not been forced by increased population size.

METABOLIC AND HYGRIC PHYSIOLOGY OF THE LITTLE RED KALUTA, *DASYKALUTA ROSAMONDAE* (MARSUPIALIA: DASYURIDAE)

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The little red kaluta (*Dasykaluta rosomondae*) is a small (35 g) dasyurid marsupial found in arid spinifex grasslands of the Pilbara region, Western Australia. Kalutas resemble other dasyurids in many aspects of their physiology. In the thermoneutral zone (26-33 °C), body temperature (33.5 °C), evaporative water loss (1.4 mg g⁻¹ h⁻¹), wet thermal conductance (4.7 J g⁻¹ h⁻¹ °C⁻¹) and dry thermal conductance (3.3 J g⁻¹ h⁻¹ °C⁻¹) are not different from allometric predictions, without and with phylogenetic correction. They readily use torpor at low ambient temperatures for energy and water savings. Nevertheless kalutas appear to have some specialisations to their arid habitat. Body mass is substantially less than that expected based on its phylogenetic position (200 g). They have a low basal metabolic rate and are very thermolabile, which presumably confer significant energy savings. Their point of relative water economy of 18°C is surprisingly high, despite its water-rich carnivorous/insectivorous diet, and this could be interpreted as an adaptation to its very arid distribution.

ONGOING DECLINE IN THE NATIVE MAMMAL FAUNA OF THE TOP END

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In 1999, we reported decadal-scale decline in a range of native mammal species at Kapalga (Kakadu NP), with evidence of decline at a range of other sites in northern Australia. Of concern then was that the declines were particularly evident for those types of species that have proven extinction-prone elsewhere (larger rodents, larger dasyurids, possums and bandicoots). In the decade since, we (and others) have undertaken a series of studies and monitoring programs that have corroborated ongoing decline and helped clarify the pattern and causal factors. The studies have included broad-scale documentation of Indigenous knowledge of mammal status; autecological studies of individual species, focusing particularly on their critical resources and their responses to putative threats; experimental manipulation; broad-scale distributional survey; and substantial monitoring on conservation reserves. This research has demonstrated that mammal declines are general but patchy across tenures, land uses and regions, but with typically better persistence on islands. In the last decade, there has been major decline in the mammal fauna of the most intensively monitored site (Kakadu NP). Causal factors may differ between species and regions, but predation by feral cats is most likely to be the most significant problem, with inappropriate fire regimes being detrimental and also likely to increase the intensity of predation. Disease may also be involved, but there is not yet compelling evidence. A substantial management response will be required to redress the problem.

GUIDELINES FOR THE KANGAROO WHISPERER: FINDING WAYS TO MINIMIZE DISTURBANCE DURING APPROACH OF KANGAROOS ON FOOT AND BY CAR

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Wildlife icons like the Australian kangaroo species are major tourist attractions. Tourists seek close encounters and overcome distance by approaching wildlife. Species typically react with energy demanding processes such as vigilance and flight that may be detrimental to fitness in the long-term. In this study we examined how tourists approach free-living kangaroos during encounters in a popular Outback tourism destination, the Flinders Ranges of South Australia. We then simulated the typical properties of approaches to quantify the behavioural reactions of Red Kangaroos (*Macropus rufus*) and Euros (*M. robustus erubescens*) in relation to the disturbance context (including species, sex class, group size, cover, time of day and wind speed).

Approach varied in respect to access (on-trail, off-trail), transport (on-trail: hiking, driving; off-trail: hiking) and approach style (on-trail: continuous, stop-and-go; off-trail: direct/continuous, direct/stop-and-go, direct/stop-and-go/talking, tangential/switchbacks/stop-and-go). On-trail approach elicited less kangaroos to flee and shorter flight initiation distances (FIDs). In addition, Red Kangaroos' flight response was more efficient as the distances moved for every metre of safety distance gained were shorter. Following a vehicle approach fewer kangaroos fled and more time was spent with maintenance activities. FIDs and flight paths (FPs) were shorter after an on-trail stop-and-go approach but only if the person was hiking and after an off-trail direct/stop-and-go approach. Approaches in the evening rather than the morning, in habitat with cover and during days with wind speeds of less than 10 km h⁻¹ triggered shorter FIDs and/or FPs. Generally, Euros were less flighty than Red Kangaroos and females with large pouch young elicited a lower response than females without obvious pouch young, females with young-at-foot or males. The results suggest that wildlife tourists should be educated to the best choice of approach behaviour and viewing conditions and thereby reduce aversive reactions in kangaroos and mediate closer observations. This is likely to increase visitor satisfaction and may assist protected-area managers in promoting compliance with low-impact behaviour.

POSTER SESSION

MORPHOLOGICAL VARIATION OF THE GASTROINTESTINAL TRACT OF OLD ENDEMIC MURINE RODENTS WITH PARTICULAR REFERENCE TO SPECIES FROM NORTHERN AUSTRALIA

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Within the monophyletic group of Australo-Papuan Old Endemic rodents, diets differ markedly across species. In northern Australia species are either largely granivorous - *Pseudomys delicatulus*, *Zyomys maini*, *Conilurus penicillatus*, carnivorous - *Hydromys chrysogaster*, *Xeromys myoides*, partly or largely herbivorous - *Melomys burtoni*, *Pseudomys nanus*, frugivorous - *Mesembriomys gouldii*, or frugivorous/omnivorous - *Uromys caudimaculatus*. Here we ask the question: how much morphological divergence has evolved in the anatomy of the GI tract? Using fixed material we determined the absolute and relative sizes of corpus (=fore) and antral regions of the stomach, relative lengths of small and large intestines, and size and shape of the caecum. Our findings show that, although the granivorous and omnivorous species have roughly equal volumes of corpus and antral stomachs, in *M. burtoni* and *U. caudimaculatus*, the corpus makes up ca. 65% of the total volume and contains abundant bacteria, whereas, in *H. chrysogaster* the stomach is relatively small with the corpus making up only ca. 25%. The small intestine generally comprises 65% of the total intestinal length, but in *H. chrysogaster* and *X. myoides* the small intestine makes up ca. 90%. The caecum varies greatly from being long and vermiform in *C. penicillatus*, to C-shaped in *Pseudomys nanus* and *Z. maini*, large and sacculated in *M. burtoni* and *M. gouldii*, large and non-sacculated in *U. caudimaculatus*, and relatively small and non-sacculated in *H. chrysogaster* and *X. myoides*. These observations show that, amongst the Australo-Papuan Old Endemic murine rodents from northern Australia, dramatic differences have evolved in the relative size and proportions of the GI tract.

GENETIC IMPACTS OF CULLING

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Management plans often aim to ensure long-term persistence of populations, which usually translates into maintaining population sizes. Many species regulate population dynamics in response to high mortality rates, which explains how high levels of harvesting may not result in low population sizes. This presents the possibility that the ratio between effective and actual population size may change through time, and thus population size may not be the best indicator of population health. The gray wolf, *Canis lupus*, is often actively managed and annual culling rates above 30% appear not to significantly reduce population sizes. This culling may have other important effects, such as adversely affecting genetic diversity. Here, we studied a gray wolf population that is coastally distributed, encompassing the Alaska/British Columbia border. This population has an independent evolutionary history from its inland counterparts, with low levels of east-west migration. Yearly levels of hunting are low in coastal British Columbia (%) and high in southeast Alaska (15 - 30%). We genotyped 13 microsatellite loci from 118 wolves in order to compare levels of genetic diversity. We show that high levels of hunting of southeast Alaskan wolves have resulted in significant declines in genetic diversity. This population is healthy in terms of abundance, its long-term survival may be undermined, especially if immigration from British Columbia is reduced, a likely consequence of planned development. Genetic diversity affects the survival of populations and individuals, and therefore, genetic diversity data should be included in management plans.

A GIS-BASED HABITAT SUITABILITY MODEL FOR THE BRUSH-TAILED ROCK-WALLABY (*PETROGALE PENICILLATA*) IN THE GRAMPIANS NATIONAL PARK

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Previous surveys of habitat for the threatened Brush-tailed Rock-wallaby (*Petrogale penicillata*) in the Grampians National Park have been limited by the time required to conduct field survey and have relied on previous field work by others to direct survey effort. Point data from 82 historic occupation sites of *P. penicillata* were analysed to contribute to a landscape

level habitat suitability model. The analysis included a range of habitat variables which were then used to generate a habitat suitability index (HSI). A hexagonal grid was developed in preference to a square grid to better fit the topographical features. Several iterations of various modelled scenarios were trailed by varying the proportional weighting of the individual habitat parameters. Further refinement of the model was achieved by spatial analysis of contemporary predator densities and surface water availability during drought. The model will be used to assist in the direction of ground survey for suitable translocation sites within the Grampians National Park and adjacent areas.

DIVERSE ASSEMBLAGE OF FOSSIL DASYURIDS FROM A MID-PLEISTOCENE RAINFOREST

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Dasyurids are one of the most diverse groups of marsupials. It is thought that they radiated in the late Miocene or early Pliocene in response to climatic drying. That interpretation is supported by the high diversity of extant xeric-adapted dasyurids, the relatively low diversity of mesic-adapted species, and the low diversity of fossil dasyurids in Miocene rainforest sites.

Fossil sites in the Mount Etna region (eastern central Queensland) contain the only known record of Pleistocene rainforest vertebrates in Australia. It was hypothesised that dasyurid assemblages from these sites would be of low diversity, while more recent sites in the same area would have higher diversity as the regional climate dried and the rainforest disappeared. Dasyurid assemblage diversity in four sites representing different habitats was compared using rarefaction analysis.

Surprisingly, the highest diversity was found in the older rainforest sites, which contained assemblages with diversity comparable to those of modern xeric habitats.

Most taxa in the Mount Etna rainforest sites are undescribed, indicating that dasyurids diversified in

both xeric and mesic habitats. Rainforest retraction in the mid-Pleistocene caused the extinction of many of the mesic-adapted taxa. The modern situation of high diversity xeric habitats and low diversity mesic habitats is thus the result of extinction of mesic-adapted taxa rather than diversification only in more arid settings.

UNDERSTANDING DISPERSAL PATHWAYS IN FRAGMENTED HABITATS: THE POWER OF GPS TRACKING

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Most studies of dispersal have applied genetic analyses of relatedness between populations to infer the exchange of genetic diversity. While this provides a measure of population mixing, exactly how this mixing has come about remains unknown. Behavioural observations, using radio-telemetry or mark-recapture, identify individual dispersers and dispersal distances but cannot inform about the actual pathways through the habitat. However, it is precisely this information that is required to understand the level of habitat structural complexity that animals require for successful dispersal. Such information is essential if we wish to effectively link individual habitat patches, via habitat restoration or preservation, to sustain meta-populations on a landscape scale. GPS collars, that automatically record animal positions at set time intervals, provide such data at a previously unattainable temporal resolution, while avoiding the disturbance associated with manual tracking. Here we present preliminary data from a study using GPS collars to track movements of mountain brushtail possums (*Trichosurus cunninghami*) of dispersal age, in a highly fragmented landscape in the Strathbogie Ranges, Victoria. The locations recorded (one fix per hour during the animals' nightly activity period) clearly demonstrated that they avoided open land, instead travelling along forested roadside corridors, thus moving longer distances than direct routes through cleared agricultural matrix. Nevertheless, they occasionally entered the matrix and crossed small gaps between habitat patches or roadside corridors. These results emphasise the value of GPS tracking to studies of habitat selection by dispersing animals. The high quality of the data justifies their considerable purchase price.

ASSESSING THE EFFECT OF HABITAT TYPE AND DISTURBANCE ON POPULATION SIZE AND STRUCTURE IN THE COMMON BRUSHTAIL POSSUM (*TRICHOSURUS VULPECULA*) AND OTHER MAMMAL SPECIES IN PRODUCTION FORESTS IN TASMANIA

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Brush-tail possums (*Trichosurus vulpecula*) are one of the most widely recognised hollow-users in Australia. However, despite the species being regarded as 'common', little is known of the impacts of habitat disturbance on brush-tail possum ecology. This study aims to investigate the size and structure of brush-tail possum populations in disturbed and undisturbed areas and to assess species diversity amongst the other mammals trapped at these sites. Sites have been established in dry *Eucalyptus* forest disturbed (logged/burned) and control (unlogged) sites in SE TAS and wet *Eucalyptus* forest disturbed (logged) and control sites in NE TAS. Animals are trapped at each site biannually; data (sex, body mass, relative age, and presence/absence of pouch young) are gathered on all animals.

Possum population sizes are similar at the dry forest sites but at the wet forest sites, the disturbed site population is substantially lower than that of the control site. Adult brush-tail sex ratios are significantly different, with a 50:50 sex ratio for the control populations and a 70:30 male:female ratio for the disturbed population in both forest types. This male bias may reflect intraspecific competition for prime den sites at the disturbed sites. Preliminary results also indicate that species composition is similar between dry forest sites. In the wet forest sites, although native species were found in higher numbers at the control site, species diversity is higher at the disturbed site. This contrasts with other studies which have found that fauna diversity is negatively impacted by logging disturbance.

ECOLOGY OF AN INLAND POPULATION OF COMMON RINGTAIL POSSUMS (*PSEUDOCHEIRUS PEREGRINUS*): COMPARISON WITH COASTAL STUDIES

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Although the Common Ringtail Possum, *Pseudocheirus peregrinus*, is considered abundant throughout Australia, there is evidence to suggest that populations are declining in inland NSW. Previous studies of the Common Ringtail Possum in south-eastern Australia have focused on coastal populations so little is known about inland populations. Studies of the closely related Western Ringtail Possum in south-western Australia have found that coastal populations build dreys whereas inland populations nest in tree hollows. Therefore, the purpose of this study was to compare the ecology of an inland population of Common Ringtail Possums located at Black Rock Ridge in central west NSW with previous studies of coastal populations. Data collection took place over four consecutive days and nights during April, using spotlighting to determine population size, habitat analysis to determine habitat requirements, nest site identification to determine nesting habits, and bird surveys, hair samples, tracks and scats to identify potential competitors and predators. This research identifies the basic needs of inland Common Ringtail Possums so that appropriate species conservation strategies can be developed as necessary.

THE USE OF PRINTED BIOSENSORS TO MEASURE PROGESTERONE, AND ITS APPLICATION TO THE ASSESSMENT OF OVARIAN FUNCTION IN THE NUMBAT (*MYRMECOBIUS FASCIATUS*)

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A biosensor system using screen printed sensors was developed to measure progesterone as an index of ovarian function, and compared with a standard enzyme immunoassay (EIA). The sensors were coated with a monoclonal progesterone antibody and incubated in a mixture of sample/standard and progesterone-3-CMO-horseradish peroxidase (Prog/HRP). The endpoint was the change in potential read after 30 minutes following the addition of sodium perborate. The assay

was optimised in terms of the Prog/HRP concentration, the antibody dilution and incubation times. It was then used to measure progesterone in the urine of five female Numbats (*Myrmecobius fasciatus*). Results were available using the sensors within 20 minutes compared to the standard EIA protocol of 2.5hrs. The serial dilution of a urine sample taken at the diestrus stage showed parallelism with the serially diluted standard. A significant rise in progesterone (mean±sem) after mating compared to before was seen for both the EIA (1.31±0.20 to 3.70±0.13 ng/ml) and the sensor (1.83±0.33 to 4.02±0.61 ng/ml), and there were no significant differences between the sensor and EIA results at either stage (all p<0.1). A comparison of the values obtained with the sensors to those obtained with the conventional EIA showed a significant correlation for each of the animals (r=0.82 to 0.99). It is concluded that the biosensor system is a viable alternative to conventional EIA, and provides the advantage of (a) a shorter assay time and (b) greater potential for use in the field.

FEEDING NUMBATS (*MYRMECOBIUS FASCIATUS*) WITHIN A CAPTIVE BREEDING PROGRAMME: SEASONAL VARIATION IN THE YIELD OF TERMITES COLLECTED FROM BUSHLAND SITES

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Being termitivorous, captive Numbats (*Myrmecobius fasciatus*) require a regular supply of termites for food. A total of 789 drums were therefore used over a two year period, 1996/97 and 1997/98, to collect termites for the Native Species Breeding Programme at Perth Zoo. *Coptotermes sp.* were collected by packing 20 litre metal drums with karri (*Euclayptus diversicolour*) slats and placing them on the ground over termite galleries in the jarrah (*E. marginata*) forests of Mundaring and Byford. *Nasutitermes sp.* were obtained by placing drums over raised nests in Banksia woodland around Welshpool. Drums were soon invaded by termites and collected 2-3 weeks later. Once at Perth Zoo, termites were recovered by removing the slats and tapping them into trays for further separation from debris. The termites from each drum were weighed and kept refrigerated until use. A peak yield (mean ± sem) for *Coptotermes sp.* of 266.9 ± 15.1 g/drum was seen in January dropping to 64.5 ± 13.0 g in July. The peak yield of *Nasutitermes sp.* was seen in November (454.3 ± 148.6 g/drum) and this declined to 146.0 ± 43.3 g/drum in April. It is concluded that the

maximal yields of *Coptotermes sp.* and *Nasutitermes sp.* do not coincide, and that the peak yield of *Coptotermes sp.* occurs during the summer months declining to the lowest yield in winter. Strategies have been introduced to store surplus termites frozen, and the effort and cost of collecting termites should not be underestimated when setting up a large colony of Numbats.

AN ENIGMATIC NATIVE RAT, *RATTUS SP.*, OF THE NORTH KIMBERLEY, W.A.

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During live trapping on Doongan and Theda stations (126°418'40.578"E, 15°422'50.728"S; 126°429'43.932E, 14°447'20.052S) in the north Kimberley, several species of native rodents were collected. These included *Melomys burtoni*, *Zyomys argurus*, two *Pseudomys* (*P. nanus* and *P. delicatulus* sp?), and at least three *Rattus* species. The *Rattus* species captured included *Rattus villosissimus* (n=3) and *R.tunneyi* (n=38), with another group of individuals not yet identified. The latter animals collected were sexually mature with the male producing sperm and one of the two females being pregnant with five foetuses. Morphological analysis confirmed that the sperm were indeed *Rattus*-like, with the sperm head having a single, long, apical hook. The animals were grey-brown on the back and flanks, with cream-coloured fur on the underparts. Body weights ranged from 65-94 g, tail length 87-109 mm and ear length 14-15 mm, with the head length 33-38 mm. The arrangement of footpads, colour of tail and structure of hair have failed to reveal the identity of these individuals at this stage. Future morphological and molecular studies are planned to determine the specific identity of these animals.

A DYNAMIC MODEL TO PREDICT CHANGES IN GENETIC DIVERSITY AND INBREEDING IN CLOSED POPULATIONS

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Captive breeding programs often struggle to maintain genetic diversity in their breeding populations, which are usually evolved from a small number of founders and therefore limited in diversity from the outset.

Additionally, in the case of highly endangered species there may be no opportunity to replenish genetic diversity in captive stock from unrelated populations. We have developed a dynamic model to explore how allelic diversity, heterozygosity and inbreeding change in a closed population over time. This model can be used to predict for how many generations genetic diversity can be maintained at a desirable level or to compare how different breeding regimes will affect the amount of diversity lost from the population in a given amount of time. A file of diploid genotypes of any sort of markers is read into the model and the genotypes are “mated” *in silico* to simulate the random assortment of gametes at meiosis for a specified number of generations. The population size, expected heterozygosity, allelic diversity and inbreeding coefficient are calculated at each generation. The model includes realistic population parameters such as recruitment rate, fecundity and length of reproductive life which determine the number of individuals present and breeding at each generation. We use the captive and wild populations of the southern ESU of the brush-tailed rock-wallaby (*Petrogale penicillata*) to demonstrate how expected heterozygosity, allelic diversity and the inbreeding coefficient change over time in a highly endangered, closed population, given different breeding regimes. Currently, the model is written in the MATLAB programming environment.

**DEVELOPING ABUNDANCE ESTIMATES,
BASED ON DIGGING INTENSITY, TO
UNDERSTAND THE IMPACTS OF PRESCRIBED
BURNING ON THE LONG-NOSED POTOROO
(*POTOROUS TRIDATYLUS*)**

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Prescribed burning of native vegetation is being used increasingly in southern Australia to reduce the risk of high intensity wildfires. Despite this, there is little

ecological information available about how altered fire regimes impact on native fauna. The long-nosed potoroo is a small mycophagous macropod that forms an important ecological tripartite relationship with hypogean fungi and mycorrhizal trees (such as eucalypts). This species is classed as endangered in Victoria but a robust population still persists in the French Island National Park. Establishing study sites and trapping potoroos requires a large amount of time and effort, and this effort can often go unrewarded, with low trap success typical for potoroids. Therefore, other census methods, using secondary signs of potoroos, need to be developed to gain a better understanding of the abundance and distribution of potoroos. An index of potoroo abundance is being developed by relating digging intensity (by counting digs along fixed transects) to known abundance of animals at sites with a trappable population. This index will be used to provide information of presence/absence and estimates of potoroo abundance at other sites of varying age since fire, both on French Island and other localities in Victoria. The results of my project will improve our understanding of how prescribed burning affects long-nosed potoroo populations and provide managers with reliable estimates of potoroo densities that were not possible within the logistic constraints of current trapping programs for such rare and elusive animals.

**FIRE, TOPOGRAPHY AND CANE TOADS:
EFFECTS ON SMALL MAMMAL DISTRIBUTION
AND ABUNDANCE IN BURRELLS CREEK
CATCHMENT, NORTHERN TERRITORY**

Sze-En Lau^a, David B Croft^{a,b} and Vivienne Sobek^c

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This study was an investigation into the propensity for cane toad-induced predator-release to be elicited in small mammal communities in a catchment in the fire-prone wet-dry tropical savannahs of the Northern Territory, Australia. Predator-release theory suggests small mammal numbers will increase as their larger predators are lost to cane toad poisoning. Thus the distribution and abundance of a small mammal community was systematically sampled across the riparian zone in the uplands, lowlands and around human habitation of the catchment of a representative permanent creek where

cane toad abundance was likely to vary with topography. Wildfires entered the site during the study and burnt the northern side of the creek. Thus matched burnt and unburnt sites were sampled. The immediate effects of burning and the time since last fire were dominant over topography in differentiating quality of small mammal habitat across the catchment. Small mammal richness and distribution varied as a function of fire history (contemporary and past) rather than topography and cane toad abundance. A greater variety of small mammal species was more frequently captured in unburnt habitat, especially at the maximum time (7 y) since last fire. The results of this study emphasise the value of unburnt land as habitat for fire-sensitive small mammal communities and reinforce the long-held opinion that fire is the most pervasive natural driver of wet-dry savannah biodiversity. Cane toads, although more abundant in the lower reaches of the catchment, were present on all sites and thus their effects on frog-eating predators may be pervasive.

TOOTH WEAR AND AGE ESTIMATION IN KANGAROO

Soichiro Tomo^{1,2}, Ikuko Tomo^{2,3}, Grant C. Townsend², Kazuaki Hirata¹ Department of Anatomy, St. Marianna University, Kawasaki 216-8511, Japan, ²Dental School, The University of Adelaide, SA 5005, Australia, ³South Australian Museum, North Tce, Adelaide, SA, 5000

In some mammals, such as elephants, sirenians and grazing kangaroos, the molars erupt successively behind their precursors, with the anterior tooth in a quadrant being shed from the anterior edge of the tooth row as the entire row moves forward. This feature is called molar progression (MP) (Lentle et al. 2003). In general, tooth wear is often employed for age estimation of wild animals (Martin 1981). Molar Index (MI), which is determined by the relative positions of molars, has been used for age estimation of grazing kangaroos (Kirkpatrick 1964). Wear and MP were thought to be decoupled (Domning 1984, McArthur 1988). We studied the correlation coefficient between wear of residual teeth and MP. Forty skulls of grey kangaroos (*Macropus fuliginosus*) in the South Australian Museum have been used for this study. Wear classes were devised; modified from McArthur (1988). The molars (M^1 - M^4) on the right side of the maxillae have been examined and summed up total wear classes calculated on each specimen. MI (Kirkpatrick 1964,65) has been recorded. R^2 (decision coefficient) values were about 0.8. There is a strong correlation between total wear class and MI. Tooth wear might be able to be employed for age estimation of grazing kangaroos.

Nick Gascoigne, Director
Exotic Species Regulation Section, Wildlife Branch
Department of the Environment, Water, Heritage and the Arts
GPO Box 787
CANBERRA ACT 2601

17 July 2008

Dear Mr Gascoigne

Re: Importation to Australia of the Savannah Cat (Domestic Cat X Serval)

The Domestic Cat has proven to be one of the Australia's most environmentally devastating pests which, considering the competition, is a strong statement against any action that knowingly increases that threat. The environmental risk of importing the Savannah Cat to Australia may not be extreme, but it is clearly great enough that avoidance is better than future regret.

It has been emphasised by cat breeders that the Savannah Cat hybrids offered for sale will be only 3-6% of the genotype of the Serval. Whilst true, this needs to be seen in the context of how much influence a small difference in genotype can make to the phenotype and behaviour of a species (as illustrated by the mere 5% genetic difference between humans and chimpanzees).

Some Australian breeders are proposing to sell Savannah Cats as de-sexed individuals. However, there is no legal requirement to do so and the voluntary plan will not be enforceable. Likewise, the potential contracts by which some breeders propose to bind purchasers to specific care, containment and disposal of Savannah Cats will be neither legally binding nor regulated. These actions should be not considered as a realistic amelioration to the risks posed by the Savannah Cat.

Escape of Savannah Cats is likely to occur, as evidenced by the Domestic Cat's well-known ability to defeat confinement. Allowed wandering is also not unlikely as owners of Domestic Cats have consistently proven, even with relatively expensive breeds. The high cost of Savannah Cats offers some hope that they will be contained, yet the diverse response of owners and nature of the cat itself must be considered in assessing this risk.

Although any attempt by an escaped or released Savannah Cat to breed with feral cats will result in further dilution of Serval genes, it is still the case that the introduction of any Serval characteristics to the feral cat population will cause further harm to the Australian environment. Based on the precautionary principle, the Australian Mammal Society recommends that the Savannah Cat not be approved for import and sale. The members of the Society will be eager to learn what action you have taken toward protecting Australian biodiversity from further risk.

Yours sincerely,

Dr Todd Soderquist

Conservation Officer
Australian Mammal Society
PO Box 494
Armidale NSW 2350



Australian Government

Department of the Environment and Water Resources

Dr Todd Soderquist
Australian Mammal Society
PO Box 494
ARMIDALE NSW 2350

Dear Dr Soderquist

Thank you for your letter of 31 August 2007 to the Minister for the Environment and Water Resources, the Hon Malcolm Turnbull MP, concerning threatened Tasmanian Devil. I have been asked to respond.

The Australian Government has provided \$3 million to the Tasmanian Government to respond to the threat of the Devil Facial Tumour Disease. This funding will be used in conjunction with the Tasmanian Government's commitment of \$1.5 million to implement the strategic plan which aims to understand the disease and carry out priority actions likely to conserve and protect the species.

The Australian Government is a member of the Devil Facial Tumour Steering Committee which is responsible for providing advice and direction on the best way to use the funding. It is pleasing to note the progress made in diagnosing the cause of the disease and in working towards a better understanding of how it is transmitted between individual devils, and trialling disease suppression techniques in the wild.

As you identify, establishing 'insurance populations' is an important step. It is reassuring that an increasing number of healthy individuals have been relocated to mainland zoos and that a further 30 individuals have recently been captured from disease free areas in Tasmania's north west, to boost captive breeding numbers and provide genetic diversity.

In addition, insurance populations at four mainland zoo have been established and a disease suppression trial on the Forestier Peninsula is showing promise in maintaining wild populations with limited management. A considerable effort has also been invested in monitoring the geographic distribution of the disease and its impact on wild devil populations. Part of this \$1 million for 2007/08 includes funds for the implementation of an insurance population strategy.

The Steering Committee is also investigating the best way to market the Tasmanian Devil nationally and internationally, to generate further philanthropic and sponsorship funding interest to be directed towards ongoing management of the species in the wild and to explore collaborative opportunities for research.



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Thank you for your offer of assisting in the preparation of the recovery plan. I will forward a copy of your letter to the Tasmanian Department of Primary Industries and Water, who are preparing the recovery plan, for their consideration.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Mark Flanigan', with a long horizontal stroke extending to the right.

Mark Flanigan
Assistant Secretary
Strategic Approvals and Legislation Branch
9 October 2007



Tasmania

MINISTER *for* PRIMARY
INDUSTRIES *and* WATER

16 OCT 2007

RECEIVED
22 OCT 2007
DECC Armidale

Mr Todd Soderquist
Australian Mammal Society
PO Box 494
ARMIDALE NSW 2350

Dear Mr Soderquist

Thank you for your letter of 31 August 2007 regarding the Tasmanian devil. I am pleased that the Australian Mammal Society appreciates the seriousness of the situation faced by the Tasmanian devil and the importance of funding by the Australian and Tasmanian Governments to enable timely action.

I am also pleased to hear that the Australian Mammal Society endorses the establishment of free-roaming devil populations as part of the overall Insurance Population Strategy that was endorsed by the Steering Committee of the Save the Tasmanian Devil program in July this year.

My Department is preparing plans for implementation of the Insurance Population Strategy to ensure that the insurance population is located at numerous sites and that it includes both intensively managed captive animals and free-roaming animals in locations that are isolated from the disease. The possibility of wild to wild translocation of devils to Tasmanian islands is one component of the Strategy that is under consideration but as you correctly point out islands need to be carefully assessed for their long-term suitability.

The concept of very large fenced enclosures on the Australian mainland is in accordance with the Strategy and its feasibility is also being assessed.

A draft National Tasmanian Devil Recovery Plan is being drafted which will be released for public comment later this year.

Yours sincerely

David Llewellyn MHA
MINISTER FOR PRIMARY INDUSTRIES AND WATER