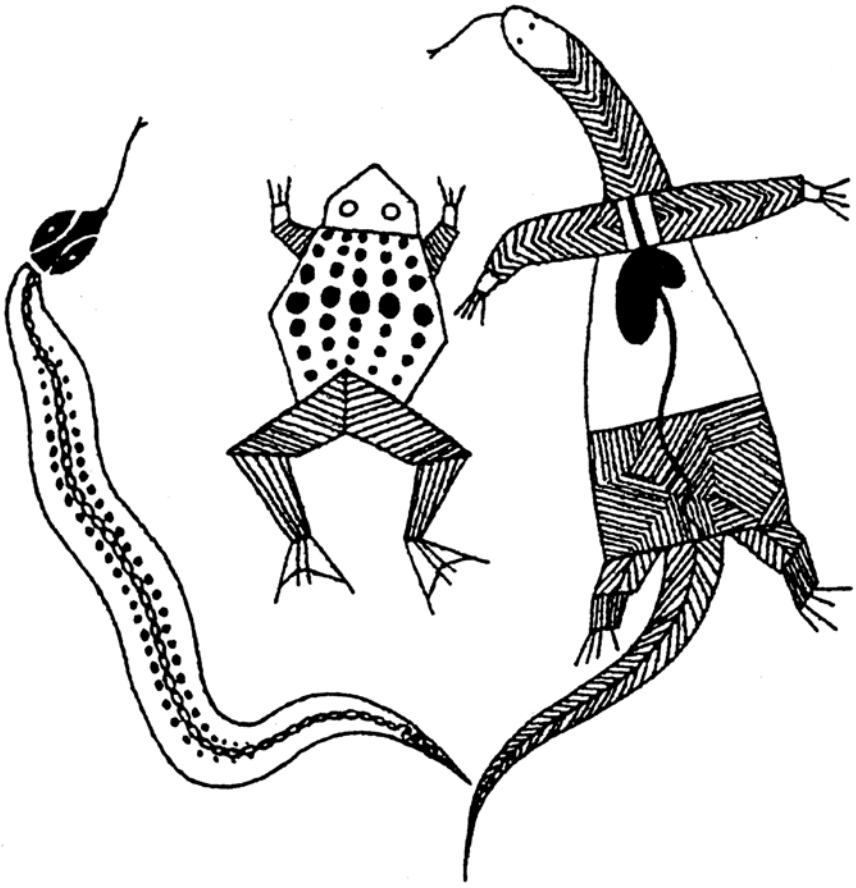
THE AUSTRALIAN SOCIETY OF

HERPETOLOGISTS

INCORPORATED



NEWSLETTER 41

Australian Society of Herpetologists Incorporated
History of Office-bearers

Formation Committee (April 1964)

Convenor, MJ Littlejohn; Editor, AK Lee; State Representatives, IR Straughan (Qld), FJ Mitchell (SA), HG Cogger (NSW), G Storr (WA), RE Barwick (ACT), JW Warren (Vic).

First AGM (23 August 1965)

President, MJ Littlejohn; Vice-President, NG Stephenson; Secretary-Treasurer, AA Martin; Asst. Secretary-Treasurer, KJ Wilson; Ordinary Members, FJ Mitchell and IR Straughan; Editor, AK Lee.

President: MJ Littlejohn (1965-69); AK Lee (1969-1970); HG Cogger (1971-73); J de Bavay (1974); H Heatwole (1975-76); GC Grigg (1976-77); MJ Tyler (1978-79); GF Watson (1979-81); AA Martin (1981-82); RS Seymour (1982-83); R Shine (1983-84); GC Grigg (1984-86); J Coventry (1986-87); RE Barwick (1987-88); Jcovacevich (1988-91); M Davies (1991-92); R Shine (1992-94); A Georges (1994-96); D Roberts (1996-98); M. Bull (1998-1999); R Swain (1999-2001); S Downes (2001-).

Vice-President: NG Stephenson (1965-67); RE Barwick (1967-69); HG Cogger (1969-70); MJ Littlejohn (1971-72); MJ Tyler (1973); HG Cogger (1974); J de Bavay (1975-76); H Heatwole (1976-77); GC Grigg (1977-79); MJ Tyler (1979-80); GF Watson (1981-82); AA Martin (1982-83); RS Seymour (1983-84); R Shine (1984-86); GC Grigg (1986-1987); J Coventry (1987-88); RE Barwick 1988-91); J Covacevich (1991-92); M Davies (1992-94); R Shine (1994-6); A Georges (1996-98); D Roberts (1998-99); M Bull (1999-2001); R Swain (2001-).

Secretary/Treasurer: AA Martin (1965-67); GF Watson (1967-72); LA Moffatt (1973-75); J Caughley (1975-76); RWG Jenkins (1976-77); M Davies (1978-83); G Courtice (1983-87); J Wombey (1987-1999); S Keogh (1999-).

Asst Secretary/Treasurer: KJ Wilson (1965-69); JJ Loftus-Hills (1969-70); DF Gartside (1971-72); J Barker (1973-75); R Longmore (1976-77); T Burton (1978-83); A White (1983-86); E Bugledich (1986-90); A Georges (1990-94); T Burton (1994-1999); I Scott (1999-).

Ordinary members: FJ Mitchell (1965-67); IR Straughan (1965-67); HG Cogger (1967); JL Hickman (1969-70); NG Stephenson (1969-70); PA Rawlinson (1971-72); MJ Tyler (1971-72); J de Bavay (1973-74); MJ Litlejohn (1973-74); H Heatwole (1974-75); R Winokur (1975-76); RS Seymour (1975-76); R Humphries (1976-77); MJ Littlejohn (1976-77); RS Seymour (1978-80); AA Martin (1978-80); R Humpries (1980-82); AE Greer (1980-81); R Longmore (1981-83); D King (1982); B Firth (1983-84); J Coventry (1984-86); R Shine (1986-88); G Czechura (1988-90); RWG Jenkins (1990-91); K Chrisitian (1991-92); M Thompson (1992-94); K McDonald (1994-95); L Schwarzkopf (1995-98); M Anstis (1995-98); R Alford (1998-99); Nancy Fitzsimmons (1998-1999); C James (1999-2001); S Hudson (1999-2001); P Horner (2001-); G Gillespe (2001-).

Editor: AK Lee (1965-67); AA Martin (1967-73); GC Grigg (1973-76); JD Roberts (1976-82); L Taplin (1982-84); R Longmore (1984-1999); J-M Hero (1999-).

Public Officer: R Longmore (1983-).

Honorary Members: JA Moore (1969); MJ Littlejohn (1982); HG Cogger (1996).

Coat-of-Arms design: GF Watson.

Newsletter of the Australian Society of Herpetologists Incorporated

No. 41 May 2003

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ASH Website: http://www.gu.edu.au/school/asc/ppages/academic/jmhero/ash/frameintro.html

Direct all membership enquiries to Dr Scott Keogh, Secretary/Treasurer, School of Botany and Zoology, The Australian National University, Canberra 0200, ACT. Membership forms can be downloaded from the ASH web site.

Index

Editorial

In the words of Jeffrey Lebowski, in the 4 years since you last received ASH news "a lot of new shit has come to light". Rather than squeeze this information into one enormous document, I decided to create two newsletters. All of the "house-keeping" of ASH from February 1999 to July 2002 can be found in Newsletter 40 (also produced in May 2003). This includes important records such as the Minutes from Annual General Meetings, Minutes from the Meetings of Council, Auditor's Reports, and the Abstracts from ASH Conferences from the all too distant past (Yungaburra, Queensland in 1998; Ross River, Alice Springs in 1999; Gum Leaves, Tasmania in 2001). Please be warned: not only is Newsletter 40 incredibly boring, it contains a huge number of pages of text. Rest assured that all of the really juicy information, including uncensored pictures of members at ASH2002, can be found in this more colourful Newsletter 41 (also produced in May 2003). The main purpose of Newsletter 41 is to fill you in on what's been going down in Australian herpetology since 1999. It also includes the house-keeping details from the last financial year.

For the first time in the history of ASH, the newsletter is being distributed in electronic format. We have provided the files in both PDF format and RTF format. In addition to emailing these documents to the ASH List server, you will be able to download them from the ASH website. Since many of you will have attended our scientific meetings, I have positioned the abstracts from these conferences at the end of the newsletter to make it easier for you to print only the first part of the document without this information.

Our Secretary/Treasurer, Scott Keogh, has made a big effort to get everything up to date on the membership front. You will be contacted sometime soon via email with details about your membership status and advice on how to renew your membership. Once absoluately everthing is up-dated, ASH will move to an electronic system where membership will be due at the same time each year. The exact date will be advised so keep checking the web site. Please also note that all present and past members of ASH will remain on the ASH List server until everything is up-dated.

A fun time was had by all at the last AGM at Birrigai in 2002. Personally, delivering my choice of disco music through kick arse speakers to a group of herpetologists has been one of the major highlights of my life. Special thanks must go to our ASH Dancing Queens, Jacquie Herbert and Dale Roberts, for leading the way. It seems that Dale is also a talented musician. We have received a lot of enquires from talent scouts about his rap performance entitled "Group sex in frogs". On behalf of Dale, we are currently negotiating with rapping icon "Shaggy" about including the video footage of this performance in an up-coming rap music video clip. We'll keep you posted on developments. In the meantime, we hope to make the video available to ASH members as soon as possible.

In this newsletter you'll find some news about the next AGM to be held in December 2003 at the Mary River Park in the Northern Territory. Keith Christian and Paul Horner have been working hard to put together what promises to be an action packed meeting. Keep your eyes and browsers on the ASH web site for more news and updates.

Last year Marion Anstis, and Mark Hutchinson and Roy Swain, published impressive identification books on some of Australia's herpetofauna. Marion's book is entitled "Tadpoles of South-eastern Australia: a guide with keys" and is published by the World Wildlife Fund for Nature. Mark and Roy's book, co-authored with Michael Driessen, is entitled "Snakes and lizards of Tasmania" and is published by the Nature Conservation Branch and University of Tasmania. Please contact Marion (marion@zeta.org.au) or Roy (Roy.Swain@utas.edu.au) direct for more information.

On behalf of ASH, I'd like to congratulate a number of our members that have retired in recent years: Murray Littlejohn (University of Melbourne), Margaret Davies (University of Adelaide) and Jeanette Covacevich (Queensland Museum). All three of these people have made major contributions to herpetology in Australia and overseas, and we wish them well in their retirement.

On a sadder note, most of you will have heard the terrible news about one of our ACT members, Will Osborne, loosing his home and contents during the February 2003 bushfires that swept through Canberra. Some of the items engulfed in the flames were Will's professional library, field gear, and 15 years of research and monitoring records on alpine frogs. His greatest loss though, was his lovely old Vega banjos (made in Boston in the 1930's) which Will loved playing. I've had word that, given the circumstances, Will and his family are doing well and are keeping a positive outlook. He is very grateful to ASH members and friends that have donated surplus field gear and returned personal items (photo's, cards, books) that Will had given them over the years. Our thoughts are with Will and his family.

I'd like to finish up by thanking a number of our members. Newsletter 41 would not have been possible without the hard work of our state representatives (listed at the beginning of the section on Regional Reports) and I'd like to thank each and every one of them for doing their utmost to round up information from their colleagues. Naomi Doak devoted considerable time to arranging that the Regional Reports were posted on the ASH website. Over the past year she has also taken care of up-dating many other sections of the ASH website. A big thanks to Jacquie Herbert for providing many of the photos from ASH 2002 that are in this newsletter. Last, but not least, since this is the first newsletter since his retirement as editor, I'd like to applaud Ric Longmore for his long-lasting efforts in producing informative, entertaining and thorough ASH newsletters over a period of 16 years (1984-1999).

On that note, I'd like to draw everyone's attention to a job opening on the ASH committee for the very illustrious position of Newsletter editor. The newsletter is one of our society's main outlets for finding out what's going on herpetologically in different research groups around Australia. To have the greatest impact, the reported information needs to be current, therefore ASH newsletters should be produced at least annually. At the next AGM we would like to put forward the suggestion that the current position of Editor be divided into two new positions: 1. Listserver and Worldwide Web Editor and 2. Newsletter Editor. Our current editor is happy to continue editing the List server and Worldwide Web site. However, I'm hoping to be inundated with applications from enthusiastic ASH members that would like to follow in the footsteps of Ric Longmore as our new newsletter editor.

I hope to see you all at ASH2003 in December.

Yours in Herpetology,

Sharon Downes
President

Welcome to the following ASH Members that have joined us since 1999!

Adam Stow
Alexa Ryhorchuk
Alison Fitch
Allie Mokany
Andrew Stauber
Anke Maria Hoefer
Bansi Shah
Ben Phillips
Ben Smith
Bob Wong
Bonnie Lauke
Brett Mott
Chantelle Mayderez
Chloe Schauble
Chris Clemente
Dan Salkeld
Dane Trembath
Danielle Edwards
Danny Wotherspoon
Dave Runciman
David Chapple
David Wilson
David Hunter
Devi Stuart-Fox
Donna Hazell
Doug Woodhams
Ed Meyer
Elizabeth Magarey
Fiona Powell
Genaya Misso
Geoff Heard
Greg Horrocks
Greg Kerr
Harry Hines
Heath Butler
James Smith
Jane Girling
Jason Rossendell
Jemina Stuart-Smith
Jessica Stapley
Joanne Chambers
Joern Fischer
Julie-Ann Harty
Konrad Osterwalder
Kris Rogers
Kylie Leonard
Kylie Robert
Leonie Valentine
Lorrae McArthur
Louise Osborne
Lyn Nelson
Mark Harmann
Marko Sacchi
Megan McCann
Megan O'Shea
Melissa White
Michael McFadden
Michelle Drew,
Mike Wall
Mitchell Ladyman
Naomi Doak
Natalia Atkins
Raelene Hobbs
Richard Peters
Sacha Jellinek
Samantha Kneeves
Sarah Smith
Steven John Sass
Stewart Ford
Tara Goodsell
Tracy Langkilde
Trent Penmann
Valerie Boyarski

ASH2002 Birrigai Delegates

Minutes of the 29th AGM
Australian Society of Herpetologists Incorporated

Minutes of the twenty-ninth Annual General Meeting held at "Birrigai", ACT on Friday 12 July 2002. The meeting opened at 5.00pm with President Sharon Downes in the chair.

Members present: Murray Littlejohn, Rick Shine, Dale Roberts, Simon Blomberg, Kirsten Parris, Frank Seebacher, Mike Thompson, Simon Hudson, David Booth, Michael Mahony, David Chapple, Arthur Georges, Nancy Fitzsimmons, Mitch Ladyman, Dan Edwards, Tracy Langkilde, Andrew Hamer, Tony Tucker, Naomi Doak, Donna Hazell, Keith McDonald, Ross Alford, Jane Girling, Erik Wapstra, James Smith, Sasha Jellinek, Brett Goodman, Brian Malone, Jennifer Taylor, Dan Salkeld, Lin Schwartzkopf, Peter Harlow, David Wilson, Greg Kerr, Glenn Shea, Graham Thompson, Bonnie Lauk, Kylie Robert, Ricky Long-john Spencer, Jonno Webb, Frank Lemckert, Ric Longmore, Ian Scott, John Wombey, Sharon Downes, Scott Keogh, Roy Swain, John Clarke, Mike Wall, Trent Penman, Harko Werkman, Harry Hines, Clare Morrison, Luke Shoo, Andrew Stauber, Jemina Stuart-Smith, Jason Rossendell, Jodi Rowley, Martin Whiting, Greg Brown.

Apologies: Graeme Gillespie, Paul Webber.

Minutes of the 28th AGM held at Gumleaves, Tasmania:

Minutes of the 28th AGM were circulated at the meeting. These were taken as read and confirmed as a true and accurate record of that meeting.

Moved: R Swain

Seconded: F Lemckert

Correspondence:

None of the correspondence presented was considered in need of a reply.

Treasurer's Report:

This year saw the addition of 30 new members (now ~300-350 in total), as well as an ABN designation, which does not require a tax statement.

The database to replace the old black book has now been completed, at a cost of $500.

$500 has also been allocated to website development.

The ASH list server is current. Naomi Doak and Jean-Marc Hero should be contacted with any email changes.

The Treasurer reported that ASH has just under $17,000 in bank, with $1000 in stock (t-shirts, etc.).

President's Report: The Society's financial state is considered to be healthy. After discussion at the last AGM about allocating some of these funds to support research by students members of ASH, Downes and Keogh instated a student research grant competition at the end of 2001. A report on this competition can be found in "Other Business" below. We will continue to offer this research grant competition as long our current healthy financial state is maintained.

Election of Office Bearers:

As no further nominations were received, the members nominated at the AGM at Birrigai on 12 July 2002 are hereby elected.

President:	S Downes
Vice President:	R Swain
Secretary/Treasurer:	S Keogh
Asst. Secretary/Treasurer:	I Scott
Editor:	J-M Hero

Public Officer: R Longmore
Ordinary Members: P Horner and G Gillespe

Editors Report:

The editor was unable to attend the meeting, but the President spoke on his behalf. There was discussion about the production of the ASH newsletter. Until recently, each newsletter produced was only done so in hardcopy format. Jean Marc Hero reported that present members were not relaying information for the newsletters as expected. It was suggested that a representative from each state be present at subsequent AGMs, which would be responsible for passing on this information. State representatives were elected as follows:

NSW Frank Lemckert
QLD Harry Hines
SA Greg Johnston
WA Mitchell Ladyman
NT Jeanne Young
ACT Scott Keogh
TAS Bonnie Lauck

Representatives are to be contacted by JM Hero before the next AGM (by May at the latest). It was noted by Ric Longmore that the last newsletter was produced in 1999.

Venue for next meeting:

Paul Horner and Keith Christian graciously offered to host the next AGM in Darwin, NT at Mary River Park. A meeting date during the 1st week of December (5th – 8th) 2003 was suggested, but tenuously as this weekend may conflict with another conference.

Other Business:

Student Research Grants: Three awards were granted in 2001, the first year of the competition; 2 Phd student awards, and 1 honours student award. There was a poor response of applications (12 in total) was noted. Dale Roberts suggested emailing members rather than notifying via list server. The awards were as follows:

Joern Fisher CRES, Australian National University

Sasha Jellinck University of Tasmania

David Chapple Australian National University

The need for more judges from outside ACT and ANU was noted, due to the difficulty of assessing their own students' work. It was suggested that other suitable people may be contacted for this year's grants, with suitable timeframe given.

Election of Official Librarian: Glenn Shea was nominated for a new position of the official ASH librarian. He accepted the nomination. His task is to file archival ASH information.

Ejection: Murray Littlejohn, who objected due to prejudice of early opinions.

Ejection: A motion was put forward to eject Dale Roberts from the meeting.

Moved: R Shine

Seconded: All

National Database of Herpetofauna: The development of this database was restricted by funding cuts. G Gillespie said that he is working on the problem and will report back on the feasibility of setting up this scheme at the next meeting.

Herpeteformists Unite: Mike Thompson stressed the relationship between ASH and NZHSoc, inviting members to the next NZHSoc AGM. Please email Mike for further information.

Retiring: It was brought to the meeting's attention that Jeanette Covacevich was retiring as the Curator of Reptiles at the Queensland Museum and it was suggested that the Society send her a letter.

Population Disturbance: One of the Broad-headed snakes strongest populations is under duress, as reported by Rick Shrine (or is that Stein?). He suggested that the NSW NPWS be encouraged and supported by ASH to lock gates in and around Morton National Park.

Symposia in Africa: Two open-invitation Comparative Physiology symposia (specifically, reproductive and thermal biology) are being offered in Africa during the upcoming year. There are a limited number of places, so please contact Mike Thompson for details.

2004 AGM Invite: Mike Thompson offered to host the AGM following the Darwin-2003 meeting in the Sydney region.

Thank You: Ric Longmore thanked the ACT members of the Society for organising the meeting at Birrigai.

Climatic Data: Simon Hudson wanted to state that it was cold.

Student Prizes: An increase in posters at ASH meetings over the past few years was reported, with an award being handed out at the last meeting. The continuation of this practise was approved and it was suggested that the award be named the "Ric Longmore Student Prize for Best Poster". Ric Longmore accepted this suggestion.

Murry Littlejohn Prize for Honours/Masters Research:

Winner ($200)—Bansi Shah, "Why do thick-tailed geckos aggregate?"

Honorable mention—Rachel Sims, "Use of thermal springs for aquatic basking by the Pig-nosed Turtle, *Carettochelys insculpta*"

Peter Rawlinson Prize for Postgraduate Research:

Winner ($300)—Kerry Beggs, "Conservation versus pastoralism: herpetofauna as indicators of ecological change in the Mary River region, Northern Territory"

Honorable mention—Kylie Robert, "Designer families: sex determination in the viviparous lizard *Eulamprus tympanum*"

Honorable mention—Sean Doody, "Patterns of Predation in Pig-nosed Turtles"

Ric Longmore Prize for Best Poster:

Winner ($200)—Tara Goodsell, "Freshwater turtles in wet and dry waterholes: tracking metapopulation patterns of the Cooper Creek turtle with microsatellites"

New members: NATALIA ATKINS, VALERIE BOYARSKI, HEATH BULTER, CHRIS CLEMENTE, CHANTELLE MAY DEREZ, DANIELLE EDWARDS, STEWART FORD, TARA GOODSELL, MARK HARMANN, JULIE-ANN HARTY, HARRY HINES, DAVID HUNTER, ELIZABETH MAGAREY, MEGAN MCCANN, MICHAEL MCFADDEN, BRETT MOTT, TRENT PENMAN, BEN PHILLIPS, FIONA POWELL, KRIS ROGERS, JASON ROSSENDELL, DAVE RUNCIMAN, STEVEN JOHN SASS, BANSI SHAH, JAMES SMITH, ANDREW STAUBER, JEMINA STUART-SMITH, DANE TREMBATH, MIKE WALL, MELISSA WHITE, DAVID WILSON, DOUG WOODHAMS.

The meeting closed at 5.51 pm.

COUNCIL REPORT 2002

Report of Council, July 2002

President – Sharon Downes

Vice President – Roy Swain

Secretary/Treasurer – Scott Keogh

Public Officer - Richard Longmore

Assistant Sec/treasurer – Ian Scott

Scott Keogh put forward the suggestion that a poster prize be awarded to the best student presentation at ASH and that this prize be named the Richard Longmore prize. It was agreed to have this discussed at the AGM. The financial status of the Society was discussed and is considered to be in good shape. Ric Longmore discussed the possibility of the position of President being held for more than one term. The president indicated that she would be happy to run for a second term. Ric Longmore also raised the issue of the lack of production of an ASH newsletter since 1999. It was agreed to ask at the AGM for volunteer state representatives to pass on information for the newsletter to the editor, Jean Marc Hero.

Scott Keogh

Secretary/Treasurer

Sharon Downes

President

J.M. Neill
CHARTERED ACCOUNTANT
(A.B.N. 59 971 007 603)

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Canberra City ACT 2601
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ACT 2601

AUDITOR'S REPORT TO THE MEMBERS OF THE AUSTRALIAN SOCIETY OF HERPETOLOGISTS INCORPORATED

1. I have audited the attached accounts being the Income and Expenditure Statement for the year ended 30 June 2001 and the Balance Sheet at that date in accordance with Australian Auditing Standards.

2. As an audit procedure it was not practicable to extend my examination of fund raising beyond the accounting for amounts received as shown by the books and records of the Association.

3. Subject to paragraph 2, I report that in my opinion:

   (a) The accounts are properly drawn up so as to give a true and fair view of the matters required by subsection 72(2) of the Associations Incorporation Act, 1991 to be dealt with in the accounts.

   (b) The accounts are properly drawn up in accordance with the Act.

   (c) The accounts are properly drawn up in accordance with proper accounting standards.

   (d) I have obtained all the information and explanations required.

   (e) Proper accounting records and other records have been kept by the association as required by the Act.

4. It is noted that the Society has not been holding annual general meetings within the 5 months time frame laid down by section 69 of the Associations Incorporation Act 1991. It is recommended that the situation be corrected in future.

J M NEILL
CHARTERED ACCOUNTANT

7 June 2002

THE AUSTRALIAN SOCIETY OF
HERPETOLOGISTS INCORPORATED

BALANCE SHEET
AT 30 JUNE 2001

Last Year		$	$
	ACCUMULATED FUNDS		
15992	Opening Balance		19460
3468	Surplus (Loss) for the year		(4427)
19460	Closing Balance		15033
19460	TOTAL FUNDS		15033
	REPRESENTED BY:		
	CURRENT ASSETS		
1124	Stock on Hand - at cost	1125	
18372	Bank Cheque on hand	0	
4	Cash on Hand	4	
0	Cash at Bank	13737	
0	Income tax Credit	32	
0	Subscriptions in arrears	135	
19500			15033
19500	TOTAL ASSETS		15033
	CURRENT LIABILITIES		
40	Subscriptions in advance	0	
40			0
19460	NET ASSETS		15033

THE AUSTRALIAN SOCIETY OF
HERPETOLOGISTS INCORPORATED

INCOME AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 30 JUNE 2001

Last Year		$	$
	INCOME		
2604	AGM Fees		2892
1340	Subscriptions		310
220	Newsletter		0
118	Sale of T Shirts,etc - profit		0
6	Interest		83
4288	TOTAL INCOME		3285
	LESS EXPENSES		
240	Audit Fee	220	
0	AGM Expenses	2892	
16	Bank Fees	25	
64	Filing Fees	75	
500	Prizes	3500	
0	Web Site Expenses	1000	
820	TOTAL EXPENSES		7712
3468	SURPLUS (LOSS) FOR THE YEAR		(4427)

THE AUSTRALIAN SOCIETY OF HERPETOLOGISTS INCORPORATED

NOTES TO AND FORMING PART OF THE ACCOUNTS FOR THE PERIOD ENDING 30 JUNE 2001

Last Year **1. STATEMENT OF SIGNIFICANT ACCOUNTING POLICIES** $

The Company is not a reporting entity because in the directors' opinion there are unlikely to exist users who are unable to command the preparation of reports tailored so as to satisfy specifically all of their information needs, and these accounts are therefore special purpose financial reports that have been prepared to meet the requirements of members and income tax law.

The Company has applied Accounting Standard AASB 1025 Application of the Reporting Entity Concept. No other Accounting Standards or Statements of Accounting Concepts have mandatory applicability and have not been applied.

The significant accounting policies which have been adopted in the preparation of the financial statements are:

(a) Accrual accounting has been applied and the accounts have been prepared on the basis of historical costs and do not take into account changing money values nor, except where stated, current valuations of non-current assets.

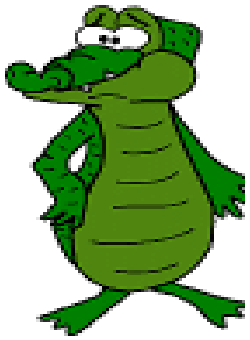
2. INCOME TAX CREDIT

An amount of $32.00 withholding tax was deducted by the bank from interest received until the Society obtained an ABN. This amount is refundable by the Taxation Office as the Society is exempt from income tax at present.

3. SUBSCRIPTIONS IN ARREARS - $135.00

These subscriptions for the year were received after 30 June 2001.

ASH 2003 AGM
Preliminary announcement



The 2003 ASH meeting will be held at the Mary River Park, about 100 km from Darwin and 32 km from Kakadu National Park. The dates for the conference will be December 3-7, 2003. The 2003 ASH conference at Mary River Park was originally scheduled for December 4 – 8, 2003. However, these dates overlapped with the ESA conference by one day, so we have decided to start the ASH conference one day earlier and finish on the 7th, so it will be possible for people to attend both.

ASH 2003 will be from 3-7 December

We appreciate there may be conflicts with other conferences, but that is probably always going to be the case. So please put these dates on your calendar, and we will be in touch later with more details.

Have a look at the Mary River Park web site (http://www.maryriverpark.com.au/)

It includes general information along with some pictures. Bookings however, should be made through the conference organizers (Keith Christian and Paul Horner) closer to the conference date.

Some preliminary evening activities include:

- A barbecue on a sand bar in the middle of the Mary River with the crocs.
- The following evening, all the survivors will pile into a hatchback for some night spotting at Fogg Dam. If the number of survivors is greater than expected, this activity might run over two nights.

Keep your eyes and browsers on the web site for more news and updates.

Keith: kchristi@ntu.edu.au

Paul: paul.horner@nt.gov.au

Please lodge your archival ASH material with our librarian

For the past few years, there has been some concern about the transformation within ASH of distributing information electronically rather than via hard copy. The main concern was that important information about ASH would be lost in cyberspace (or more accurately, sit on someones computer) rather than be stored in hard copy format in the ASH archives. It was decided that ASH should develop an archival system and that all important information distributed electronically (i.e., newsletters, conference abstracts, etc) should also be represented in the archives in hard copy format. This is fine for all future correspondance, but we would like to gather hard copies (or electronic scans) of worthy ASH memorabilia up until now.

At the 2002 AGM at Birrigai, **Glen Shea** accepted the new position of **official ASH librarian**. This message is a call, directed mainly at senior members of ASH, for any material that should be archived. If you have anything "ASH" in hard copy format that you think should be retained in the archives, can you please send it to Glen at the following address: Faculty of Veterinary Science, The University of Sydney, Sydney 2006, NSW (email: gshea@mail.usyd.edu.au).

An example of the sort of thing we are after is below. This photo was sent in by Roy Swain. He says "The attached is a not very good photograph that may have some archival value. It's from the 1969? ASH meeting in Adelaide - I can't help with identifications, other than Peter Rawlinson (blue shirt) and one of my ex Tasmanian colleagues (John Hickman - man with camera - used to work on frog cestodes)."

Do you recognise anyone?

Know your members

Name as it appears on your birth certificate:
Francis Laurence Lemckert

Nickname: Don't really have one. Maybe people use one when I am not around?

Number of candles on your last birthday cake: Hmmm, 38.

Hometown: Sydney

Current position: I had better answer this properly. Research Scientist, Research Division, State Forests of NSW.

Education: BSc, MSc at University of Sydney. Apparently currently enrolled in a PhD at the University of Newcastle.

Main herpetological interests: Conservation of endangered species. Reproductive strategies of frogs.

Greatest Influence in your career: I hate to say this but, Rick Shine.

Greatest moment in herpetology: Meeting Sharon Downes followed by seeing my first Green-thighed Frog.

Top 3 publications: Mine? I am sure that there are a number of people that would argue that I don't have top publications.

Lemckert FL, 1999, An assessment of the impacts of selective logging operations on Amphibian diversity in a forested area of northern New South Wales. Biological Conservation 89:321-328

Lemckert FL, Brassil T, 2000, Movements and habitat use of the endangered giant barred river frog, Mixophyes iteratus, and the implications for its conservation in timber production forests. BiologicalConservation 96:177-184

Lemckert FL, Shine R, 1992, Costs of reproduction in a population of the frog Crinia signifera (Anura: Myobatrachidae) from Southeastern Australia. Journal of Herpetology 27: 420-425.

Ambitions: Make a difference to frog conservation in NSW. Write a book on frogs. Publish 15 papers in 2004. Overthrow Sharon Downes as president of ASH.

Hobbies: My family (how sickly sweet). Eating chocolate. Any sport at all. Passing on my knowledge of frogs to interested people, particularly students starting their zoology careers.

Favourite meal: Quite a lot of those really. My wife's Green Curry is really good.

Favourite drink: Banana smoothie.

Favourite film: Shawshank Redemption

Favourite musician/band: Britney Speares? Icehouse.

Tattoos: Once liked to look for them on girls.

Hair color: Brown (except for the increasing grey bits)

How many times did you fail your driver's test? What has this got to do with anything? I think that failing once was rather good really. It shows that I did not follow the norm.

ASH2002 Trivia Questions

Match the person and response to the following three questions on the ASH2002 registration form. Place the person's number on the line to the left of their response. The answers can be found on the last page of this Newsletter.

Do you wear socks with sandals?

1. Greg Johnston	_____	Always
2. Michael Mahony	_____	I wear socks with thongs
3. Sara Broomhall	_____	Only when it compliments my safari hat
4. Nick Clemann	_____	Only when around Shaz-mate
5. Heath Butler	_____	White socks
6. Rick Shine	_____	Never - I live in north QLD!
7. Nancy Fitzsimmons	_____	Only on religious holidays
8. Lin Schwarzkopf	_____	Not since I left JCU
9. Simon Hudson	_____	No, I keep my socks down my pants
10. Greg Brown	_____	Certainly not, I'm not an academic anymore

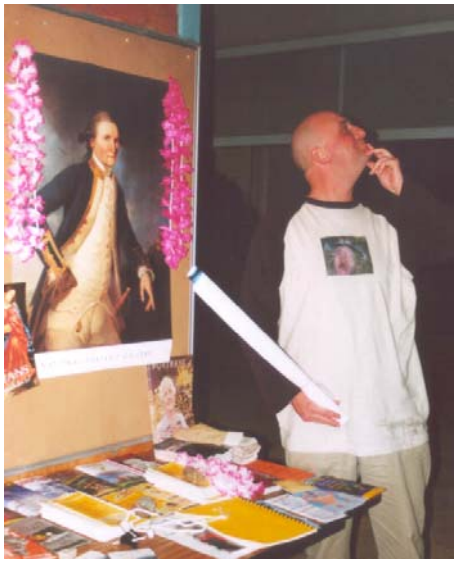
Do you have snake envy?

1. Michael Mahony	_____	What do you think?
2. Louise Osborne	_____	There is no such thing as snake envy, only turtle envy
3. John Wombey	_____	Snakes, they look like worms don't they?
4. Frank Lemckert	_____	Its not necessary
5. Nancy Fitzsimmons	_____	Nope, dragons rule the earth
6. Harko Werkman	_____	No, I'm very secure
7. Martin Whiting	_____	I have tortoise envy
8. Frank Seebacher	_____	Absolutely
9. Tony Tucker	_____	Never!
10. Simon Hudson	_____	There is no such thing as snake envy, only turtle envy

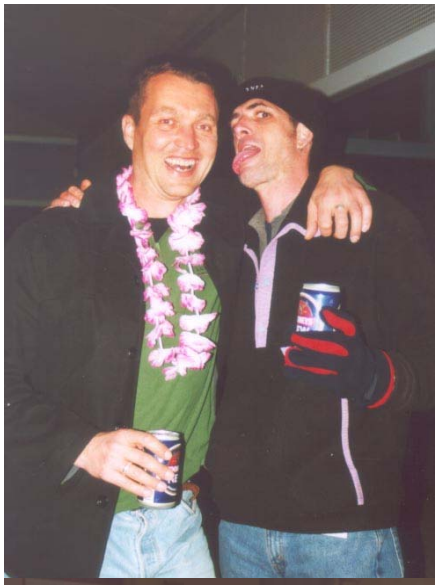
Do you have a beard?

1. Devi Stuart-Fox	_____	Very small whiskers
2. Dale Roberts	_____	Who doesn't?
3. Tony Tucker	_____	Yes, I also have a Swiss army knife
4. Fabien Aubret	_____	On my bottom
5. David Wilson	_____	One lonely chin hair
6. Dave O'Connor	_____	No, I've tried hard but never could make it
7. Andrew Stauber	_____	Proudly since 1976
8. Ross Alford	_____	Do male frogs vocalise?
9. Mike Thompson	_____	Of course
10. Karen Thumm	_____	No, but my pet death adder does

ASH2002 Birrigai Photo Gallery




ATHLETIC







ATHLETIC

Congratulations to the ASH2002 Birrigai Conference Award Winners

Murray Littlejohn Prize for Honours Research: **Bansi Shah**, Why do thick-tailed geckos aggregate?

Peter Rawlinson Prize for Postgraduate Research: **Kerry Beggs**, Conservation versus pastoralism: herpetofauna as indicators of ecological change in the Mary River region, Northern Territory.

Ric Longmore Prize for Best Poster: **Tara Goodsell**, Freshwater turtles in wet and dry waterholes: tracking metapopulation patterns of the Cooper Creek turtle with microsatellites.

……

Tardiest Registrant Award: **Gerry Marintelli** for expressing interest in attending the conference two months before registration opened and then registering one month after the deadline.

Permutation of Institutional Address Award: **The University of Newcastle** for having eight registrants submit seven different permutations of the institutional address.

Best Response to Registration Question Award:

Question 1: Do you have a beard?

Runner-up: Bearded biologists have been superseded (**Sara Broomhall**)

Runner-up: Not since the hormonal therapy (**Tracy Langkilde** and **Nancy Fitzsimmons**)

Winner: Yes, but not on my face (**Lin Schwartzkopf**)

Question 2: Do you have snake envy?

Runner-up: I'm envious of anything with two penises (**Dave Hunter**, **John Clulow**, **Kris Rogers**)

Runner-up: We know the place of snakes in the world order, they are just amphibians with a few autapomorphies! (**Dale Roberts**)

Winner: No, they don't call me reticulated python for nothing (**Ricky Spencer**)

Question 3: Do you wear sandals with socks?

Runner-up: I'm not a marine biologist (**Kylie Robert**)

Runner-up: Sandals are the deviles playthings (**Jason Rossendell**)

Winner: Only in the mating season (**Marion Anstis**)

Stating the Obvious Award: **Greg Brown**, **Peter Luckock**, **Kim Hauselberger** and **Harry Hines** for responding "yes" to the question "Will you be presenting a paper or a poster?".

Art Deco Award: **Peter Harlow** for sending in a printed version of his regitration form that had every lined repeated twice in succession.

Disrespect to Supervisor Award: The **Shrine lab** for breaking into and lounging around Rick's lab during a Christmas party at which he was absent (award based on photographic evidence).

Fantasy Room-mate Award: **Sarah Broomhall** for requesting to share a room with Brad Pitt and **Frank Lemkert** for requesting to share a room with a young beautiful woman.

……

The John Cann Award for Snoring: Ricky-John Spencer

The Biggest Goose Perpetual Award: Dale Roberts

ASH Dancing Queen: Jacquie Herbert and Dale Roberts

Congratulations to the 2002 ASH Student Research Award winners

Kylie Robert, University of Sydney: Temperature-dependent sex determination in an Australian live-bearing lizard: what role do hormones play? $750

This study aims to link two scientists from diverse disciplines to combine their expertise to approach a novel research topic with the view to a future international collaboration. The study will measure embryonic yolk steroids and circulating maternal plasma steroids (testosterone and estradiol) at different stages and sex determining temperatures throughout development and pregnancy in the viviparous lizard *Eulamprus tympanum*.

Brett Goodman, James Cook University: Ecomorphology, performance and life history traits in skinks. $750

This study aims to: determine the microhabitat use of each taxon, and establish relationships between microhabitat use and morphology in the Eugongylus sub-group of skinks; determine whether species that exhibit morphological specialization for specific habitats also exhibit greater performance at ecologically relevant tasks relative to their congeners; and determine whether morphological specialization for specific microhabitats results in a trade-off between ecologically relevant performance tasks and instantaneous reproductive output, relative to their congeners.

Naomi Doak, University of Griffith: Phylogeography of Mixophyes *and taxonomic resolution of* Mixophyes balbus/fleayi. *$750*

The primary aim of the project is to investigate the genetic population structure and genetic diversity of *Mixophyes iteratus, M. balbus, M. fleayi,* and *M. fasciolatus* and determine the degree to which geographically distant and isolated populations are genetically distinct. The implications of these patterns of genetic diversity for conservation and management of the three species can be determined and genetically divergent populations identified as a priority for conservation. This in turn will provide data for wildlife management agencies to underpin species conservation and recovery programs. At the broad scale, the phylogeography of *Mixophyes* will indicate historical refugia and pathways of migration among montane areas and thus provide an insight into the history of wet forests in southeast Australia. Sound species-management decisions to ensure the long term persistence of rare or threatened species must be based on an understanding of population genetic structure.

Anke Maria Hoefer, Australian National University: Consequences of weed invasion for lizards: an experimental approach. $350

The general aim of my research is to employ a model experimental system to test the potential impact of weed invasion on the phenotypes of lizards. This objective will be achieved by monitoring growth of lizards raised in semi-natural patches of microhabitat that vary in degree of colonization by a weed. Knowledge about the impact of weeds on fauna is essential for the development of strategies to adequately manage invaded ecosystems. The current proposal is therefore unusual in that the data collected to address its primary objective (a test of theory) also will be used to address several secondary aims (relating to management of areas invaded by weeds).

Christofer Clemente, University of Western Australia: Locomotion in Australian monitor lizards (Varanus): ecomorphological and ecophysiological considerations. $350

The proposed study will: a) examine relationships between ecology, performance traits, kinematics, physiology and morphology for Western Australian goannas; b) use these relationships to understand why certain traits have evolved in some species but not others; and c) test the significance of trade-offs (or the lack thereof) between performance traits. Specifically this study will use goannas as a model of a group of closely related species to address the questions: how is performance influenced individually or collectively by morphology, physiology, kinematics and ecology? What is the mechanistic basis of habitat segregation? And how do trade-offs between performance traits influence these relationships?

Regional reports

State	Contact	Email address
New South Wales	Frank Lemckert	frankl@sf.nsw.gov.au
Queensland	Harry Hines	harry.hines@epa.qld.gov.au
South Australia	Greg Johnston	gjohnston@adelaidezoo.com.au
Western Australia	Dale Roberts	droberts@cyllene.uwa.edu.au
Northern Territory	Jeanne Young	jeanne.young@ntu.edu.au
ACT	Scott Keogh	scott.keogh@anu.edu.au
Tasmania	Roy Swain	roy.swain@utas.edu.au
Victoria	Brian Malone	b.malone@zoo.latrobe.edu.au

New South Wales

Macquarie University

Herpetology is alive and steaming along at Macquarie University in both the Department of Biological Sciences and Department of Psychology. In recent years we have dusted off **Jean Joss** in Biological Sciences (and reminded her that lizards are more interesting than lungfish, and only slightly more interesting than frogs) to supervise the PhD projects of **Pete Harlow** and **Michael Watt**. Pete is now working as curator of herpetology at Taronga Zoo following his completion of an exhaustive and well received examination of TSD in Australian agamid lizards. Michael finished his PhD late last year on the neuroendocrinology of jacky dragons and is currently on a post-doc in the US. **Adam Stow** is in the final year of his PhD. Using both field and genetic techniques, he has been examining the effects of deforestation on population processes in Cunningham's skink (*Egernia cunninghami*), such as dispersal, the mating system and interactions between relatives. In recent work, parentage assignment through the use of microsatellite markers has established that groups of *E. cunninghami* typically consist of long-term breeding partners living together with their offspring. Adam is on the circuit of presenting his work at conferences; he won the best student talk at the Genetics Society of Australia meeting which gave him the confidence to attempt a 45 minute talk in 12 minutes at the recent ASH meeting. Adam is due to complete his PhD late this year and is on the look-out for a future. **Erik Wapstra** moved from cold Tasmania to Sydney to take up a Macquarie University Research Fellowship to continue his evolutionary studies on snow skinks. Specifically, he is examining facultative sex allocation in snow skinks. Snow skinks are viviparous, yet appear to have some form of TSD; his project is examining how and why female snow skinks are able to facultatively allocate resources between sons and daughters.

The Department of Psychology has a large number of staff and students working on visual systems in lizards. **Chris Evans** is currently actively involved in supervising a large number of students; Chris was the pioneer of the development of video playback techniques that has been used to great effect in recent projects. **Darren Burke's** research examines the way in which Jacky lizards process visual information - the way in which they see the world - especially the moving world. Do they have particular sensitivity to perceptual stimuli which are of biological significance to them (like the oscillatory movements in male aggressive signals, or movements of their prey), and if so, how? To what extent are they able to discriminate these kinds of movements from background motions (a task they face in their cluttered and windblown natural environment)? Has communicative signalling in Jacky lizards capitalised on existing perceptual sensitivities, or has the signalling provided selection pressure to evolve new sensitivities? Chris and Darren are supervising the following students. **Paul Carlie** is completing a Masters on factors mediating recognition of an approaching aerial predator by the jacky dragon (*Amphibolurus muricatus*). In related work, **Felicity Hoese** is an

undergraduate student examining the relative importance of specific movement characteristics of prey in eliciting predatory response in Jacky dragons. **Terry Ord** has now finished his PhD and has a post-doc at the University of Indiana. By comparing signal behaviour across Iguania, he has been examining macro-evolutionary trends in display behaviour focussing on how intra-sexual selection (male-male competition), as well as ecological and physiological constraints between lizard species has promoted variation in signal design (Work conducted in collaboration with Chris Evans, Macquarie University, and Dan Blumstein, UCLA). **Richard Peters** is undertaking a PhD on the visual ecology of lizards, focussing in particular on the structure of movement-based animal displays, using the Jacky dragon (*Amphibolurus muricatus*) as a model system. The approach he has adopted involves integrating analysis, computational modelling and laboratory experiments to understand the factors that mediate recognition.

Publications

Edwards A, Jones SM, Wapstra E (2002) Multiennial reproduction in females of a viviparous, temperate-zone skink, *Tiliqua nigrolutea*. *Herpetologica*, in press

Harlow PS (2000) Incubation temperature determines hatchling sex in Australian rock dragons (Agamidae: Genus *Ctenophorus*). *Copeia* 2000:958-964

Harlow PS, Shine R (1999) Temperature-dependent sex determination in the frillneck lizard, *Chlamydosaurus kingii* (Agamidae). *Herpetologica* 55:205-212

Harlow PS, Taylor JE (2000) Reproductive ecology of the jacky dragon (*Amphibolurus muricatus*): an agamid lizard with temperature-dependent sex determination. *Austral Ecology* 25:640-652

Olsson M, Shine R, Wapstra E (2001) Costs of reproduction in a lizard species: a comparison of observational and experimental data. *Oikos* 93:121-125

Olsson M, Shine R, Wapstra E, Ujvari B, Madsen T (2002) Sexual dimorphism in lizard body shape: the roles of sexual selection and fecundity selection. *Evolution* 56:1538-1542

Olsson M, Wapstra E, Olsson C (2002) Offspring size-number strategies: experimental manipulations of offspring size in a viviparous lizard (*Lacerta vivipara*). *Functional Ecology* 16:135-141

Ord TJ, Blumstein DT (2002) Size constraints and the evolution of display complexity: why do large lizards have simple displays? *Biological Journal of the Linnean Society* 76:145-161

Ord TJ, Blumstein DT, Evans CS (2001) Intrasexual selection predicts the evolution of signal complexity in lizards. *Proceedings of the Royal Society of London, Series B* 268:737-744

Ord TJ, Blumstein DT, Evans CS (2002) Ecology and signal evolution in lizards. *Biological Journal of the Linnean Society* 77:127-148

Ord TJ, Evans CS (2002) Interactive video playback and opponent assessment in lizards. *Behavioural Processes* 59:55-65

Ord TJ, Peters RA, Evans CS, Taylor AJ (2002) Digital video playback and visual communication in lizards. *Animal Behaviour* 63:879-890

Peters RA, Clifford CWG, Evans CS (2002) Measuring the structure of dynamic visual signals. *Animal Behaviour* 64:131-146

Stow AJ (2002) Microsatellite loci from the Cunningham's Skink (*Egernia cunninghami*). Molecular Ecology Notes, in press

Stow AJ, Sunnucks P, Briscoe DA, Gardner MG (2001) The impact of habitat fragmentation on Cunningham's skink (*Egernia cunninghami*): evidence from allelic and genotypic analyses of microsatellites. *Molecular Ecology* 10:867-878

Wapstra E, Swain R, O'Reilly JM (2001). Geographic variation in age and size at maturity in a small Australian viviparous skink. *Copeia,* 2001:646-655

Websites

http://galliform.psy.mq.edu.au/ (Animal Behaviour Lab, Macquarie University)
http://galliform.psy.mq.edu.au/lizard/ (Visual Ecology of the Jacky dragon)
http://sunflower.bio.indiana.edu/%7Etord/ (Terry Ord's home page)
http://vision.psy.mq.edu.au/~darrenb/ (Darren Burke's home page)

University of NSW

At UNSW we are trying to contribute to the future dominance of herpetology in Australia by women (as forecast by Rick Shine at ASH 2002). On the frog front, **Jodi Rowley** has just completed her honours thesis examining interactions between tadpoles of *Litoria aurea* and *Limnodynastes peronii*. **Fiona Powell** is in the first year of her PhD researching interactions between the introduced plague minnow, *Gambusia holbrooki*, and native anurans in the Sydney Basin. Her aim is to clarify the role of *G. holbrooki* in frog population declines in relation to declines in habitat quality. In the field Fiona will measure the abundance of anurans in relation to habitat variables and the abundance of *G. holbrooki* and other predators. In laboratory tanks she plans to determine whether native anurans have any defences against *G. holbrooki*. For instance, do tadpoles decrease their larval period in response to chemical cues from *G. holbrooki* or native predatory fish? And can adult frogs detect chemical cues from *G. holbrooki* and avoid ovipositing where they are present? **Emma Burns**, who did her honours research on the molecular ecology of the broad-headed snake (*Hoplocephalus bungaroides*), is doing a PhD on the conservation genetics of the green and golden bell frog (*Litoria aurea*).

Now to research on things reptilian. **Rebecca Montague-Drake** is studying the distribution, abundance and diversity of reptiles around artificial watering points (AWPs) in Sturt National Park, arid New South Wales. The work is part of her PhD entitled "*Strategic management of artificial watering points for biodiversity conservation*", which is also examining the abundance and distribution of kangaroos, small mammals, avifauna and vegetation around AWPs. Rebecca pitfall trapped (0, 1, 3 and 5 km from AWPs) and walked transects (radiating out from an AWP to 5 km from any AWP) to assess reptile abundance and distribution. Seven skink, 4 agamid, 6 gecko and one snake species were captured in pitfalls. One species captured was *Cyclodomorphus venustus*, for which Sturt National Park is thought to be a stronghold. Preliminary analysis has identified few significant trends relating reptile abundance to distance from an AWP. Full results will be available after January 2003. For further information, Rebecca may be emailed: becmd@ruralnet.net.au.

Angie Penn is writing up a PhD that has examined issues relating to the conservation and management of small mammals and lizards in Mumbulla State Forest and the adjacent Biamanga National Park. Angie's work has examined the long-term effects of disturbance from logging and fire on the lizard fauna of this area.

Jennifer Taylor is writing up her PhD on thermal biology and competition in the sympatric skinks *Ctenotus robustus* and *Ctenotus taeniolatus*. As a side line Jenny is also examining habitat use, growth and reproduction of *Amphibolurus muricatus* (including some collaborative work with **Peter Harlow** from Taronga Zoo) and habitat use by frogs on vegetated coastal dunes regenerating after sand mining.

And finally, the token male herpetologist at UNSW ... There must be something about quokkas that turns mammalogists into herpetologists. **Matt Hayward** has recently submitted his PhD thesis on quokkas. While it is unlikely that Matt will describe as many reptiles as Glenn Storr, he has at least seen the light and will now embark on a career in herpetology. This may have something to do with the fact that his 23 000 cage-trap nights yielded only 95 quokkas but 241 lizards, 2 snakes and 2 frogs! We can now look forward to some publications from Matt on habitat use by sleepy lizards and *Egernia kingii* in the northern Jarrah forest.

Publications and theses

Burns EL, Costello BH, Schulmeister A, Houlden BA (2002) Microsatellite makers in Fijian crested iguanas (*Brachylophus vitiensis*) also amplify Fijian banded iguanas (*B. fasciatus*). Molecular Ecology Notes, in press

Burns EL (1998) Molecular Ecology of the Broad-Headed Snake. Honours thesis, School of Biological Sciences, UNSW

Burns EL, Houlden BA (1999) Isolation and characterization of microsatellite markers in the Broad-Headed Snake *Hoplocephalus bungaroides*. Molecular Ecology 8:520-521

Harlow PS, Taylor JE (2000) Reproductive ecology of the jacky dragon (*Amphibolurus muricatus*): an agamid lizard with temperature-dependent sex determination. *Austral Ecology* 25:640-52

Penn AM, Sherwin WB, Lunney D, Banks PB (2003) The effects of a low-intensity fire on small mammals and lizards in a logged, burnt forest, submitted

Taylor J.E. & Fox B.J. (2001) Disturbance effects from fire and mining produce different lizard communities in eastern Australian forests. *Austral Ecology* 26:193-204

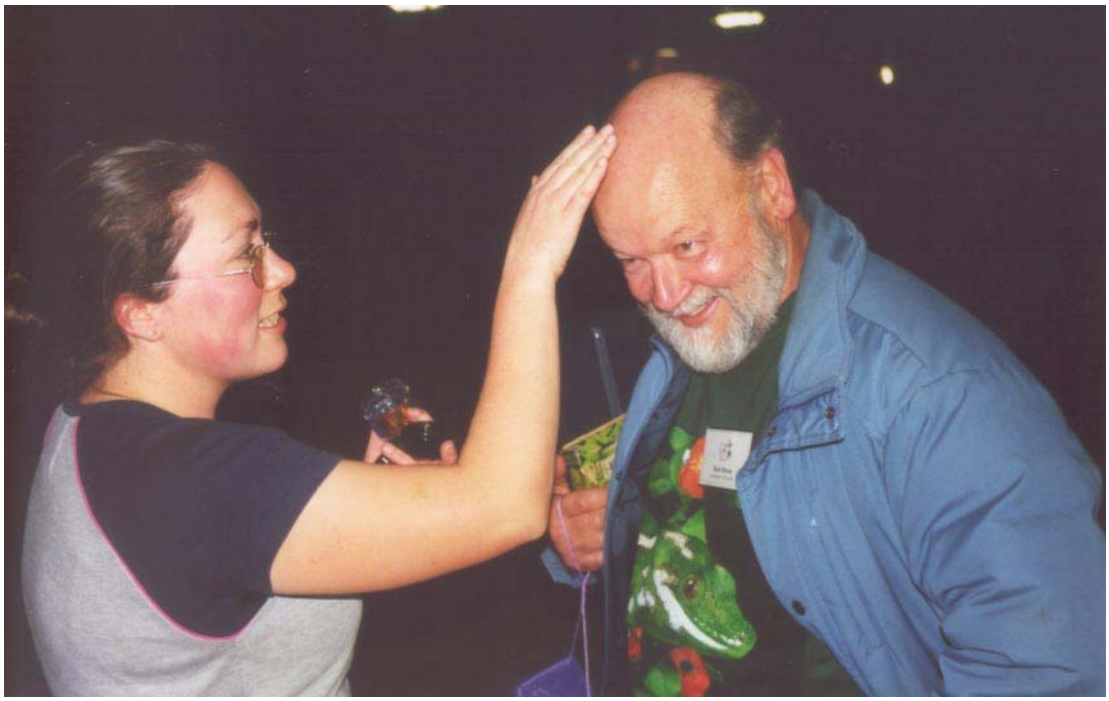
Taylor JE, Fox BJ (2001) Assessing the disturbance impact on vegetation and lizard communities of fluoride pollution interacting with fire and mining in eastern Australia. *Austral Ecology* 26:321-37

University of Sydney

Rick Shine continues to develop his suntan with fieldwork on sea-snakes in the Pacific Islands. The latest unfortunate serpents to have their sex lives examined are turtle-headed sea-snakes (*Emydocephalus annulatus*) at Baie des Citrons, the main topless beach in Noumea. Together with research assistants **Melanie Elphick** and **Elizabeth ("George") Barrott**, Rick spent much of June 2002 examining foraging and reproductive biology of these marine snakes. Earlier in May, he and new graduate student **Tracy Langkilde** spent a few weeks in a much colder environment, studying pheromonal communication and male mating tactics in garter snakes (*Thamnophis sirtalis*) in central Canada. In between successive blizzards, they managed to gather some extensive data sets on sexual conflict at the communal dens, and on the interactions between males, females and the notorious female-mimicking "she-males". Rick is also continuing his long-term collaborations with several other researchers, notably **Bob Mason** (Oregon State University) and **Xavier Bonnet** (CNRS, France), as well as a sundry bunch of postdocs, postgrads and academics at the University of Sydney.

Thomas Madsen and **Bea Ujvari** are back at beautiful Fogg Dam, near Darwin, continuing to harass the great-grandchildren of the water pythons (*Liasis fuscus*) that Thomas and Rick began harassing 15 years ago. Thomas and Bea are focussing on the interactions between genetics, parasites, and life-history traits. They are also looking at ecological impacts of the imminent arrival of cane toads at the study site, using goannas as well as snakes as study subjects.

Greg Brown is another postdoc still based at Fogg Dam year-round, and can be found wandering peacefully along the dam wall every evening looking for his beloved colubrid snakes – many of whom are adults that started their lives in Greg's egg-incubation factory before release into the wild. Greg now has data on many thousands of animals and is beginning to analyse the effects of neonatal circumstances on an animal's subsequent growth and survival. However, he still misses the disgusting Canadian foodstuffs that supported him in his early years.



Jonno Webb's current postdoc is back in Sydney, and focuses on ecological and behavioural interactions among a guild of small snake species that occur along the NSW coast. The studies include both laboratory-based work (videotaping behaviour) and field research.

Mark Fitzgerald is still writing his PhD. Recent publications are listed below and include analysis of habitat use and tree preferences (Copeia; June 2002) and of the spatial ecology (Austral Ecology; October 2002) of Stephen's Banded Snakes. Analysis of the thermal ecology of the species is in preparation. During Summer 2001-2 I conducted a preliminary investigation into the ecology and retreat site selection of Pale-headed Snakes *Hoplocephalus bitorquatus* (with Brian Lazell), which produced previously unknown data on tree preferences, the thermal attributes of diurnal shelter sites, activity patterns and sequestration periods for this species. This study was the subject of an unpublished report to the Western Region Assessment Council, which will later be transformed into a paper for publication. Much extra-curricular threatened species impact assessment work continues, interspersed with preparation of PhD material. **David Pearson**'s Ph D thesis attracted rapturous praise from the examiners, hopefully compensating him for the rigours of radio-tracking 60 carpet pythons over most of Western Australia for five years. **Ben Phillips** is still poisoning snakes with cane toad toxins, trying to find a snake that can swim down a raceway as fast as Ian Thorpe, and wandering through Queensland and the Northern Territory trying to quantify adaptive responses of snakes to toad presence. Most Aussie snakes are proving very bad at handling toad toxins, so the news is not encouraging. **Mike Kearney** is spending a year in the USA under a Fulbright program, and learning some new methods with which to explore the mysteries of climatic adaptation ion parthenogenetic geckos. **Rob Pringle** is back in the USA, and on his way to Oxford for a Masters degree in history (??), after spending a few months with Jonno Webb and Rick Shine examining habitat use by elapid snakes.

Sara D. Broomhall: As part of my PhD research, I found that the temperature at which frog eggs are kept (first 2-6 days of development) influence the way in which brief exposure to a common agricultural pesticide (active ingredient endosulfan) many days later modifies the resulting tadpole's growth, feeding, behaviour, and vulnerability to predation when tested after days or even weeks in clean water. This has involved many nights out in the rain finding shy and retiring amplecting pairs (most of the species I worked on were definitive wallflowers), and enough acid-soaking and solvent-rinsing glass jars to last seven people twelve lifetimes. With time off in-between to measure a few thousand preserved tadpoles, and several thousand more from videotape. During the past few years

I also quantified how egg rearing and larval rearing temperatures interact to alter tadpole growth and vulnerability to predation, and investigated the effects on tadpoles of a mosquito growth regulator, methoprene, and its photo-degredates. At present I am somewhat desperately writing a thesis, sending off papers (1 in press, 3 in review, 2 *almost* ready), consuming far too much chocolate, and writing a booklet on pollutants and frogs for the WWF. One of the most frustrating things at the moment is the sheer time delay in having papers reviewed (now 10 months in one case and still going). Its very difficult to have papers in order to apply for post-docs with these lag times. With this in mind, one may well foresee another semester of demonstrating and tutoring undergraduates in my future, but not if I can help it!

Mike Wall: For my Ph D I'll be studying *Lialis burtonis*, a pygopodid lizard that has strikingly converged both morphologically and ecologically with saurophagous snakes. I will study the lizard's habits in the field with radiotelemetry and will undertake experiments in the lab as well, likely focusing on the species' unique foraging behavior (it is a sit-and-wait predator that eats relatively very large skinks). I hope to learn something about the evolution of "snakiness" in lizards generally and in this species in particular. How, for example, is *Lialis* so successful on a continent dominated by saurophagous snakes? And why aren't more lizard-eating Australian snakes ambush predators?

Tracy Langkilde: I'm still in the honeymoon phase of my PhD, having started only 5 months ago. I have conducted a preliminary study looking at the habitat use of a suite of sympatric montane skinks (*Egernia cunninghami, Egernia saxatilis, Egernia whitii, Eulamprus heatwolei* and *Eulamprus tympanum*). These skinks use the same sorts of habitat, and have a nasty tendency to attack other skinks that come too close. The plan now is to look at how this aggression affects the distribution of these species. So the next 3 years will involve lots of video-watching, and running around in cold places (mostly the Blue Mountains) playing with skinks.

Dave O'Connor: After spending the last three years chasing black rock skinks (*Egernia saxatilis*) around in the beautiful (but bloody cold) Blue Mountains, watching blobs of microsatellites move down gels and hours of videos of lizards in a nally bin staring at each other, I've now finally started writing. So look out for another exciting paper in the "Why *Egernia* live in family groups" series: "Nuclear family structure in the black rock skink" (Submitted). As a slight break from the writing, I'm off for a couple of months to do some research on the social Cordylid, *C. cataphractus*, with le Fras Mouton in South Africa. See if they also like living in groups for similar reasons. Whilst there I'll also have the pleasure of working with Martin Whiting on his brilliantly coloured Augrabies Flat Lizards, (along with Devi Stuart-Fox from UQ) which will make a nice change from all the black rock skinks playing happy families. I think Martin must almost be an honorary ASH member by now, given the fact he was at the last ASH meeting and Devi and I are the latest in a number of ASH people to have gone to Augrabies with him. After that it's back to the writing (I promise Rick).

John Llewelyn: My honours project is on the thermal biology of several small elapids. The species that I will be studying are; *Cryptophis nigrescens*, *Demansia psammophis*, *Cacophis squamulosus* and *Hemiaspis signata*. My aim is to indicate possible adaptations to nocturnal activity in elapid snakes by examining the range of body temperatures at which each species is active and the thermal sensitivity of biologically important processes such as locomotion.

Bansi Shah: For my recently completed honours research, I looked at potential explanations for why thick-tailed geckos (*Nephrurus milii*) aggregate in the field. I found that thick-tailed geckos *do* aggregate in the field. Interestingly, however, the group composition seemed to be random, rather than family groups as in some species of *Egernia*. I also found that the geckos are selective of their diurnal retreat-sites both in the field and in the laboratory. Geckos continued to aggregate in the lab, but when the opportunity for physical interaction was removed, they no longer aggregated. So, I conducted further experiments and found that the geckos not only heated and cooled more slowly when with another gecko, but exposure to rapidly cooling conditions stimulated geckos to huddle together more closely. These results suggest that aggregation behaviour in thick-tailed geckos has evolved for biophysical advantages rather than "social" interactions.

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Mike Thompson's lab continues with a variety of herpetological projects, and **Frank Seebacher** has joined the staff at Sydney. Mike and Frank are now working on a number of joint projects. **Ricky Spencer** finished his Ph.D. on the impact of foxes on turtles and has moved to a post-doc at the University of Queensland. **Kylie Robert** has continued to investigate the thermal biology of *Eulamprus tympanum* after her discovery of TSD in this viviparous lizard as part of her Ph.D., while **Terry Annable** is making changes to his Ph.D. thesis on the reproductive biology of *Nephrurus* and *Underwoodisaurus* geckos. **Kris Rogers** has escaped the clutches of the University of Queensland after honours there on turtles, to work in Sydney with Frank Seebacher and Mike Thompson on thermal acclimation, using tadpoles and frogs as his model. **Jacquie Herbert** finished her honours last year with Simon Hudson and Mike Thompson on the influence of maternal diet on neonates of highly placentotrophic skinks. She has now taken on the role as Queen of the lab (as well as "Dancing Queen of ASH"), being in charge of everything as a research technician. **Sebastian Iglesias** finished characterising Specific Dynamic Action in the water skink, *Eulamprus tympanum,* for his honours at the end of last year with Frank and Mike, and he is now working on a paper from his thesis. At the same time, **Rebecca Stewart** finished her honours project on uterine and oviductal changes during reproduction in skinks, with Mike and Chris Murphy. On a slightly different note, **Pru Harvey** finished her honours this year, working on the physiology of emergence, singing and feeding in Australian cicadas, increasing once again the number of taxa investigated in Mike's lab. Also this year, **Janet Sparrow** is studying thermal acclimation in a local population of long-necked turtles with Frank and Mike. And there is more. **Tim Ikin** is making changes to his M.Sc. thesis on visual acuity in the dragon lizard, *Ctenophorus nuchalis*. **Susan Adams** has joined the lab as a short-term post-doc. from the Department of Anatomy and Histology to work with Mike and **Chris Murphy** on their ARC-funded project on changes to the uterus that lead to pregnancy in lizards. Apart from

mountains of miscellaneous administration, Mike's main focus continues to be the evolution of viviparity of skinks. Many people are involved, including **Jim Stewart** from East Tennessee State University, who visited the lab (and mostly ran the program) for a while at the end of last year. **Lorenzo Alibardi** from the University of Bologna in Italy is a regular visitor to the lab and visited in the last two summers to further his research into the embryological development of reptilian skin.

Carol Browne is in the last throws of her PhD and has been studying the effects of aquatic pollutants on freshwater turtles in Sydney. A major part of her study was examining the effects of a wide range of pollutants on the immune system of the animals, and determining if pollutants were associated with depressed white cell numbers and increases in haemogregarine parasites. Carol is also just completing lab analyses on turtle tissues collected from wild-caught animals in order to determine the concentrations of metals accumulated, and to see if elevated metal levels are correlated with a decrease in reproductive success.

Conference attendance by lab members
2000 Society of Experimental Biology, Cambridge University, UK
2001 The Ecology of Island Biotas, Wellington, New Zealand
2001 Society for Research on Amphibians and Reptiles in New Zealand, St Arnaud
2001 Chobe 2001 International Conference of Comparative Physiology and Biochemistry, Botswana
2001 40th Annual Conference of the Microscopical Society of Southern Africa
2001 Australian and New Zealand Society of Comparative Physiologists and Biochemists. Adelaide
2002 29th General Meeting of the Australian Society of Herpetologists, Birrigai, ACT
2002 Fourth World Congress: Alternatives and Animal use in the Life Sciences, New Orleans, USA

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Since the last hard copy newsletter appeared in 1999, **Glenn Shea** has continued working on typhlopids, *Demansia* (with **John Scanlon**), various New Guinea skinks, including *Sphenomorphus*, *Ctenotus* and *Prasinohaema* (with **Allen Greer**), large Australian skinks (*Tiliqua, Cyclodomorphus* and *Egernia*), pygopod phylogenetics (with Arnold Kluge),reproduction in the pygopod genus *Delma*, testicular cycles and sperm storage in elapid snakes (with **Rick Shine**), herpetological surveys of reserves in western New South Wales (with **Ross Sadlier, Gerry Swan**, and volunteers from the **Australian Herpetological Society**) and various minor nomenclatural and historical issues. There have been preliminary discussions about having his four-volume Ph.D. thesis from 1992, including the *Tiliqua* bibliography, scanned and available as an electronic publication.

He has also taken over editing the journal *Herpetofauna*.

Three students have completed theses in the Faculty on herpetological topics: **Sarah Gill** (1998), **Patricia Poon** (2000) and **Chris Laing** (2000).

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Poon P, 2000, Oviductal morphology, seasonality of mating and sperm storage in five Australian elapid snakes. B.Sc.(Vet.) thesis

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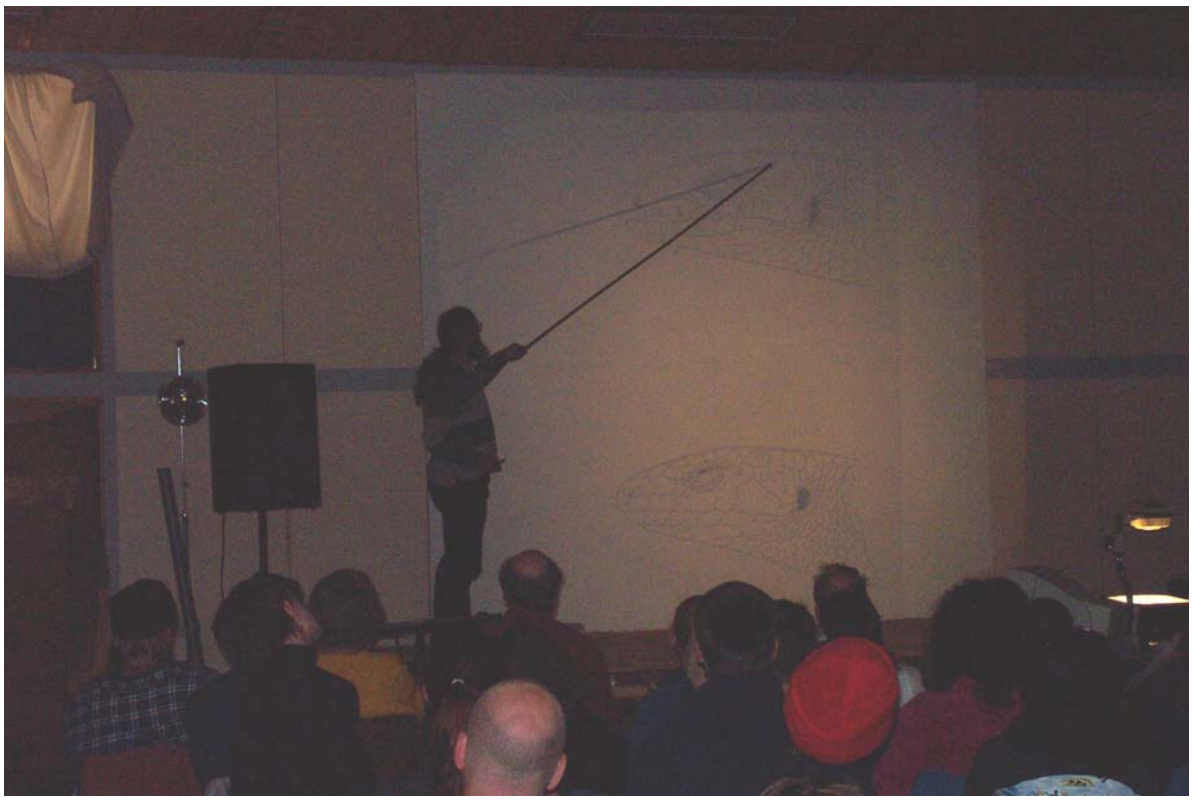

University of Technology, Sydney

The research of **Andrew Stauber** and **David Booth** through the University of Technology, Sydney, focuses on fragmentation, disturbance and maintenance of the habitat of two frogs, the RED-CROWNED TOADLET *Pseudophryne australis*, and the GIANT BURROWING FROG *Heleioporus australiacus*. Both species are listed as vulnerable under the NSW Threatened Species Conservation Act 1995. In the Sydney Basin, they predominantly inhabit ridge tops where habitat destruction and fragmentation through housing development are major threats.

The largely field-based research aims to collect ecological information on these frogs in relation to habitat use, population demographics and genetics, and will contribute to conservation of biodiversity by allowing better management of shrinking populations. The outcomes will help with the design of guidelines to maintain genetic diversity within both species, and to recommend or prescribe ameliorative measures for activities with the potential to impact both species.

This research is funded by an ARC SPIRT grant in collaboration with Industry partners NSW National Parks and Wildlife Service, AGL, NSW State Forests, and Transgrid.

The University of Newcastle

Mike Mahony continues to be an epicentre of frog activity at the University of Newcastle with projects going in a wide range of fields. He continues an in depth ongoing monitoring program on stream dwelling forest frogs of New South Wales between the Hunter Region and the NSW/Queensland Border. This work continues to show a marked reduction in the numbers of many frog species and ongoing losses of frogs to what appears to be the Chytrid fungus. At least the main species of conservation interest, the Barred Frogs (*Mixophyes* spp.), appear to generally be holding their own, although there are still serious concerns for populations of Fleays Barred Frogs (*M. fleayi*) in the Border Ranges. This work is being very supported by volunteers from Earthwatch who have provided invaluable help in the regular warm season frog counts. Mike is also continuing his genetic collaboration with the **South Australian Museum**, which has led to several important publications naming several new species of frogs. His other main area of interest, with **John Clulow**, is in developing cryopreservation as a possible future means of frog conservation. This work, which involves freezing sperm and, hopefully eggs and embryos, may be very useful for species that reach critically low levels and declines show no sign of abating.

On the herpy student front, both **Robert Browne** and **Melissa Pommering** have finished their PhD work on cryopreservation of frog eggs, sperm and embryoes and have written up their theses (well almost for Mel). Publications from both are beginning to role forth. **Andrew Hamer** has also finished his PhD work understanding the needs of Green and Golden Bell frogs (*Litoria aurea*) on Kooragang Island (Andrew has spent many nights in deep discussion with some frogs). The findings so far suggest that they really just like to be near each other. However, the tadpoles are more sensitive to nitrate and phosphate fertilizers than common species like *Crinia signifera*, and the increased use of agrochemicals in the 1960s may have contributed to declines from agricultural areas like the Central Tablelands of NSW. Field and lab studies also show that the life-history of the tads is suited to relatively permanent waterbodies that are free of damn plague minnows (*Gambusia* sp.). **Karen Thumm** continues with her project to unearth the life history strategy and reproductive quirks of the red-crowned toadlet. Emphasis has now moved from the investigation of why continuous iteroparity has evolved in this species to the detail of hatching mechanisms and metamorphic timing. She's now trying to understand the apparent lack of phenotypic plasticity in development observed and how this species comes to terms with an environment demanding flexible responses. The end of this work now appears to be in sight.

Collaborative work with State Forests continues in the form of two PhD projects. **Harko Werkman** has been spending the last couple of years learning how difficult frog counts can be as he attempts to unravel the impacts of forestry on stream dwelling frogs. Mostly he has learnt that these frogs cannot be trusted and that there are not as many around as there used to be. The drought has hopefully also broken in time to allow him to check how frogs on his streams have changed after logging. **Trent Penman** has just started a project looking at the conservation biology of the Giant Burrowing Frog (*Heleioporus australiacus*) in the forests of southern NSW. This project aims to determine what habitat features are important to this frog, how common they really are, how they use the habitat and if fish heads are an attractant to the population in Broadwater State Forest. Many long nights of driving roads and radio-tracking has given Trent numerous frogs to work magic with. They are proving to be more common than expected and have very strong site fidelity, returning to several home burrows almost exclusively, often after several months away from one. Breeding activities are the next big area of interest that requires exploration along with the effects of UV rays on frog researchers in coastal embayments.

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State Forests of NSW

Frank Lemckert: Rumour has it, that I have started a PhD at the University of Newcastle. If true, this work will look at what happens when you make a whole lot of new ponds in a forest and then disturb the forest when the frogs have just got nice and comfortable in their new homes. There is going to be a fair bit of trapping, radio-tracking and frog counting in all of this and so should keep me busy in the Watagan state forests for a few years. I suspect that I will also catch a lot of reptiles in the process, but I'll try and avoid collecting any meaningful data on these lower vertebrates. I'm also learning more about the habits of the Heath Frog (*Litoria littlejohni*), including making a few ponds that will increase their available breeding habitat. I just about have Green-thighed Frogs (*L. brevipalmata*) out of my system. Surveys around the Bulahdelah By-Pass have indicated that the local populations have not been significantly affected by the presence of the road (at least in the short term). The GTFs have been entertaining to work on, even if it has caused a few strained moments with my wife regarding Valentines Day. As a group, the ecology section here has been looking at the contribution plantations can make to increasing or returning biodiversity to areas of

western NSW. A pilot project has looked at the methods best employed to sample plantations and remnant vegetation patches and in the coming year we will be undertaking a major sampling of sites in the Albury-Wodonga area. This will include both frogs and reptiles although the preliminary data suggests that few herps are present in these areas. A lack of ground cover appears the likely culprit and there are plans to do a bit of habitat restoration in some plantations to see if they cannot be encouraged to return.

I am involved in a number of collaborative projects in a supervisory role (see the relevant University sections). **Harko Werkman** and **Trent Penman** from the University of Newcastle are both recipients of Joint Industry Scholarships supported by State Forests of NSW. The same is true of the Stephens Banded Snake work by **Mark Fitzgerald** at Sydney University. Mark has also been employed to learn a bit about the vertical habits of Pale-headed Snakes. I will be assisting **Fiona Powell** at the University of NSW in her work on amphibians and introduced predators and have some role helping **Beth Mott**, at the University of Wollongong, in her work on vertebrates in plantations. I co-supervised **Cheryl Gallyot** in her Honours investigations on the impacts of eco-tourism on frogs in Royal National and Heathcote National Parks that indicated some impacts on the water, but not much on the frogs.

Recent Publications and Theses

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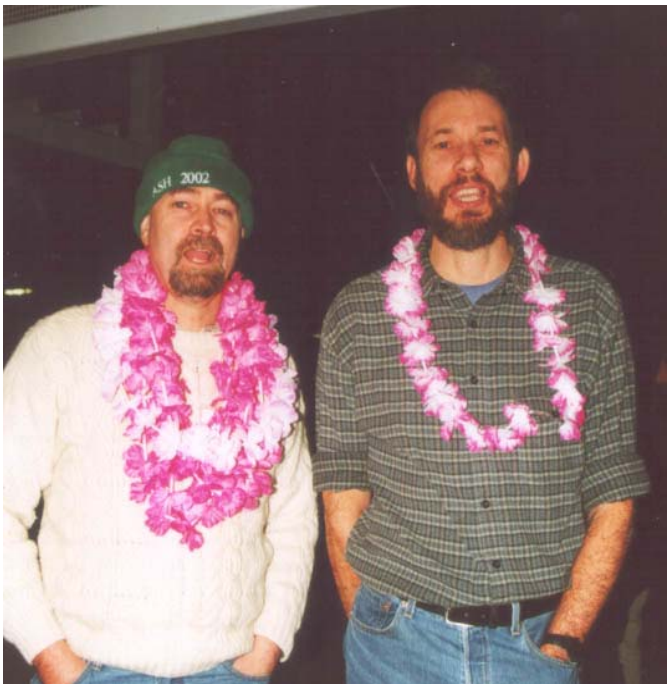
Queensland

The University of Queensland

In David Booth's lab, **Julia McCosker** is in the final stages of writing her PhD thesis on the reproductive ecology of the Brisbane river turtle and Broad-shelled river turtle. Work has commenced on examining the usefulness of multiple frequency electrical impedance technology for the non-destructive assessment of body condition in various herps. **Beth Symond's** preliminary work with cane toads is very promising. We plan to extend the work to crocodiles, lizards and turtles. **Liz Burgess** is doing some follow up work from her Honours year examining the influence of clutch and incubation temperature on swimming performance hatchling green turtles. **Graeme Armstrong** is starting an Honours project examining the diet of the undescribed species of *Elysa* from the Burnet River.



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Queensland Parks and Wildlife Service

Threatened frogs research and monitoring group: The major focus of the work of **Keith McDonald, Harry Hines and John Clarke** involves population monitoring of declining frog species of the rainforest areas of south-east, mid-east and north-east Queensland. This monitoring includes presence/absence surveys, transect counts and mark-recapture studies. Research on the chytrid fungus, in conjunction with James Cook University and the Australian Animal Health Laboratory is continuing. The main focus is investigating the distribution and prevalence of the fungus in Queensland and the seasonal aspects of outbreaks. This work also allows us to gather basic ecological information on stream frogs, for example reproductive biology.

John Clarke is continuing his Masters research on the Kroombit tinkerfrog, which received a welcome boost following the drought-breaking rains from Cyclone Beni.
Away from rainforest streams we are continuing to carry out surveys to document the distribution of Queensland's frogs.

Northern Region Ecosystem management Unit: Unfortunately the poor wet season continues in North Queensland with rainfall well below the average for this time of year resulting in limited frog activity. This is further exacerbated as it follows a very dry wet season of 2001-2002. Despite the

problems created by a poor wet season, **Keith McDonald** continues with a number of frog projects. These include a continuation of the monitoring of threatened frog populations in the Wet Tropics and Cape York, distribution patterns of the chytrid fungus, distribution surveys and management of the threatened species *Pseudophyrne covacuvichae*, continued investigation of "banana box" frogs and the general atlasing of frog distributions in northern Queensland.

As an aside to his main work program which unfortunately is largely "non herp" Threatened Species technical officer, **Alastair Freeman**, is currently looking at whether road kill data can be used as a surrogate indicator of habitat use in pythons in the southern Atherton Tablelands. He is also collecting python distributional data for the Cape York, Wet Tropics and Einasleigh bioregions.

Marine turtle expert **Ian Bell** is currently running a research and management program for marine turtles in the northern region out of the Townsville office. The primary aim of Ian's work is to determine the distribution and abundance of marine turtles through a monitoring and survey program. At the same time research into their feeding and nesting biology and threats to their survival is also being carried out. Ultimately this information will be used to develop and implement management strategies to ensure the long-term survival of marine turtles in the region.

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Northern Queensland Threatened Frogs Recovery Team, 2001, *Recovery plan for the stream-dwelling frogs rainforest frogs of the Eungella region of mid-eastern Queensland 2000-2004*. Report to Environment Australia, Canberra. Queensland Parks and Wildlife Service, Brisbane

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James Cook University

Di Barton: Well, after a bollocking like that, what can I do but write something?!! For the last two years an undergraduate subject (Projects in Behaviour and Ecology) has been run at JCU looking at various reptilian projects. The major project has been a mark-recapture program for the river turtle *Emydura krefftii* which has now been turned into a Master's project under the supervision of **Arthur Georges** (University of Canberra) and **Di Barton** (James Cook University). This project will be looking at the growth rates, feeding ecology and population demography of turtles in Ross River (a river artifically segmented into a series of weirs) and Alligator Creek (a natural river course). Over 400 turtles are already marked and measured. In 2002, there was also a study undertaken on the leeches infesting the turtles in Ross River (look forward to hearing about them at ASH this year!).

Other projects have looked at the effects of fire regime on skink habitat utilisation using a series of pitfall traps to document which species of skinks utilise burnt and unburnt areas. This field study has been backed up by laboratory studies on running speeds of lizards at different temperatures. **Simon Cook** is now in the process of collating the student's data into something a little more presentable.

Di Barton continues her dissection of anything that doesn't move out of the way fast enough and is spending all her time trying to write up the results of year's worth of collection.

Herpetology in JCU is suffering from the combined sabbaticals of **Lin Schwarzkopf** and **Ross Alford** (Ross is currently holed up in Paluma writing and slowly growing mouldy). **Doug Woodhams** is near to completion on his PhD on frog chytridiomycosis, and will commence a post doc in some American university in September. The chytrid torch will be carried by **Nicole Kenyon**. **Mirza Kusrini** is investigating sustainable frog harvesting in Indonesia. **Yvette Williams** is currently finishing her last field season investigating the determinants of rarity in microhylid frogs. **Leonie Valentine** is persisting in studying the impacts of fire regime on reptile assemblages, despite a two day wet season. **Nicola Peterson** and **Sarah Maclagan** are jointly investigating mating behaviour in *Carlia*, and focusing on female choice and male-male competition respectively. The intricacies of Eulamprus parasite ecology are being nailed by **Dan Salkeld**. **Michael Crossland** has reversed the usual flow of migration, and has moved to New Zealand to chase native frogs. **Kay Bradfield** and her unfeasable database on fluctuating assymetry in frogs has gone with him.

And major news: **Simon Cook** completed his PhD and fled to Melbourne. Tickety boo.

Griffith Univeristy

Dr Jean-Marc Hero: As always I am flat out like a lizard drinking! This year started with some hectic paper writing followed by the 2 week postgraduate course in Experimental Design & Statistics (open to Herpetologists from around the country - if you are interested send me an email). Last year I went on sabbatical and established some new research projects in Costa Rica, Cuba and Borneo, along with continuing collaborations in Spain and England. This work continues the investigations on the ecological characteristics of declining (rare) and non-declining (widespread) frogs in Australia and overseas. This year we received a DAPTF seed grant to start research on an endangered frog in Cuba.

Seems my postgrads are also flat out - see below for details on the Gold Coast contingent. Lovemore Mazibuko has also joined the postgraduate team, investigating herps in Malawi. Lovemore is the curator of herpetology at the Museums of Malawi and I am an external supervisor. I plan to visit Lovemore's study sites after the SSAR / SSIH meetings in Brasil later this year.

Meanwhile back at the beach - research on the threatened acid frogs, *Litoria olongburensis* and *Crinia tinnula*, have also stepped up at the Gold Coast Airport. With the threat of the Tugun Bypass looming, Gold Coast Airport Limited have provided funds to study the threatened species on the airport for the next 5 years (see Marama Hopkins honours project below). Furthermore a number of artificial ponds have been constructed in a rehabilitation program to provide additional habitat for the Wallum Sedgefrog.

While away on sabbatical the School gave me a new subject to teach this semester - Vertebrate Biology - so I am busy writing new lectures ... oh the joys of academia ... The good news is I was invited to speak at the next SSAR meeting in the central Amazonas - so plan to return to my old PhD stomping grounds afterwards ...

Luke Shoo: The elusive Luke Shoo has once again disappeared north into the wet tropics to continue his fieldwork looking at Altitudinal gradients in the distribution and abundance of Microhylid frogs and feathered reptiles. We have no idea where exactly he is, what he is doing or when he will be back. But keep an eye on the newsletter and make sure you are in Darwin for the next ASH for more news.

Naomi Doak: Nomes has been busy continuing on with her PhD looking at movement, habitat use and now population genetics of *Mixophyes fleayi*. She has also been spending heaps of time buried in the genetics lab developing fancy wiz-bang screening techniques to screen *Mixophyes* haplotypes. With the recent heavy rains in south-east Queensland and north-east New South Wales she has once again packed up and disappeared into the field hopefully to re-emerge in time for ASH in December where she will stun everyone with the results of her ASH student research award project.

Damian White: Damian is a Masters student investigating the effects of habitat isolation and fragmentation on the fauna of the Gold Coast environments (yes there is fauna on the Gold Coast and we don't mean the schoolies). There are approximately 72,249 ha of remnant bushland in the Gold Coast City, comprising 49.9% of the total area of the city. As with all growing cities there isever-increasing pressure placed on natural systems and habitats for housing development, industrial areas, transport infrastructure or recreation uses. Damian has been extremely busy with huge amounts of fieldwork aimed at examining the biodiversity of fauna in remaining fragments of natural vegetation throughout the coastal zone of the Gold Coast City. He is compiling a fauna inventory for each of the remnants surveyed and the is looking at the influence of the fragment attributes (size, connectivity & disturbance) on the biodiversity and species composition of the fragments.

Simon Hodgkison: Simon has reportedly been spending most of his time on golf courses scattered around south east Queensland. And no he hasn't been perfecting his putting or even working on his swing. He has infact been busy with fieldwork for his PhD investigating and assessing the ecological value of said golf courses by comparing the diversity of frogs, reptiles, birds and mammals found on golf courses, eucalypt fragments and residential areas.

He has also been investigating how variations in shape, size and structural complexity of habitats on golf courses influences local vertebrate species diversity. He then hopes to investigate the potential for golf courses to contribute to regional habitat connectivity given their distribution relative to existing habitat networks. So yes heaps and heaps of time on the golf course.

Sam Ward: One of 2 new honours students to the group who has been monitoing *Mixophyes iteratus* on the Coomera River for 3 years now as a volunteer and summer scholarship student. Sam is starting a project on *M. iteratus* at this site looking at population dynamics of this small, isolated population.

Marama Hopkins: Another new honours student is starting a project examining the distribution of 2 threatened frog species, *Crinia tinnula* and *Litoria olongburensis* at the Gold Coast airport. In particular Marama is interested in mapping the distribution of these two species at the airport and looking at the habitat variables that may influence their distribution there.

Clare Morrison: Clare recently submitted her thesis and has since been awarded with her PhD. She then moved on to a postdoc position in more tropical regions – Fiji. We do of course expect to see her in Darwin in December where we will all be able to hear about what she has been up to while busy avoiding cyclones in Fiji.

Theses

Amy Kock, 2000, Designing effective and efficient monitoring techniques for the endangered frog species *Mixophyes* iterates, BSc Honours, Griffith University, Gold Coast

Brent Dadds, 2000, Reproductive, population and movement ecology of adult *Litoria brevipalmata* (Anura: Hylidae) in a heterogeneous dry eucalypt forest in southeast Queensland , BSc Honours, Griffith University, Gold Coast

Craig Streatfeild, 1999, Spatial movements of *Mixophyes iteratus* and *M. fasciolatus* in southeast Queensland, BSc Honours, Griffith University, Gold Coast

Katie Neilson, 2000, Survey and monitoring the impacts of sand-mining on frogs, BSc Honours, Griffith University, Gold Coast

Melody Stoneham, 2001, Relationships between *Mixophyes* tadpoles and potential predators, BSc Honours, Griffith University, Gold Coast

Web site

http://www.gu.edu.au/school/asc/ppages/academic/jmhero/EndgFrogs/frameset10.html

Victoria

La Trobe University

Garry Peterson is completing his final field season of his Ph D on the ecology, evolution and conservation of the 'endangered' Corangamite Water Skink, *Eulamprus tympanum marnieae*. Recent work has included an investigation into the life history variation across the geographical distribution of *E. t. marnieae*, as well as *adjacent E. t. marnieae/tympanum intermediates* and *E. t. tympanum* populations. Other research into microhabitat use, morphological variation and population demographics has continued. Ian Scott (Scott Keogh's lab at ANU) has also just completed a genetic investigation into the *E.t. marnnieae/E. t. tympanum* complex using Garry's tissue samples that has produced some surprising results.

Emma Knights is in the midst of her Honours research project on the feeding ecology and home range of the Corangamite Water Skink, *Eulamprus tympanum marnieae*. The aims of her project are to determine the diet *of E. t. marnieae* and to identify some of the factors influencing food availability in order to provide insights into how the latter may influence the distribution and population sizes of this 'endangered 'taxon.

Heath Butler is completing his Honours research project on the effect of translocation on the behavioural ecology of Eastern Tiger Snakes, *Notechis scutatus*. This has involved radiotracking a group of translocated snakes, as well as resident individuals in a suburban parkland approximately 15 kms north-east of Melbourne. Preliminary results suggest that adult Tiger Snakes maintain relatively exclusive (non-overlapping) home ranges and are relatively inactive from December to March. Individual snakes appear to differ markedly in their response to translocation. While some individuals exhibited relatively small home ranges after translocation others maintain much larger

home ranges than residents. These results may be useful in determining future snake management in suburban areas in Victoria.

Jason Rossendell is into the third year of his study of the life history and thermal ecology of the Southern Water Skink, *Eulamprus tympanum*. He is about to start looking at population age structure using skeletochronology, before a field season where he will focus on thermal ecology of populations living in environments with different thermal regimes.

Brian Malone, Dennis Black and Peter Pridmore have put on hold their measurements of gecko performance under laboratory conditions until they can make more observations of habitat and substrate use in the field. Three species with different foot morphologies (*Heteronotia binoei*, *Christinus marmoratus* and *Gehyra variegata*) are to be included in the study.

Katie Howard will start an Honours project in August 2003 investigating the impact of predation on larval populations of the Growling Grass Frog, *Litoria reniformis*.

Alice Currey will also start her Honours project in August 2003 comparing habitat use and thermal ecology of *Tiliqua scincoides* and *T. nigrolutea* in a suburban landscap

Web site
http://zoo.herp.edu.au/herp/

Arthur Rylah Institute for Environmental Research

Nick Clemann has been engaged in all manner of vertebrate survey in all manner of environments across Victoria, some of which even include herps. His triumphs include vertebrate surveys of Little Desert and Hattah National Park, Box-Ironbark woodland and Craigieburn grasslands, Growling Grass Frog searches around Kerang (with **Michael Scroggie**), and acting as first-aid adviser to **Heath Butler** (La Trobe University) during Heath's sorties into the wilds of Melbourne's urban parks to radio-track Tiger Snakes. Nick has also extended the scope of his studies to take in Uzbekistan, riding shotgun for **Jane Melville** (Museum Victoria) while she surveys the reptiles there in April. **Geoff Brown** continues to reminisce about those halcyon moments, seemingly years ago, when he escaped the office and actually got his hands dirty.

The **Victorian Herpetological Advisory Group** continues to meet sporadically to discuss herpetological management issues Victoria and lend its weight to conserving the herpetofauna. VHAG consists of various biscuit-eaters, the likes of which include **Murray Littlejohn, John Coventry, Brian Malone, Peter Robertson, Jane Melville, Michael Scroggi, Gerry Marantelli, Graeme Gillespie, Nick Clemann** and **Geoff Brown**.

Publications

Brown GW, 2002, The distribution and conservation status of the reptile fauna of the Murray River region in Victoria. The Victorian Naturalist 119:133-143

Brown GW, Cherry KA, Nelson JL, Grgat LM, 2003, The terrestrial vertebrate fauna of the Menindee Lakes, western New South Wales. Australian Zoologist, in press

Clemann N, 2002, A herpetofauna survey of the Victorian alpine region, with a review of threats to these species. The Victorian Naturalist 119:48-58

Clemann N, 2002, *Pseudemoia cryodroma* Hutchinson and Donnellan 1992 (Scincidae: Lygosominae): a range extension, habitat preferences and identification difficulties. Herpetofauna 32:49-53

Melbourne Zoo

Philippine Crocodile, *Crocodylus mindorensis*: Good progress was made in 2002 in the field for this species. Confirmation of the existence of a wild population in the Northern Sierra Madre area on north-east Luzon Island was achieved in 1999 and a very successful workshop was held in May 2002 to develop a long-term conservation strategy for the area. **Chris Banks** represented Melbourne Zoo and the IUCN Crocodile Specialist Group, but more importantly, there was very good attendance from the local communities. Long-term survival and protection of the crocodiles will depend very heavily on the support of the local people and a range of recommended actions was developed at the workshop to support those goals. Local support is already in place, particularly through the good offices of the Mayor of San Mariano, but ongoing assistance is crucial. A highlight of the gathering was seeing wild *C. mindorensis* at two sites, a first for many of us. The meeting also provided the opportunity to finalise a second community awareness poster, in Tagalog, Ilocano and English – this was funded through a grant to Melbourne Zoo from the Whitley Foundation. Late in 2002, a group of young captive-bred Philippine Crocodiles was imported into Melbourne Zoo from the Palawan Wildlife Rescue & Conservation Centre, under the aegis of a Memorandum of Agreement with the Department of Environment & Natural Resources. Three unfortunately succumbed to accumulated stress, but the remaining three, a male and two females, are thriving.

Stuttering Barred Frog, *Mixophyes balbus:* Six of the seven frogs collected from the Timbarra Plateau in northern NSW have settled in very well. They were cooled over the winter and increased activity has been observed over the 2002-03 summer. The tadpoles arising from spawnings immediately following the frog's arrival in Melbourne in February 2001 are growing well and eight have metamorphosed to date. The project is in conjunction with the North East NSW Threatened Frogs Recovery Team and is aimed at developing husbandry protocols for the species. Two of the Herp Section keepers, **Russel Traher** and **Mike Swan**, obtained funding to undertake field surveys of *M. balbus* in eastern Gippsland. One trip was possible in the 2001-02 summer, but failed to locate any frogs. The subsequent drought conditions, coupled with the recent fires in the area, have prevented further trips.

Striped Legless Lizard, *Delma impar:* Two groups of *D. impar*, 12 in each, were soft-released in grassland sites close to Melbourne in January and March 2002. Unlike the previous releases, these were into low profile field enclosures, as part of the long-term field release monitoring program. Zoo staff participated in the releases, which attracted valuable media attention.

Southern Corroboree Frog, *Pseudophryne corroboree:* Late in 2001, three Southern Corroboree Frogs and four tadpoles arrived at the Zoo from the Amphibian Research Centre (ARC), as part of the Recovery Team's plans to increase community awareness and involve additional captive facilities. The arrival of the frogs attracted a lot of media attention and all the frogs and tadpoles settled in well, being displayed in two specifically designed and built air-conditioned exhibits at about 11ºC. A further group of tadpoles was received from the ARC in mid-2002. The Zoo is also heavily involved in the community awareness and education programs for the Recovery Team and all the various elements are communicated to visitors. The importance of the Zoo's involvement is likely to increase following the disastrous fires in the Kosciusko National Park, although we do not yet know their precise impact on the frogs.

Asian Turtles: In collaboration with PACT (Positive Actions for Conservation Team – a Melbourne community group) and a range of other Australian and overseas partners, the Zoo funded a poster designed to increase community awareness about the threats to Asian freshwater turtles. The colour poster, featuring two Chinese Three-striped Box Turtles, Cuora trifasciata, has been produced in Chinese, Vietnamese and English and is now in place in China and Vietnam. Our major partners in those countries will co-ordinate its distribution and evaluation – the China Council for International Co-operation on Environment & Development (within the Chinese CITES Authority) in Beijing, China; the Turtle Conservation & Ecology Project (TCEP) at Cuc Phoung in northern Vietnam; and Saigon Zoo in southern Vietnam. The posters will be followed by a Chinese re-print of the "Lucky Turtle" children's book, which was originally produced by the TCEP in Vietnam. **Chris Banks** was appointed as Chair of the Australian chapter of the Turtle Survival Alliance, which is a global network tasked with co-ordinating and maximising captive facilities for the benefit of threatened tortoises and turtles.

Taxon Advisory Group: The TAG met twice during 2002 – at Taronga Zoo in July and the Territory Wildlife Park, south of Darwin, in November. Significant progress was achieved with some especially important issues over the two meetings:

- Deciding on the appropriate antivenom to provide coverage for those zoos holding North American crotalids, particularly rattlesnakes. This has been a difficult matter to address, following the US decision in 2000 to cease production of the Wyeth Polyvalent Crotalid Antivenom, which has been the main antivenom of choice globally for many years. The new antivenom is "Antivipmyn", manufactured by Bioclon in Mexico City.
- A major importation program of a range of reptile and frog species to meet display needs and conservation aims of the region. Some of the animals involved will bring new blood into the region for species that are already in our zoos; whilst others are new species to increase diversity and visitor interest. The latter group include a number of exotic frog species, as well as

Asian freshwater turtles. This initiative is requiring extensive discussions with Environment Australia and Biosecurity Australia.

- Circulation of a set of recommendations for increased involvement with threatened Asian tortoises and freshwater turtles.
- Review of those species which are currently in the region in very small numbers and which would benefit from some level of co-ordinated management.
- Initial consideration of northern Australian species, both reptiles and frogs, which are under potential threat from the impact of Cane Toads as the latter species spreads further across northern Australia.
- Extensive discussion and recommendations to the Exhibited Animals Protection Act process of updating minimum standards for the display of reptiles in NSW.

Significant births and arrivals: Two *C. trifasciata*, also known as Golden Coin Turtles, were received from Rotterdam Zoo and a pair of Crested Basilisks, *Basiliscus plumifrons*, arrived from Wilhelma Zoo in Stuttgart, Germany. The female Basilisk arrived gravid and laid 12 eggs soon after arrival – eight young subsequently hatched and are now sub-adults. Tokay Geckoes, *Gekko gecko*, have breed after a long wait – four very pretty babies from two clutches.

Two more Reticulated Gila Monsters, *Heloderma suspectum*, were produced, with an ultrasound machine assisting in monitoring reproductive status. A further five Broad-headed Snakes, *Hoplocephalus bungaroides*, were born on 16 February 2002, after the adult pair had been maintained in an outside enclosure over the preceding winter. Lastly, six Fijian Crested Iguanas, *Brachylophus vitiensis*, were hatched from two clutches of eggs, marking a significant step in the regional management of this highly threatened lizard.

Other Important Developments: The identification signs in the Reptile House have had new lights fitted, which as made a huge difference to the visitor experience. Also adding to visitor enjoyment is a large (3m x 1m) glass tank for the Arafuran File Snakes, Acrochordus arafurae – the previous tank cracked across the base and the new unit, together with filter and other fittings, was donated by Coburg Aquarium.

Matt Vincent has taken up a position as Curator of Animals at Healesville Sanctuary and is replaced by **Damien Goodall**.

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The Australian Research Centre for Urban Ecology (ARCUE)

Kirsten Parris is finishing the first phase of her study on the persistence of pond-breeding frogs in urban and suburban Melbourne, analysing patterns of assemblage composition and species richness as a function of pond size, isolation and habitat quality. She will soon be launching into phase two, which will include metapopulation modelling and (hopefully) experimental manipulation of ponds. She is also just completing a collaborative project with David Lindenmayer from the ANU on the effects of exotic pine plantations on forest frogs in the Tumut region of NSW. Kirsten will be starting an ARC post-doc in March 2003, with a new project investigating the impact of roads (including traffic noise, vibration and road kill) on bird and frog communities.

Lauren Edwards is finishing up her Honours work on activity patterns of urban and rural frogs in the Melbourne region, and identification of optimal survey conditions for a range of species. She will soon have a full 12 months of nightly monitoring data (using automatic tape recorders) from four sites around Melbourne (South Yarra, Burnley, Cranbourne and Healesville).

Publications
Parris KM, 1999, Review: Amphibian surveys in forests and woodlands. *Contemporary Herpetology* 1999(1). http://alpha.selu.edu/ch/ch/1999/1/index.htm
Parris KM, 2001, Distribution, habitat requirements and conservation of the cascade treefrog (*Litoria pearsoniana*, Anura: Hylidae). Biological Conservation 99:285-292
Parris KM, 2002, Assessment of amphibian diversity in the Blackall and Conondale Ranges, south-east Queensland. In Natrass AEO (ed) Frogs in The Community. Proceedings of the Brisbane Symposium, 13-14 February 1999, pp 65-75, Queensland Frog Society Inc., East Brisbane
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Parris KM, McCarthy MA, 1999, Identifying What influences the structure of frog assemblages at forest streams? Australian Journal of Ecology 24:495-502
Parris KM, McCarthy MA, 2001, Identifying effects of toe clipping on anuran return rates: the importance of statistical power. Amphibia-Reptilia 22:275-289
Parris KM, Norton TW, Cunningham RB, 1999, A comparison of techniques for sampling amphibians in the forests of south-east Queensland, Australia. Herpetologica 55:271-283
Williams NSG, Leary EJ, Parris KM, McDonnell MJ, 2001, The potential impact of freeways on native grassland. Victorian Naturalist 188:4-15

Royal Melbourne Institute of Technology (RMIT)

After a stint in New Zealand, **Ted Rohr** took up a teaching and coordinator position at RMIT University. Not surprisingly, field work is biased towards reptiles. Together with **Craig Billows**, he has set up monitoring sites for the Striped Legless Lizard in the Hamilton to study the species' distribution in this area and its habitat preferences. He is also in the progress in continuing field and lab-based research on the ecology of copperheads.

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Wildlife Profiles

Over the 2000/2001 field season, **Geoff Heard** conducted an honours project investigating aspects of habitat use by the Inland Carpet Python (*Morelia spilota metcalfei*) in north-east Victoria (under the supervision of Dennis Black at La Trobe University). Following completion of the study, Geoff has taken up a research assistant role with **Peter Robertson** of Wildlife Profiles P/L and has spent the last two field seasons working on a variety of projects, including on-going research on the ecology and conservation status of *Litoria raniformis* across Melbourne's northern basalt plain (with **Michael Scroggie** of ARI).

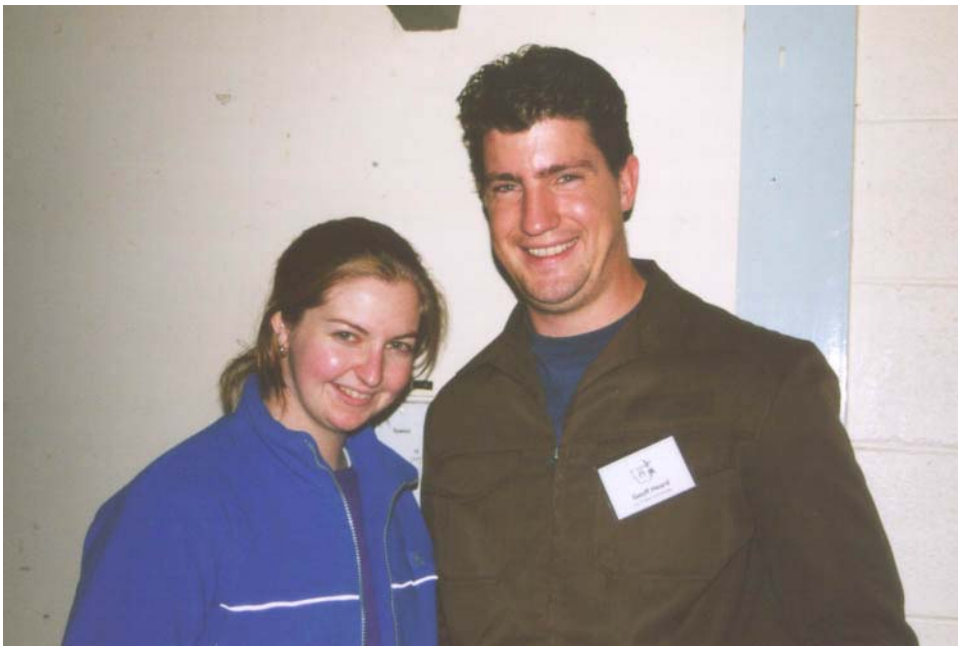
Publications

Heard GW, 1999, Born again captive. *Monitor* 10: 65-68

Heard GW, 2003, Captive reproduction of the Inland Carpet Python (*Morelia spilota metcalfei*). Herpetofauna, in press

Heard GW, 2003, Notes on the use of tail displays as an anti-predator tactic of the Red Bellied Black Snake, *Pseudechis porphyriacus* (Serpentes, Elapidae). Herpetofauna, submitted

Heard GW, Black D, 2003, A survey of the reptile fauna inhabiting the Mt Meg Flora and Fauna Reserve, north-east Victoria. The Victorian Naturalist, in press



South Australia

The Royal Zoological Society

Research-wise things have been pretty quiet on the herp front. **Greg Johnston** is writing up reptile stuff from past ages. **Chantelle Derez**, is set to start an Honours project on foraging behaviour in *Moloch horridus* through University of Adelaide. She will be cosupervised by Mark Hutchinson of the South Australian Museum. **Devi Stuart-Fox** has finished her PhD on evolution of colour in rock dragons, through University of Queensland, and has moved onto a postdoc with **Martin Whiting** in South Africa.

Husbandry-wise **Terry Morely** and crew have had several breeding successes. Several *Nephrurus deleani* have been bred from parents originally confiscated from international airports. Having received three Aruba Island Rattlesnakes in 2001, we have now had one clutch each from both females. Madagascan Tree Boas produced one young this year. Thirteen woma pythons bred at the Zoo seem destined for a release to the wild programme at the Arid Recovery Project at Roxby Downs.

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South Australian Museum

Mark Adams and **Steve Donnellan** are concluding an extensive study of the origin of parthenogenesis in the *Menetia greyii* complex (Scincidae). The study has turned up many surprises including the presence of more than 20 species and a complex history of reproductive interaction between sexual and asexuals.

Steve Donnellan, **Steve Richards** and **Mike Mahony** (University of Newcastle) are clarifying species boundaries and phylogenetic relationships in *Pseudophryne*, *Litoria ewingii* complex, *Litoria thesaurensis* complex and *Heleioporus australiacus*.

Mark Adams and **Ken Aplin** (ex WA Museum) are clarifying species boundaries in a number of south-western herp species including *Myobatrachus* and *Moloch*.

Paul Horner, (NT Museum) has been an annual vagrant to Adelaide over the past couple of years to run gels with **Mark Adams** on *Cryptoblepharus*. Aside from just about doubling the number of known species in Australia, they claim to be simplifying the taxonomy!

Alison Fitch, enrolled in a PhD at Flinders Uni, is isolating and characterizing a panel of microsatellites from *Varanus*. In the first two yeas of her PhD Alison developed a comprehensive mitochondrial DNA sequence database of all the Australian goanna species, and comprehensive phylogeographic studies of five widespread arid zone species, *V. acanthurus, V. gouldii, V. brevicauda, V. eremius and V. tristis*.

Duncan Taylor, enrolled in a PhD at Flinders Uni, is studying the evolution of microsatellites in island and mainland populations of *Morelia*. Duncan has discovered some unusual patterns of microsatellite evolution in *M. spilota* that will extend the usefulness of microsatellites beyond parentage studies. Duncan will be collaborating with Dave Wilson at ANU to determine parentage in Dave's Cape York green pythons.

Adam Skinner, enrolled in a MSc at Adelaide Uni, is establishing a sound systematic framework for the brown snakes (*Pseudonaja*). Adam is currently writing up and formally describing some species whose identity he has significantly clarified.

Chris Grant, who did his Honours project in 2000 and is now up to his armpits in bent-wing bats is writing up his study of the molecular systematics of the *Ctenophorus decresii* complex.

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Western Australia

The University of Western Australia

Dale Roberts: My laboratory is in self-maintenance load right now as I head up the new School of Animal Biology formed from the old Zoology Department and the Animal Science Group from Agriculture - they work on sheep and emus and cheese making and the like! My lab currently has four graduate students working on herp topics:

Michelle "Squishy" Drew: Role of constructed wetlands as sites for frog conservation - focused on predator prey interactions in wetlands formed after sand mining. Neat experiments on interactions with fish and odonates and stable isotope studies of tadpdole diets. Michelle is writing up and is off to Missouri with **Mike Smith** (see below).

Robby "Wildman" Davis: Impacts of habitat fragmentation and salinity on a wheatbelt burrowing frog, *Heleioporus albopunctatus*. Combines genetic studies of subdivision with detailed adult demography and studies of tadpole and egg survival.

"Big" Martin Dziminski: Variation in maternal provisioning of frog eggs and impacts on tadpole growth and survival in unpredictable environments. Comparative studies of variation in yolk volume within and between females, Documentation of environmental variability and some clever field experiments where we have to get the microsatellites moving to see what happened to the fat and skinny eggs.

Dan "AFFA" Edwards: wrote a grant application in her first month and scored an AFFA award (look under Agriculture amongst tractor tyre design - yes you can get them!) looking at phylogeography of south-west frogs and how reproductive mode affects patterns of subdivision of populations. Joint project with DNA sequencing in Scott Keogh's lab at ANU.

The recently departed:

Mike Smith - off to a post-doc with Carl Gerhardt at Missouri

Phil Byrne - currently at UC Santa Barbara working on *Drosophila* with Bill Rice then back to an ARC postdoc at ANU with Scott Keogh

Natasha LeBas - 5 year postdoc at St Andrews, yes that is the golf place, in Scotland but craving Australian sun

Simon Conroy - investment banker in Canberra - we train them all in my lab!

Visitors: Attila Hettyey from Hungary, Ph D student, for one year, to work on sperm motility in large and small males of *Crinia georgiana* and probably on a lot of other frogs

Dale Roberts: currently running an ARC grant with **Scott Keogh** and **Phil Byrne** developing a comprehensive phylogeny of Myobatrachid frogs which we hope to use to look at life history evolution, call structure evolution and their relationship to sexual selection, biogeography and systematic issues (like how many *Uperoleia* species are there really out there?).

Sperm competition studies still continue with a small grant (with **Phil Vercoe** - one of the sheep people) and **Tent Garner** (Zurich) to analyse paternity in group matings using microsatellites. **Leigh Simmons** is also driving me into more and more detail on sperm - paper submitted with Phil Byrne and Leigh on sperm morphology versus risk of sperm competition in Oz frogs and we are now looking at moving onto sperm motility to test various theoretical models from sperm competition theory.

Still dabbling in threatened frogs - with lots of people in my lab pulling data together data on *Spicospina* - range, population estimates, counts of calling males, seasonal calling activity and responses to fire

Publications

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Byrne PG, 2002, Climatic correlates of breeding, simultaneous polyandry and potential for sperm competition in the frog *Crinia georgiana*. Journal of Herpetology 36:129-133

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Doughty P, 2002, Coevolution of developmental plasticity and large egg size in *Crinia georgiana* tadpoles. Copeia 2002:928-937

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Lebas NR, 2002, Mate choice, genetic incompatibility, and outbreeding in the ornate dragon lizard, *Ctenophorus ornatus*. Evolution 56:371-377

Northern Territory

Museum and Art Gallery of the Northern Territory

Paul Horner continues his PhD work on the systematics of *Cryptoblepharus*. He has completed the data gathering and analysis stages and is well into the task of writing up the thesis. With many new taxa (and the synonymising of *C. carnabyi* with *C. plagiocephalus*), expect major changes in nomenclature for Australian populations.

Publications

Horner P, Fisher A, 1998, *Ctenotus rimacola* sp. nov. (Scincidae), a new species of lizard with two allopatric subspecies, from the Ord-Victoria region of northwestern Australia. Records of the Western Australian Museum 19:187-200

Horner P, 1999, Type specimens of terrestrial vertebrates in the Museum and Art Gallery of the Northern Territory – 1973 to 1999. The Beagle, Records of the Museums and Art Galleries of the Northern Territory 15:55-74

Woinarski JCZ, Horner P, Fisher A, Brennan K, Lindner D, Gambold N, Chatto R, Morris I, 1999, Distributional patterning of terrestrial herpetofauna on the Wessel and English Company island groups, northeastern Arnhem Land, Northern Territory, Australia. Australian Journal of Ecology 24:60-79

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The Northern Territory University

Keith Christian: We've been busy with a range of studies on lizards, snakes and frogs. PhD completions include **Christina Schlesinger** (The Effect of a Temporally Variable Environment and Grazing on Lizards in Mulga (*Acacia aneura*) Shrublands of Central Australia) and **Alaric Fisher** (Biogeography and Conservation of Mitchell Grasslands in Northern Australia - not all herps, but a couple of chapters on them). **Tim Schultz** completed PhD entitled "Oxygen transport in varanid lizards during exercise" in 2002. Tim has left the Northern Territory University and joined the staff at Adelaide University. **Gavin Bedford** submitted his PhD thesis entitled "Ecology and Physiology of five species of python from the Northern Territory of Australia" in November. All chapters from it have been submitted as papers with the first published in 2001. He is currently employed by Rick Shine on the project investigating the effect of the cane toad (*Bufo marinus*) on the snake fauna of the Top End of Australia.

Kerry Beggs packed her bags and left the Applied Ecology Research Group at the University of Canberra to join the Key Centre for Wildlife Management at the Northern Territory University in June 1999. Kerry is working on her PhD that is investigating the impact of introduced pastures on herps and other wildlife in the Mary River region. Sadly for Kerry the quad biking in the mud and tripping around the floodplain by airboat has ended, and she is currently spending countless hours listening to frog recordings, finishing analyses and getting ready for the big write-up phase.

During her fieldwork, Kerry recorded a number of individuals of a species of rare geckos - *Diplodactylus occultus* (yellow-snouted ground gecko). This species has not been recorded since about 1988, and was previously only found in Kakadu. A male and female of the yellow-snouted ground gecko, which Kerry collected, currently live at the Territory Wildlife Park, and have had at least one clutch of babies. Kerry also was featured in a short segment on Ten Network's "**Totally Wild**" (info can be found via the Northern Territory Government threatened species website at http://www.ipe.nt.gov.au/news/2002/10/threatened/).

James Smith joined the Key Centre in July 2000 to begin work on his PhD. James is studying many aspects of the life history of mangrove monitor, *Varanus indicus*.

Jeanne Young also formerly with the Applied Ecology Research Group at the University of Canberra moved north to undertake a PhD in the Christian lab in March 2000. Jeanne has been investigating evaporative water loss of frogs in the wet dry tropics, and trying to correlate differences in ecology, skin secretion chemistry and histology to the variation in the ability to resist cutaneous water loss

amongst the Hylid species that occur around Darwin. Jeanne's research was funded by and ARC grant awarded to Keith Christian and David Parry. She also received a small grant for the Centre for Tropical Wetland Management (Northern Territory University). During her fieldwork, Jeanne discovered an undescribed species of frog of the genus *Uperoleia*. She is in the process of completing the species description as well as analysing and writing up her thesis.

Lorrae McArthur joined the Christian lab in July of 2001. Lorrae is currently undertaking a postgraduate research project that examines the seasonal energetics of some species of frog in the Top End of Australia. The project will focus on three similar sized species: the cocoon forming giant frog *Cyclorana australis,* the green tree frog *Litoria caerulea* and the aquatic frog *Litoria dahlii*. Computational models that depict and compare the flow of energy during the wet and dry seasons will be constructed using data collected from laboratory and field research. Laboratory research will include oxygen analyses on animals asleep, resting, exercising, fed and 70% hydrated; digestive passage rate; calorimetric measurements of intake and output; and gut morphometrics. Field research using telemetry and observational surveys will include seasonal average climatic conditions, behaviour and activity. It is intended that the findings of this project will provide valuable baseline information about how these native species interact with their environment before impacts such as the invasion of the introduced cane toad *Bufo marinus,* to assist with the management of native frogs and the wetland ecosystems in which they inhabit.

Lorrae has received small grants/scholarship from Centre for Tropical Wildlife Management (Northern Territory University), Australian Geographic, Linnean Society of New South Wales, and Australian Federation of University Women to help support her research.

Chris Tracy has recently joined us from the University of Wisconsin in the United States. In June, Chris finished his PhD at the University of Wisconsin (with Warren Porter), entitled, "Pattern and theory of geographic variation in physiology and body size in chuckwalla, *Sauromalus obesus*. Chuckwallas show a lot of variation among populations in body size, growth patterns, sexual dimorphism, and digestive physiological function. The goal of Chris's PhD was to describe the patterns of variation in these characteristics and to begin to determine the extent to which this variation can be explained by adaptations to local habitat conditions or by simple phenotypic plasticity.

Chris has received a National Science Foundation (USA) Postdoctoral Fellow to work with Keith Christian at the Northern Territory University. Chris has shifted gears a bit for this project and is currently investigating the complex question of thermoregulation in frogs. Chris is picking up on Jeanne Young's research on water loss in Top End frogs, and exploring the relationships between water loss rates, body size and temperature regulation in several NT frog species.

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The Australian Capital Territory

The University of Canberra

The Applied Ecology Research Group (**AERG**) continues to strengthen its focus on all things herpetological. We will have a strong showing at conferences this year including Sea Turtle Symposium in Malaysia, the SSAR/ASIH conference in Manaus, the International Wildlife Conference/AWMS in Christchurch and the International Genetics/GSA Conference in Melbourne. The molecular ecology lab has had a surge in new equipment, including an automated sequencer and we will be physically expanding the lab later this year. AERG will also be expanding our capacity for housing animals, with a newly refurbished animal room.

Erika Alacs joins us from Murdich Univ. as a new PhD student to investigate questions of phylogeny within *Chelodina*, population genetics of *Chelodina* spp. in northern Australia and mating systems within *C. rugosa*. She studied quokka's for her honours, but we won't hold that against her. Her project is funded by the Australian Federal Police.

Kiki Dethmers, a PhD student from the Netherlands has been visiting on an Australia-Europe scholarship to study the genetic structure of green turtle feeding grounds in the Indo-Pacific. This links in with previous work she was doing at the Univ of Queensland.

Sean Doody is officially Dr. Doody and he continues through 2003 with a post doc investigating biodiversity in rice agro-ecosystems. He and **Fiorenzo Guarino** have been studying the geographic variation in sex-determining attributes in water dragons and they are seeking more funding to continue this work. He continues to work on investigations into the impact of cane toads on native predators along the Daly River (now funded by CSIRO), on the field energetics of pig-nosed turtles, also in the Daly River and considering questions about why some turtles are nocturnal rather than diurnal nesters. To finish off, He and Rachel Sims are studying communal nesting in lizards

Sharon Farley has begun an honours thesis looking at the genetic structure of the undescribed *Elseya* sp. in the central coast rivers of Qld. Her project is designed to provide information to assist conservation planning in the context of a number of new water development initiatives in the region. Her work is funded by the Qld EPA.

Lachlan Farrington is now Dr Lachie (with a PhD on trout genetics) and he continues to work on and supervise all things genetic including the impact of harvest on marine turtles in the Indo-Pacific, the Cooper Creek turtles and *Elseya* sp projects.

David Freier has begin a MSc project to study embryonic development and hatchling growth in *Chelodina rugosa* as part of a husbandry project for the Maningrida community of Arnhem Land. His work is funded by an ARC Linkage Grant awarded to the University of Canberra and the Bawinanga Aboriginal Corporation.

Nancy FitzSimmons continues with a focus on molecular ecology of marine and freshwater turtles and crocodiles. She and **Tony Tucker** are expanding an ecological and genetic study of study freshwater turtle populations in the Kimberley, this year running it as an Earthwatch project. Doing a bit more ecology, she began a project to estimate the numbers of nesting turtles at Raine Island (world's largest green turtle rookery).

Damien Fordham continues his research in Arnhem Land studying the impact of different harvest regimes on the population structure of *Chelodina rugosa* and hopes soon to convert from Masters to PhD. His work is also funded by the ARC Linkage Grant awarded to the University of Canberra and the Bawinanga Aboriginal Corporation.

Arthur Georges and **Stephen Sarre** have remained focused on sex in dragons and look to expand their initial study to investigate the mechanisms of sex determination. Arthur has also been busy up in Arnhem Land working with the community in Maningrida to develop a sustainable industry of raising long-necked turtles for trade. He is recently back from Cambodia visiting **Rohan Holloway's** project on conservation biology of the endangered river turtle, *Batagur baska*.

Tara Goodsell finished her honours on the genetic structure of the Cooper Creek turtle as part of a CRC FE project. She is currently employed at AERG and will be extending her honours work for publication and also completing a study of the phylogeny of the South American turtle genus *Phrynops*.

Bernd Gruber is a visiting PostDoc from the Centre of Environmental Research UFZ, Interdisciplinary Department of Conservation Biology, Leipzig, Germany. For his PhD thesis he studied the effect of individual movement on population dynamics in an arboreal gecko. By the aid of individual-based simulation models he predicted the reproductive success of the population and developed a landscape index, which calculates the reproductive success of a structured population. His work at AERG is focused on checking the validity of the approach using genetic studies

Fiorenzo Guarino has just completed a contract looking at flow patterns in the Daly River, NT and the associated effects on pignose turtles funded under the National Heritage Trust. He is also involved in the CRC FE Cooper Creek project, and with dragon chasing and incubations with **Sean Doody** from Sydney to Cairns, and has a number of papers coming from his thesis.

Marion Hoehn is a visiting PhD student from the Enviornmental Research Center in Leipzig, Germany. She is here working on two species of gecko, *Oedura reticulata* and *Gehyra variegata* in the wheat belt region of WA near Kellerberrin. Along with doing surveys and mark-recapture studies, she is using genetic markers (microsatellites) to look at dispersal, genetic variability and temporal changes in genetic structure.

Rohan Holloway completed his honours degree on the trade of non-marine turtles in Cambodia. He is now back in Cambodia undertaking a PhD on the conservation biology of *Batagur baska* with funding from the Wildlife Conservation Society.

Dave Hunter continues to work on his PhD on: Local adaptation and the conservation of the Booroolong Frog, *Litoria booroolongensis*. Work this summer focused on tadpole response to fish as potential predators. He has also been spending as much time as possible investigating the effect of the bush fires on alpine frogs, particularly corroboree frogs.

Winston Kay visited for a month from University of Queensland to run population genetic analyses on croc samples from the western Kimberley and join in the joys (and hair pulling) of being a gel jock.

Mel White finished her honours project on the population structure of Cooper Creek turtles with the CRC FE, and was quickly whisked away by the CSIRO Arid Rivers team for another extended field trip to catch turtles in the Diamantina.

Megan McCann finished her honours investigating the genetic structure of green turtles populations in the Gulf of Carpentaria and Arafura Sea and the impacts of harvest upon them. She is now gainfully employed by Nancy to determine whether crocodiles intended for release in Can Tien National Park, Vietnam are pure bred *Crocodylus siamensis*.

Will Osborne had a corroboree frog photo of his featured in the Canberra times in an article about the impact of bush fires on their 'homes', but they never realised Will had lost his home too, along with his library, field note books, banjos (not banjo frogs) and some of his research. He continues to be involved with research and management aspects of alpine frogs and reptiles and more recently with biodiversity in rice fields.

Rod Pietsch continues his PhD on the landscape ecology and population genetic structure of the northern corroboree frog. The focus of field work this summer necessarily was set in the context of drought and fire.

Stephen Sarre and colleagues Arthur Georges and Alex Quinn continue to be fascinated by sex…in dragons; how sex is determined and how it varies across species. He is also working with Alex investigating sex-differentiating genes in Tuatara. He continues with a long-standing interest in herps of the fragmented wheat belt of WA, and is helping with a new genetic study by Marion Hoehn.

Oliver Berry is finishing hi PhD thesis on *Oligosoma grande*, a large rock-dwelling lizard in New Zealand. He is studying this species in fragmented habitats and testing various genetic techniques (such as assignment tests) to estimate dispersal distances.

Alex Quinn- Alex has been working with **Steve Sarre** on investigations of sex differentiating genes in Tuatara. He has also been looking at sex determination in dragons and will soon be taking on that topic for his PhD.

Dane Trembath is joining AERG for a Masters, working on the demographic consequences of superabundance in *Emydura krefftii* in the Ross River, in Townsville.

Tony Tucker continues as an adjunct at AERG in addition to his new role as marine turtle biologist with Mote Marine Lab in Florida. He continues field studies with Nancy FitzSimmons of freshwater turtles in the Kimberley, this year with the help of Earthwatch volunteers. He has been collaborating with ANSTO to determine rates of elemental accumulation in crocodile osteoderms, and contributes to Arthur Georges' study at Jervis Bay on *Chelodina longicollis*. He also worked with Joan Whittier's Earthwatch project on green turtles in Malaysia.

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The Australian National University

The **Keogh Lab** in the School of Botany and Zoology has continued to grow and is now out of control, so Scott hides in his office and has no idea what's going on. The lab has been very active at national and international conferences over the past few years. Most members of the lab are working on various aspects of molecular and behavioural ecology of lizards (mostly) and frogs and a few are doing big-scale molecular phylogenetics and phylogeography.

Phil Byrne, after a stint working on *Drosophila* in the USA, has just returned to start an ARC postdoc working on multiple mating and sexual selection in frogs.

Sharon Downes is in the second year of her ARC postdoc on the effects of weed invasion on lizard behaviour and life history traits. The blue periwinkle is a common weed throughout eastern Australia and significantly alters the thermal environment for small lizards. However, lizards can shift their behaviour (climb the vegetation and bask on the canopy) in order to thermoregulate. Sharon is using a manipulative experiment in outdoor enclosures to examine these shifts in behaviour and the associated effects on growth and reproduction. By the way, her singing career has really taken off since her debut at ASH2002.

Ignase Buscher and **Joke Bilcke** are visiting fellows in the lab over the 2003 summer. They hail from Belgium and are working with Sharon Downes on the weed-lizard project. Their particular focus is on how the foraging behaviour of lizards changes in environments invaded to different degrees by weeds.

David Chapple is a couple of years into a PhD looking at the behavioural and molecular ecology of White's Skink, *Egernia whitii*. He recently completed his second field season looking at the social structure, mating system and significance of colour polymorphism in *E. whitii*. The genetic analyses (DNA microsatellites) to be completed this winter will reveal the level of relatedness between individuals within social groups and shed light on the species mating system. David is also close to completing a molecular phylogeny for the *Egernia whitii* species group to resolve several taxonomic issues and examine the evolution of colour polymorphism and complex social behaviour within the species group. He has also recently completed a review on the evolution of complex sociality and monogamy in the *Egernia* genus.

Christine Hayes is a senior research officer in Scott Keogh's lab and she has been involved in virtually all the molecular work going on. In particular, Chris has been developing and using microsatellites for a variety of herps and also working on generating big DNA data sets for Australian elapids and myobatrachid frogs.

Anke Maria Hoefer is half way through her PhD. that is concerned with the general mating system of non-territorial and mono-morphic lizards. My study animal is the common garden skink *Lampropholis guichenoti*. Besides getting basic information on how the mating system of this species works I am tryin to figure out things like "how does female presence influence male-male aggression" and "how does weed infestation affect life history trades of small heliothermic skinks".

Scott Keogh mostly just does admin and replies to emails now, but in between that he is finishing up his work on the molecular phylogenetics of elapids (finally!) and is working on a major collaborative project with Dale Roberts on the phylogenetics of all myobatrachid frogs. He has also been dabbling in behavioural and molecular ecology and has been investigation questions to do with multiple mating in female *Eulamprus*.

Vimoksalehi Lukoschek is a PhD student based at James Cook University but she is co-supervised by Scott Keogh. Vimoksalehi is working on the higher level phylogenetic systematics of sea snakes and the population genetics of several sea snake species.

Junko Kondo. As a part of her Honours, Junko Kondo is studying the retreat-site sharing behaviour in Velvet Gecko (*Oedura lesueurii*) by using both field survey and laboratory experiments. Her project focuses on some of the behavioural mechanisms that may influence gecko's decision of whether to share the retreat sites or not with particular individuals.

Allie Mokany is set to commence her PhD in mid April looking at Resilience and Resistance of aquatic beasties to environmental change. This broad topic will be further refined throughout the year and she will hopefully be able to present something tangible at the next ASH conference.

Nicki Mitchell has recently joined the Keogh Lab following a 2-year postdoc in New Zealand (working on temperature-dependent sex determination in tuatara). Nicki is working with Scott and Dale Roberts, collating a huge data set on Myobatrachid frogs which will be used to examine the evolution of diverse reproductive traits. She starts a postdoc on frog physiology/behaviour at La Trobe University later this year, after 1) producing a child, and 2) waiting for husband Oliver Berry to write up his PhD.

Matthew Morgan is just about to start a PhD working on some aspect of molecular phylogeography and phylogenetics of myobatrachid frogs. Details will be provided in the next ASH newsletter!

Louise Osborne is finishing the second year of her PhD investigating the anti-social behaviour of dragons. She is using the tawny dragon (*Ctenophorus decresii*) as a model system to figure out why dragons bob their heads, wave their arms and flash their tails around. She is concentrating on the information content of these signals such as signal reliability, and figuring out what cues are important in rival recognition.

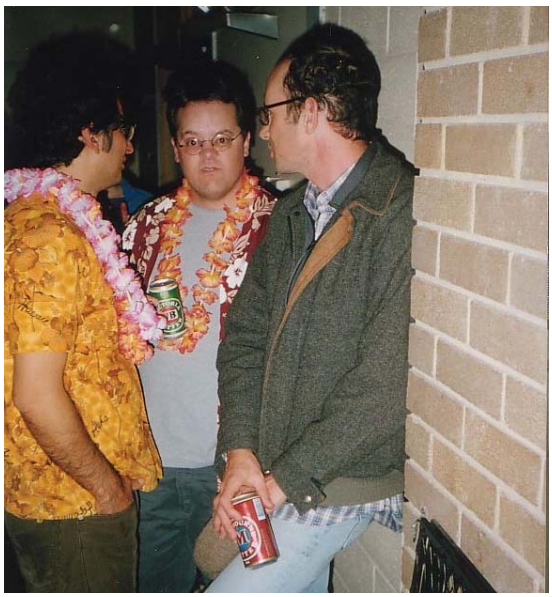
Ian Scott has been investigating the taxonomic status of the threatened Corangamite water skink *Eulamprus tympanum marnieae* using mtDNA sequence data from the ND4 gene as well as microsatellite polymorphism data. Analyses of the mtDNA sequence data have revealed that populations assigned to *E. t. marnieaeae* are most closely related to geographically proximate populations that are assigned

morphologically as *E. t. tympanum* or intermediates. These data have revealed the presence of two discrete mitochondrial haplogroups (5.3-7% divergent) that are geographically isolated from one another by the watershed between the Hopkins River and Corangamite drainage basins. Each haplogroup is comprised of populations that can be assigned either to *E. t. marnieae, E. t. tympanum* or intermediates between them. *E. t. marnieae* as currently described is not monophyletic and while this has some conservation implications, the *E. tympanum* complex of southwest Victoria appears to be a candidate case of incipient parallel speciation.

Warwick Smith is in the third year of his PhD and has been collecting data on mating behaviour and hatchling behaviour in *Varanus rosenbergi* on Kangaroo Island in an effort to determine the effect of different strategies on reproductive success and survival. This is being done with real time video recording of nuptial burrows and of termite mounts which are the oviposition sites and the shelter sites for hatchlings for the first few months of life. Tissue samples are also being collected for the development of a genetic marker for gender determination and for paternity analyses and other population genetics aspects of the project.

Jessica Stapley is in the final year of her PhD investigating the behavioural ecology of two skinks common to the ACT (*Pseudemoia entrecasteauxii* and *Eulamprus heatwolei*). During her PhD she has combined molecular and behavioural studies to investigate the causes and consequences of alternative male mating strategies in these lizards. Her project also focused on the predator avoidance behaviours of lizards when they are faced with multiple enemies. The thesis also investigates the influence of individual variation in behaviour (ie.personalities) on the evolution of mating and predator avoidance behaviours.

Bob Wong did his honours on frogs a while back, but has been working on sexual selection in fish for his PhD. We include him here for completeness sake as he is still part of our lab, and he does still occasionally dream about frogs.



Past members: Suzi Morrison finished honours a couple of years ago working on mating systems in *Eulamprus*. After travelling the world she is now a biological illustrator in Melbourne. **Kathryn Read** finished honours a couple of years ago on the molecular phylogenetics of *Crinia* and allies. She is now working for the Australian Research Council. **Megan Head** finished honours last year on the chemical ecology of *Eulamprus*. She is now doing a PhD at UNSW on sexual selection in fish. **Eleanor Wilson** finished honours last year on the mating systems in *Eulamprus*. Eleanor is now a mom and studying psychology. **Paul Doughty** spent two years in the lab as an ARC Postdoc working on phenotypic plasticity in frogs. Paul has jumped ship and is now working on Drosophila at UQ!

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Lyn Nelson (from **Paul Cooper's** lab) is in the process of writing up her PhD research on *Tympanocryptis pinguicolla* (Grassland Earless Dragon) which is listed as Endangered. Her work has focussed on comparing aspects of the life histories of populations of this lizard from grassland areas near Canberra with populations of a genetically distinct group from higher elevations near Cooma. Lyn also examined temperature selection of *Tympanocryptis pinguicolla* in the laboratory and in the field. Temperature sensitive transmitters were attached to the lizards during part of this field work and data from these were compared with datalogger records. A field energetics study forms part of her thesis work.

Donna Hazell is currently working as a post-doc in landscape ecology at CRES but still have a strong interest in researching frogs. Have been busy submitting manuscripts from my PhD thesis, which was accepted early 2002. Also writing grant applications for my next big herp project.

Joern Fischer is a PhD student at CRES with research interests in conservation biology and reptile ecology. He spent the last summer pitfall trapping lizards in a fragmented landscape near Tumut (NSW). Fieldwork has just been completed, and Joern will spend the next few months developing statistical habitat models for various species of lizards. He is hoping to finish his PhD in mid 2004.

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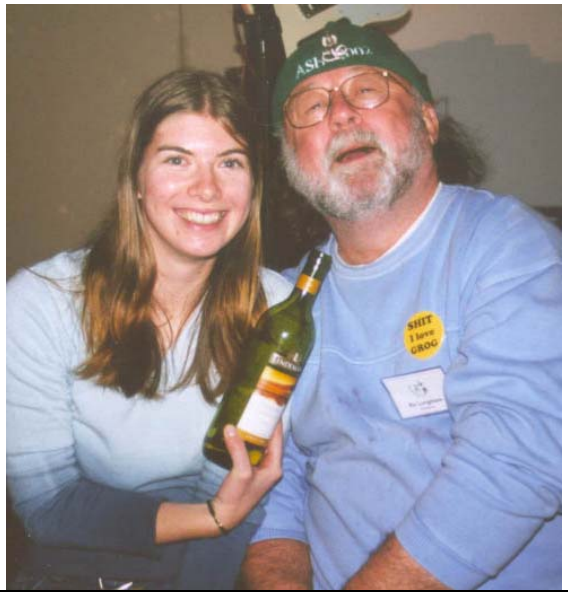
CSIRO Sustainable Ecosystems

John Wombey: I remain on as a fellow at the ANWC helping maintain the specimen record data bases and participate in any field work going, almost entirely on birds so most things herpetological seem to have fallen through the cracks.

ACT Herpetological Association



Ric Longmore: I am enjoying my retirement and find I now have more time not to do all the herpetological tasks that I said I would do when I retired! My involvement with our small ACT Herpetological Association has increased. We held a 6 day display at the National Botanic Gardens (until closed by the massive ACT bushfires) called "The only good snake is a live snake" and welcomed thousands of very interested members of the public. Members of the ACTHA answered millions of questions and the kids could hold a python or feed a stumpytail skink. TV and newspaper coverage ensured a most successful week. I am still recovering from a wonderful ASH 2002 but hope to journey to the NT to continue my investigations and innoculations of virgin ASH members in December 2003 and to catch up with some northern mates.

Tasmania

The University of Tasmania

Roy Swain and **Sue Jones** continue to lead a small but active research group in the School of Zoology. Their own work centres on maternal-foetal nutritional relationships in *Niveoscincus* and *Pseudemoia* spp and the insight these may provide into the evolution of obligate placentotrophy. Their primary interest is in the selective advantages offered by facultative placentotrophy (i.e. why should species go beyond lecithotrophy), and how these relate to the evolution of obligate placentotrophy. Their work is supported by an ARC Discovery grant.

Janie Girling recently left the group to do further placental research at the Monash Medical Centre, but her spirit is still very much with us! Janie spent three years in Tasmania as a postdoc. fellow, doing most of her research on the biennially reproducing skink, *Niveoscincus microlepidotus*. Her work focussed on the endocrine control of gestation and parturition, and on the production of steroid hormones by embryos and placentae.

In addition to their mainstream work **Jane Melville** (Museum Victoria) and **Erik Wapstra** (Macquarie University and University of Sydney) retain close connections with the group. Jane, Roy and Nick Clemann (Arthur Rylah Institute, Victoria) are setting up a conservation genetics project (hopefully funded!) on *Tympanocryptis diemensis*. Erik and Roy are currently collaborating on the development of microsatellites for use on *Niveoscincus* spp. Development is almost complete and experimental work will commence next activity season. They have been joined by **Ashley Edwards**, who has recently returned from a post-doc. diversion researching penis worms in Sweden. Ashley will be continuing her steroid research, centred on *Tiliqua nigrolutes*, with Sue Jones.

Natalia Atkins is a Masters student investigating aspects of the reproductive biology of *Niveoscincus* and *Pseudemoia*. Her work is a sub-project of the ARC Discovery project of Roy and Sue and focuses on how and why the change from lecithotrophy (yolk provision) to placentotrophy (placental transfer) may have begun. Her experiments compare the capacity to defer parturition in related species, and how this relates to different combinations of lecithotrophy, facultative and obligate placentotrophy.

Bonnie Lauck has completed data collection for her PhD on the effect of logging on amphibian life history in the southern wet forests of Tasmania. Frogs have great potential as bioindicators for sustainable anthropogenic land management practices. Bonnie's premise is that capitalising on the their flexible life histories provides excellent opportunities for using frogs as monitors. Her study aims to provide an alternative approach to the use of population based studies to measure the effect of logging on amphibians, since the typically large population fluctuations of amphibians require unrealistically long data sets. The project includes both field and laboratory experiments.

Jemina Stuart-Smith (Duraj) began her PhD mid-2002, continuing her Honours work on *Tympanocryptis diemensis*. This season she has been running a set of incubation experiments to investigate maternal and nest temperature effects on hatchling phenotype. She is also interested in hatchling dispersal and home ranges, and has undertaken a capture-mark-recapture study on one of her study populations. Her project will also include work on winter survival and trade-offs in the utilization of fat reserves between survival and reproduction.

Renu Singh also began her PhD mid-2002. She is studying reproductive biology and habitat utilisation in *Niveoscincus pretiosus*. Jane Melville's work identified three evolutionary lines within *Niveoscincus*. Good data on reproductive and life history adaptations is available for two of these lines from Sue and Roy, Erik Wapstra, and Mike Thompson's group, and Renu will fill in some of the gaps for the third line. In particular she will focus on the extent to which her species is placentotrophic and whether placental transfer is primarily facultative or obligate. Since species from all three lines occupy co-exist within the same habitat, she will also investigate microhabitat niche separation within co-existing *N. pretiosus*, *N. metallicus* and *N. ocellatus*.

Theses

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Redburn, K (1999) Life history and habitat of the Tussock Skink, *Pseudemoia pagenstecheri,* in Tasmania, BSc Honours Thesis

Welling, A (1999) A study of the ecology of the Mountain Dragon, *Tympanocryptis diemensis,* BSc Honours Thesis

Atkins, N (1999) Development of endocrinological techniques applicable to reptilian conservation, BSc Honours Thesis

Cartledge, V (1999) Adrenal-gonadal relationships in the viviparous lizard *Egernia whitii* (Lacertilia: Scincidae), BSc Honours Thesis

Chapple, D (2000) 'Costs' of autotomy in the Metallic Skink, *Niveoscincus metallicus,* BSc Honours Thesis

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Abstracts from the 29th AGM of ASH Birrigai, ACT 2002

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Changes in oviductal morphology of the skink, *Lampropholis guichenoti*, associated with egg production

During early pregnancy in mammals, the plasma membrane (PM) of the uterine epithelium undergoes a number of alterations, which collectively are called 'the plasma membrane transformation'. A plasma membrane transformation occurs in all viviparous amniotes studied to date, including skinks, which suggests that change in the PM is critical across species for the development of uterine receptivity. Despite the possible importance of the plasma membrane transformation in the evolution of viviparity, no detailed study of changes to the oviductal epithelium of oviparous species has been made. Consequently, we described changes in the morphology of the oviductal epithelium of *Lampropholis guichenoti* during the course of egg production and oviposition to: 1 provide a baseline for understanding uterine changes in viviparous species, and 2. establish whether the plasma membrane transformation is indeed a feature restricted to viviparous species. Oviducts from juvenile, pre-ovulatory, gravid and post-gravid females were dissected in one piece, fixed and prepared for Scanning Electron Microscopy. Digital images of the entire oviduct were used to construct maps of the oviductal surface. Four anatomically different areas were defined within the oviduct, but no plasma membrane transformation was observed in the oviparous skink, suggesting that it is a phenomena particular to viviparity.

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Anuran chytridiomycosis: a model of disease development and a test of its dependence on the hydric environment

Epidemic outbreaks of disease caused by the amphibian skin fungus *Batrachochytrium dendrobatidis* have killed frogs during large scale population declines. The causes of these outbreaks are not presently known. The pathogen can be found in at least 25% of Australian frog species, and often occurs at low, apparently endemic infection rates. Understanding how the population dynamics of chytrids on frogs is related to the development of disease, and how the development of disease is affected by environmental influences, should aid in explaining the patterns of previous frog declines and in predicting and preventing future declines. The chytrid fungus is an unusual pathogen in that it recruits on the host through recolonisation by zoospores, which are released to the external environment. We hypothesised that disease in frogs is caused by simple growth of the pathogen population, with mortality occurring at a threshold pathogen density. Patterns of mortality we observed following experimental infections are consistent with this hypothesis. We also hypothesised that the rate of recolonisation of the host would depend on the hydric environment encountered by zoospores when they are released. We predicted that mortality should occur most rapidly in animals that lived in saturated humidity but did not enter flowing water. An experiment confirmed this hypothesis. Our results suggest that chytridiomycosis is most likely to develop in individuals sitting in saturated retreat sites, and may be transmitted primarily by physical contact among frogs rather than by transmission through water. This may explain the temporo-spatial patterns of previous anuran declines.

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Is the harvesting of Pig-nosed Turtles, *Carettochelys insculpta*, sustainable?

The Pig-nosed Turtle (*Carettochelys insculpta*) is an unusual-looking turtle and the single surviving species in the Family Carettocheliydae. It occurs in Irian Jaya, Papua New Guinea and the Arnhem Land region of northern Australia. In Irian Jaya the turtles are legally harvested by indigenous people for food. They are also illegally harvested by professional trappers for the international pet trade despite Indonesian legislation to protect the species. Devising a management plan for the sustainable harvesting of this turtle has been a complex conservation issue in Indonesia. Conservation bodies and researchers have highlighted the need for ecological studies of the populations of many Asian turtles (e.g. Asian Turtle Trade Working Group, 1999), including the Pig-nosed Turtle. We propose to undertake a population study in south-east Irian Jaya to ascertain if the exploitation of the population is sustainable. We plan to gather data on the population size,

the seasonal reproductive cycle, and seasonal diet. Proposed methods include mark-release-recapture to estimate the population size, histological sections of gonads to examine the seasonal reproductive cycle, and stomach flushing to determine food preferences. Conducting interviews with local people, reptile traders, government authorities, and non-government organizations will collect data on the trade and consumption, including volume, frequency, method of export and local use. This study would provide vital data to clarify the status of the animal and its exploitation and hence provide a basis for the drafting of sound management plans.

Natalia Atkins (Poster)
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Flexibility in the timing of parturition: assessing the roles of facultative and obligate placentotrophy
It is suggested that placentotrophy first evolved as a facultative mechanism enabling mothers to supplement an adequate yolk supply (lecithotrophy), thus enhancing offspring condition if circumstances are favourable during gestation. A major selective advantage arising from this is the introduction of flexibility into the timing of parturition ensuring that young are born into a benign environment. Obligate placentotrophy is seen as the next step in evolution. My project aims to assess the roles of facultative and obligate placentotrophy within *Niveoscincus*, a genus that exhibits a diversity of nutritional modes. *Niveoscincus microlepidotus* are biennial breeders: ovulation occurs in spring and embryos are fully formed by late autumn, but young are not born till the following spring. It is hypothesized that the species is primarily lecithotrophic and capable of facultative transfer but little obligate placentotrophy. The ability to utilise facultative placentotrophy to overwinter embryos and to defer birth (≥ 2 months), will be documented, and related to variability in neonate condition and survival. *Niveoscincus ocellatus* on the other hand are annual breeders, with an extensive replacement of yolk nutrition by obligate placentotrophy. It is hypothesised that with the shift to obligate transfer, limited opportunities remain for facultative placentotrophy. This should be expressed as a reduced ability to defer parturition (parturition occurs over a limited time period, 2 - 3 weeks), and with less variability in neonate condition than in *N. microlepidotus*.

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Costs and benefices of brooding in the Ball python, *Python regius*
Was parental care (especially, maternal warming of the clutch) the initial step for the evolution of endothermy in vertebrates, as suggested by Farmer (2000)? The relative costs and benefits of parental thermogenesis offer crucial evidence on the plausibility of this hypothesis. Pythons provide a unique opportunity to evaluate this issue, as they are the only reptiles to warm the clutch using maternal shivering. Previous studies have concluded that brooding confers a very high energetic cost to nest-attending female pythons, but most such studies have been conducted in atypically cool climates. We monitored changes in body mass over the course of brooding in 50 recently-captured female ball pythons (*Python regius*) in equatorial Africa (Togo). Surprisingly, brooding females lost < 4% of their initial body mass over this two-month period. The magnitude of mass loss was independent of the duration of brooding (experimentally manipulated to 0, 15 or 60 days) and of clutch size (normal, enlarged and reduced clutch-sizes). Maternal attendance throughout incubation strongly enhanced survival rate to hatching (82% *versus* 9%). Hatchlings from maternally brooded eggs were also larger and more active, swam further and faster, and developed more rapidly post-hatching (as indicated by the date of first sloughing and food independent post-natal growth rate) than did offspring from the other incubation treatments. Maternal brooding thus substantially improved hatching success at very little energetic cost to the female (the causal factor being more likely to involve protection against desiccation). This paradoxical result reflects the high ambient temperatures in the study area, meaning that nest-attending females shivered only rarely (during occasional cool weather). Our data thus challenge previous conclusions, support the hypothesis that parental care may facilitate the evolution of facultative endothermy, and suggest that such a transition may occur most readily in hot rather than cool climates.

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Conservation versus pastoralism: herpetofauna as indicators of ecological change in the Mary River region, Northern Territory
The Mary River region in Australia's Northern Territory is recognised as being of national significance – not only because of the high biodiversity its wetlands support, but also because of the very productive grazing land in the area. In recent years, pastoral activity has intensified and the introduced pastures, gamba grass (*Andropogon gayanus*) and para grass (*Urochloa mutica*), have been planted in the lower Mary River catchment and others areas of tropical northern Australia. These invasive grasses have subsequently spread onto non-pastoral lands including conservation reserves and national parks. Prior to this study, little or no information was available regarding how these pastures may be affecting faunal communities. Consequently, the extent to which this aspect of pastoralism conflicts with conservation objectives in the region was also largely unknown. As part of a broader wildlife monitoring project, my study aims to address this knowledge gap by assessing the effects of introduced pastures on the herpetofauna (other than larger varanids, agamids and snakes) of the Mary River region, and to evaluate the utility of herps as indicators of ecological change. Preliminary findings indicate distinct differences in herp communities between non-pasture "control" sites and those with a dense pasture grass cover. Management implications of this research, in particular, the validity of on-going wildlife monitoring in the region being based on herp indicators, are discussed.

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Significance of incubation temperature in sea turtles
Sea turtles nest on beaches from the equator to latitudes of about 35^{o}. At rookeries close to the equator, there is little season variation in sand temperature, and beach attributes such as orientation, sand colour and degree of shading are the primary determinants of inter-nest variation in incubation temperature. In contrast, at rookeries located at the latitudinal extremes, marked seasonal changes in sand temperatures occur, and timing of nesting and nest depth are more likely to be the primary determinants of nest temperature. Nest temperature has long been known to influence sex ratio of hatchlings emerging from a nest, but other influences of nest temperature on hatchling quality have not been extensively investigated. Here we present evidence of the influence of incubation temperature on embryonic energy expenditure, hatchling size and hatchling swimming performance.

Sara Broomhall
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Does embryonic temperature experience affect later susceptibility to Thiodan® (active ingredient: endosulfan) and predation in *Litoria peronii* tadpoles?
Declines in amphibian populations have led to sustained interest in the interactions of possible causal factors such as disease, UV-B and contamination by agricultural chemicals. Chemical contaminants may also interact with biotic and abiotic factors, which could modify their effects on anuran development. I investigated the effects of egg rearing temperature and subsequent exposure of tadpoles of the Australian frog, *Litoria peronii*, to sub-lethal concentrations of endosulfan (an organochlorine pesticide). Endosulfan significantly reduced feeding and modified tadpole behaviour (this behaviour changed with egg rearing temperature). Tadpoles exposed to endosulfan were more vulnerable to capture by dragonfly larvae when tested 24 days later; this response was dependant on egg rearing temperature. Thus, there were unambiguous effects of both egg rearing temperature and endosulfan on tadpole feeding, behaviour and survivorship in the laboratory. Consequently, brief contact with endosulfan in natural conditions may also alter future components of fitness after cessation of actual pesticide exposure. Likewise, the conditions that a tadpole experiences as an embryo may potentially alter the effects of some pesticides. These trials highlight the need to test interactions between parameters of potential ecological importance over the long-term if we are to evaluate possible consequences of pesticide exposure in natural communities.

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Frogs Up The Creek and Tortoises Going Under - The Changing Conservation Status of the Victorian Herpetofauna

Since 1991, 43 reptile and 16 frog species have appeared on various editions of the Department of Natural Resources and Environment list of 'Threatened Vertebrate Fauna in Victoria'. These lists are developed for use in strategic planning and established planning processes, and provide an indication of the level of threat and the magnitude of the task of controlling the loss of biodiversity. Only one species, *Oxyuranus microlepidota* Small-scaled Snake, is considered extinct in Victoria. There are five reptile species and six frog species that are currently listed as *Critically Endangered*, and another ten reptile and one frog species listed as *Endangered*. Overall, five alpine species are considered *Critically Endangered;* another six alpine species are listed. Since 1991 the number of frog and reptile species that have been downgraded (i.e. considered less threatened) total two and 12 respectively, and those that have been upgraded total 11 and 23. The conservation status of a further three frog and 12 reptile species has essentially not changed. Thirteen of the listed Victorian species are also threatened nationally. The Atlas of Victorian Wildlife (NRE) database yields comparatively few records for most listed species and, alarmingly, a proportional decrease for many.

Greg Brown, Rick Shine
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Neonate survival in a tropical colubrid, the keelback (*Tropidonophis mairii*)

A great deal of information exists on patterns of reproductive investment and subsequent neonate phenotypes in snakes. However, there is a glaring lack of information on how offspring characteristics affect survival. This lack of information is attributable to the difficulty in capturing and recapturing young snakes. Over four years we incubated eggs from 350 keelback litters and marked and released > 3,000 neonates. 130 individuals were subsequently recaptured after a minimum period of 3 months. Females neonates were more likely to be recaptured than males and longer individuals of both sexes were more likely to have survived. Body mass and strength of neonates did not affect their survival. The major factor affecting neonate length was moisture level of the incubation substrate. Eggs incubated on moist substrate produced longer neonates which subsequently survived better. The relationships between soil moisture, neonate size and survival may explain the seasonal timing of reproduction in keelbacks.

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Pollution and Australian freshwater turtles: metal accumulation and effects

Heavy metals can cause death or dysfunction in vertebrate adults and embryos. The objective of this study is to examine metal accumulation and monitoring methods in the two freshwater turtle species captured in Sydney – the Eastern Longnecked turtle (*Chelodina longicollis*) and the Macquarie turtle (*Emydura macquarii*). Carapace bone samples from turtles captured at four urban (polluted) and four national park (minimal pollution) lagoon sites in south-eastern Sydney are being analysed for 40 elements using ICPMS to determine differences in metal accumulation due to urbanisation and turtle species, sex or age. Blood and egg are also being assessed as alternative tissues for non-lethal sampling for heavy metal monitoring. Additionally, metal concentrations in eggs are being correlated with hatchling deformities and survival rates to explore possible reproductive consequences of metal exposure. Toxic metals (*e.g.* Pb, Zn, Al) are sequestered in the carapace of turtles, with little evidence of an age effect. Surprisingly, there is not an obvious effect of urbanisation, although some metals demonstrate strong site-specific accumulation. Carapace is a good method of assessing some internal metals (*e.g.* Zn, Ti), yet not effective for others (*e.g.* Cu, Se). Several metals (*e.g.* Mn, Zn, Se) are compartmentalised in the contents and shell of eggs.

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Testes mass and sperm competition in Australian frogs

Recent work on *Crinia georgiana* has demonstrated the reality of multiple paternity and therefore the risk of sperm competition in Australian frogs. In many animal groups a higher risk of sperm competition is associated with an increase in testis mass, giving more sperm per ejaculate. This logically reflects Parker's lottery model of sperm competition success: more tickets give you a better chance of winning. This study evaluated

comparative testis mass in Australian frogs from the families Myobatrachidae and Hylidae. We evaluated testis mass against the risk of competition, egg deposition method, egg size and eggs per egg mass. Analyses were conducted using all species and using independent contrasts correcting for phylogenetic relationships. We did not detect any effects on testis mass in Hylids. In Myobatrachids, species with foam nests had comparatively small testes, species with a higher risk of sperm competition had larger testes. Lack of effects in pelodryadids may reflect comparatively poor phylogenetic resolution and the low diversity in egg deposition mode. We are currently evaluating a similar comparative data set on sperm morphology. Sperm competition may be an undervalued selective force affecting frog mating systems.

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Opthmatic evidence for an aquatic origin of snakes

The possible origin of snakes has been debated for over a century, with both aquatic and burrowing origins proposed. The highly modified anatomy of snake eyes is widely cited as compelling evidence that snakes evolved from terrestrial, burrowing lizard ancestors. Due to the overwhelmingly detailed account of this burrowing origin by Walls (1942), the ocular evidence for the burrowing origin of snakes has been unchallenged for over 50 years. However, recent fossil evidence (including *Pachyrhachis problematicus*) supports an aquatic origin for snakes. Therefore, a re-examination of Wall's (1942) hypothesis is timely. We used phylogenetic and phenetic analyses on a large set of opthmatic characters across a diverse array of vertebrate taxa to determine the most likely selective conditions under which snake eyes evolved. In both analyses, snakes grouped most closely with aquatic, rather than fossorial taxa, suggesting convergent evolution in eye morphology between snakes and aquatic vertebrates. Thus, eye morphology suggests an aquatic rather than fossorial ancestry for snakes.

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Phylogeographic relationships among populations of White's Skink, *Egernia whitii*

White's Skink, *Egernia whitii*, is a medium sized ubiquitous lizard that occurs from the extreme south-east of Qld, through eastern NSW and Victoria to the Eyre Peninsula in South Australia. It is also abundant in several localities in Tasmania and on many Bass Strait islands. *Egernia whitii* occurs in some ecologically distinct habitats across its range including temperate heaths, alpine grasslands and woodlands, and in various localities inhabits rock crevices, burrows and hollow logs. A cline in body size, colour pattern and life-history traits appears to exist across its distribution. Consequently, given the marked geographic differences in life history and the broad range of habitats in which the species occurs I was interested in evaluating the phylogeographic relationships among populations. I have developed a well resolved phylogeny using nucleotide sequence data from the ND4 mitochondrial gene. From the phylogeny it is clear that there is extensive genetic divergence and phylogeographic structure among *E. whitii* populations. The phylogeny also confirms the recent description of 2 new alpine species (*E. montana*, *E. guthega*) that were previously considered to be *E. whitii*. The phylogenetic results and their implications will be discussed.

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***Taudactylus pleione* (Anura: Myobatrachidae): management-driven research of a critically endangered species.**

Frogs of the endemic, Myobatrachine genus *Taudactylus* ('dayfrogs' and 'tinkerfrogs') occur in high elevation mountain streams in high rainfall areas of eastern Qld. Of the six members of the genus, five have declined or disappeared. *Taudactylus pleione* is the most recently described *Taudactylus* having been discovered in 1983. It is known only from Kroombit Tops, an elevated plateau, about 70km south-west of Gladstone. *T. pleione* is found on first-order rocky streams and associated seepages within nine small (8 – 55 ha) patches of rainforest. Nothing is known of population structure among these patches and little is known of the species' ecology. Males are readily detectable when calling but otherwise individuals are highly cryptic . Only four females have been seen. Males call from concealed perches among rock piles and from crevices in seepages. Calling has been recorded between September and March. Population size is difficult to determine but could be as low as 250 adults. Amplexus, oviposition, eggs and larvae have not been recorded. QPWS has been monitoring *T. pleione* since 1994. A dramatic reduction in numbers was detected in one rainforest patch between 1994

and 1996. Threats to *T. pleione* include the amphibian chytrid fungus, feral pigs, cattle and horses. Management of these threats includes hygiene protocols, pig, cattle and horse control. The objective of my research into the ecology of *T. pleione* is to provide information for conservation management and is focusing on characterisation of habitat and microhabitat, factors affecting detectability (especially calling) and population structure.

Nick Clemann, Jodie Odgers, Tara McGee
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A snake in the grass: investigating urban snake management in southern Victoria
Around 2000 elapid snakes may be translocated around Melbourne and Geelong each year. Using questionnaires, this study investigated snake translocation by licensed controllers in Victoria, principally around greater Melbourne and Geelong. Three groups were surveyed: licensed snake controllers, residents, and "first contact" organisations that receive calls for snake removal. Issues investigated included numbers of snakes translocated, seasons and species involved, geographic trends, choice of release sites, choice of "first contact" organisations, and perceptions of why snakes occurred on properties. Controllers (n=14) and "first contact" organisations (n=12) receive calls from September-April, with most between November-February. Four species of large venomous snakes are commonly involved, mostly *Notechis scutatus* and *Autrelaps superbus*. Although correlated with the area of operation of the controller, geographic trends are evident - N. scutatus are more frequently encountered in the north, west and south-west of Melbourne, whereas A. superbus are more frequently encountered in the east and south-east. Controllers reported choosing release sites based upon permit stipulations, perceived suitability of habitat for the species, and distance (both near and far) from capture site. Ten controllers use various release sites, three always use the same release site. Residents (n=7) suggested a variety of reasons (e.g., prey/shelter availability, and proximity to "snake habitat") that snakes occurred on their property. "First contact" organisations (mainly councils) typically received 4-40 snake-related calls each year. The effectiveness of the current policy is discussed, as are the potential impacts of translocation on both snakes and release sites. Future work will include radio-telemetry study of translocated versus non-translocated snakes.

Nick Clemann (Poster)
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High steaks: grazing and other threats to herpetofauna in the Victorian High Country
This poster reviews threats to Victorian alpine herpetofauna. Recent broad-scale surveys of this region detected three frog and eleven reptile taxa. Notable records included a range extension for the threatened Alpine Bog Skink *Pseudemoia cryodroma*, and the collection of specimens of undescribed lizards from the genus *Egernia* from the Bogong High Plains, Davies Plain and Mt Bogong. Threats to Victorian alpine herpetofauna are discussed, as is the dramatic decline in many areas of the Alpine Tree Frog *Litoria verreauxii alpina*.

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Green turtle fisheries in Australasia: assessing the extent of their impact using mtDNA markers
Large commercial harvests of turtles, like in Bali, operate over expanded areas of habitat and consequently impact many more populations than harvests that operate locally, like in the Torres Straits. To test this we use mtDNA sequence data and mixed stock analyses to assess the contribution of regional breeding units in harvested populations. For this we consider 17 genetically divergent breeding populations (Management Units; MU) of green turtles throughout Australasia. We found that the smaller Torres Strait harvest is dominated by the adjacent Northern Great Barrier Reef MU, whereas the large Bali harvest draws on multiple MU's from several adjacent nations. This study compliments existing tag return data demonstrating that turtles are an internationally shared resource and highlights the complex pattern of contributing stocks that often encompass a vast geographical area. Effective management of green turtle resources throughout the Australasian region will therefore require extensive international cooperation among the stakeholders.

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Hip hop; why tracking frogs is cool
When attempting to investigate and determine the movements of amphibians there are few methods currently available that compare with the advantages of radio telemetry and cotton thread spooling. Combined, these methods allow detailed investigation of the movement patterns and potential dispersal ability of individuals. Ongoing monitoring and investigations into the population dynamics of the endangered frog *Mixophyes fleayi* are increasing information on its ecology at breeding sites. However, like many of Australia's threatened frogs there is little quantitative information available on non-breeding habitat requirements. Radio-tracking and cotton thread spooling methods were used to assess movement patterns and microhabitat preferences of *M. fleayi* at Cainbable Creek in Lamington National Park, southeast Qld. Eight males and 17 females were radio-tracked during two consecutive summer breeding periods, while 25 males and 8 females were spooled with cotton thread. The activity of both sexes is characterised by intervals of small, localised movements. In females however, this behaviour is punctuated by large movements which generally displace individuals away from breeding habitat. Females tended to leave the breeding habitat after relatively short amounts of time, while males remained within the breeding area, rarely moving away from the stream. This complements observations of many females, but no adult males, found on walking tracks and roads, hundreds of metres from streams. This project is part of a larger study investigating the population dynamics of *Mixophyes fleayi* and provides valuable insights into movement and habitat use by this species.

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Patterns of predation in Pig-nosed Turtles
The high protein eggs of turtles are a preferred seasonal food source for many predators worldwide. However, often only a single predator species impacts heavily on each population, introducing the potential for predictable patterns of predation, that when associated with a detectable cue, offer a chance for an evolutionary response in the prey population. In theory, predation patterns can be spatial (associated with nest site attributes such as elevation, slope, or distance to other nests) or temporal (associated with time of day or lay date). However, there is little empirical evidence for either in turtle populations. We investigated predation and its potential association with fitness-related traits in the pig-nosed turtle (*Carettochelys insculpta*) in northern Australia. The dominant predator was the goanna *Varanus panoptes*. Beaches with multiple nests (2-15) were significantly more likely to harbour a predation event than beaches with single nests. However, the number of nests on a beach did not influence the probability of nest survival. Nests laid at lower elevations experienced higher survival than nests at higher elevations, possibly due to distance from an ecological edge. Nests laid earlier in the season experienced higher survival than nests laid later in the season, and this pattern was corroborated by higher predation in a year with later nesting. Predation, along with flood mortality, may select for earlier nesting in *C. insculpta*. Later nesting in some years is likely due to an energy accumulation constraint, which is reflected by biennial reproduction in this herbivorous species with an energy-poor diet.

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Use of thermal springs for aquatic basking by the Pig-nosed Turtle, *Carettochelys insculpta*
During a three-year ecological study of the pig-nosed turtle (*Carettochelys insculpta*) in the wet-dry tropics of northern Australia, we documented the turtles' use of small, localized thermal springs discharging from the river bottom. Dataloggers attached to the carapace to monitor ambient water temperatures recorded the frequency and duration of thermal spring use by individuals. Turtles used the thermal springs frequently during the winter (4-6 months) when river temperatures were lower than that of the thermal springs ($x = 29 \pm 0.52^{\circ}$ C). Turtles often utilized thermal springs for several consecutive hours, leaving the springs only to surface for air. Thermal springs may be derived from groundwater (which maintains a temperature equivalent to the annual mean air temperature), rather than from a specific geothermal heat source. Nine of 19 radio-telemetered adult females were seen to use thermal springs, of which seven were gravid and two non-gravid. Thus, gravid turtles may seek thermal springs more than non-gravid turtles. Frequency, duration, and timing of usage collectively suggest active thermoregulation as the primary function of thermal spring use. Utilization of thermal springs probably permits turtles to be more active in cooler months, which may enhance growth rates and accumulation of energy for reproduction. Onset of nesting along river stretches with thermal springs preceeded nesting in a stretch not known to have thermal springs by 24 days. Thus, we speculate that by

warming themselves on thermal springs in the months prior to nesting, turtles may have accelerated follicular development and nested earlier.

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An experimental demonstration of direct behavioural interference in two Mediterranean lacertid lizard species

Podarcis sicula of Italian origin expanded its range to coastal areas and numerous islands of Croatia, where it seemingly replaced the autochtonous species *P. melisellensis* through competition. We used an experiment on newborn lizards to test whether direct behavioral interference occurs between *Podarcis sicula* and *P. melisellensis*, whereby the former species obtains an advantage over the latter species. Brief encounters between *P. sicula* and *P. melisellensis* were more aggressive and more likely to result in dominance-subordinate relationships than were brief encounters between pairs of conspecific *P. melisellensis* lizards. During prolonged encounters individuals comprising heterospecific pairs were less likely to simultaneously occupy a thermal microhabitat compared with individuals from homospecific pairs. Contrasts of individuals comprising heterospecific pairs unequivocally illustrate that behavioural interference is asymmetric in favour of *P. sicula*. During brief encounters *P. sicula* were more aggressive and dominant than *P. melisellensis* opponents. When lizards cohabited for longer periods *P. sicula* used better thermal microhabitats, whereas *P. melisellensis* used poorer thermal microhabitats than they did in isolation. In addition, *P. sicula* grew faster, whereas *P. melisellensis* grew slower than they did in isolation. These among-species shifts in microhabitat use and growth were not evident during prolonged encounters with homospecific pairs. Thus, our observations indicate that asymmetric aggressive interactions between hatchlings of our study species result in a reduction of an important fitness component of *P. melisellensis*. These findings are consistent with the hypothesis that direct behavioural interference by *P. sicula* is the mechanistic basis of the competitive exclusion of *P. melisellensis*.

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Impact of a native and introduced predator on tadpole survivorship in complex habitats

Predation is an important process that can influence the survival of amphibian larvae and can be strongly influenced by the environmental complexity of a wetland. Tadpoles persisting in wetlands characterised by habitat simplification, such as constructed wetlands, may undergo high predation rates. The introduced mosquitofish *Gambusia holbrooki* has been suspected of having deleterious effects on populations of amphibians in many parts of Australia, however most evidence is anecdotal and the few quantitative studies conducted have to a large degree failed to mimic the complex ecological interactions that may occur in nature. A factorial experiment was designed, crossing eight levels of environmental complexity with three predator treatments (no predator, predacious fish: *G. holbrooki* or predacious insect larvae *Hemicordulia tau*), to determine the relative impact of predators on survivorship of *Litoria adelaidensis* tadpoles in differing levels of environmental complexity. Analysis showed that predator type had a large influence on tadpole survivorship, while habitat cover and the presence of alternative prey improved tadpole survivorship significantly in the presence of both native and introduced predators. This study demonstrated that habitat complexity and the presence of alternative food sources can play an important role in mediating predator-prey interactions but still highlighted the potential impact the introduced predator *G. holbrooki* may have on native tadpole populations. Consequently, future design of constructed wetlands should ensure the availability of habitat structure and exclusion of the introduced predator, *G. holbrooki*.

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Studies of reproduction in *Limnodynastes tasmaniensis* (Anura: Myobatrachidae): a model species for assisted reproduction and nuclear transfer in myobatrachid frogs

Assisted reproductive technologies and gene banking provide tools to combat declining amphibian populations and extinctions in the light of unknown causal agents and failing species management strategies. This study outlines general reproductive biology and optimises *in vitro* fertilisation and oocyte storage in *Limnodynastes tasmaniensis*, developing this species as a model for assisted reproduction in myobatrachids and paving the way for development of complex procedures such as nuclear transfer and androgenesis. Larger frogs were shown to have greater fecundity, providing *a priori* indicators for future optimisation experiments. *In vitro*

fertilisation conditions were optimised where comparatively low sperm concentrations of low percentage motility with virtually no forward progressive motility obtain optimal fertilisation results, while oocyte morphological integrity was necessary for fertilisation success. Optimal *in vitro* fertilisation medium osmolality was shown to be approximately 5mosm/kg, a medium that was also able to preserve fertilisation ability of oocytes for up to 2 hours. The fertilisation ability of oocytes could be preserved for up to 16 hours in isotonic (217 mosm/kg) solutions. This data may be used to develop more complex assisted reproductive procedures for use in amphibian conservation programs to provide a working insurance policy against extinction.

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The habitat requirements of reptiles in a grazing landscape in southern NSW

The habitat requirements of reptiles were investigated in a grazing landscape in southern NSW. Survey sites were chosen on the basis of their aspect, topographic position and amount of tree cover, and covered a wide range of microhabitats. One hundred forty-four 10x10 metre plots were surveyed for reptiles by active searching and pitfall trapping in summer 2001/02. Statistical modelling was used to assess the habitat associations of moderately common species. The results suggest that habitat was partitioned between species on the basis of structural, thermal and food parameters. The Striped Skink *Ctenotus robustus* and the Olive Legless Lizard *Delma inornata* were more likely to inhabit areas with little canopy cover, a small amount of leaf litter, and a relatively large amount of grass cover. Often, these locations were associated with warm valleys. The Four-fingered Skink *Carlia tetradactyla* was significantly more likely to be detected in box woodland than in other vegetation communities. Boulenger's Skink *Morethia boulengeri* was more likely to occur in areas with a high number of spiders, ants and beetles. Species richness was highest in box woodlands. Box woodlands were important habitat for several reptile species. However, these woodlands are threatened by sheep and cattle grazing and a resulting lack of tree regeneration. In the absence of tree regeneration, similar grazing landscapes throughout NSW will undergo massive ecological changes over the next two centuries because a range of habitat features such as hollows, logs and leaf litter will become increasingly scarce.

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Gene flow and genetic structure in Australia's crocodile populations; a comparison between freshwater (*Crocodylus johnstoni*) and estuarine (*C. pororsus*) species

Australia has two species of crocodiles, *Crocodylus johnstoni*, a freshwater species and *C. pororsus*, which is found in primarily in estuarine environments. Both have ranges that extend across the northern third of the continent in river systems that flow into the sea. *C. porosus* is commercially harvested in the Northern Territory and in Western Australia, primarily in egg harvests but there is no commercial harvest at present in Qld. Effective management of both species requires a better understanding of crocodilian population boundaries and migration patterns. To investigate the extent of gene flow among populations we have sampled both species throughout their range in Australia and used microsatellite loci to determine the genetic structure among populations. This effort has included 467 freshwater crocodile samples and 578 estuarine crocodile samples, each analysed at ten loci. Our results indicate significant genetic heterogeneity among river systems in both species and that gene flow is more limited among populations of the freshwater species relative to the estuarine crocodile. There is a significant isolation by distance effect observed for both species and this accounts for about 30% of the observed genetic structure among populations. These results will be discussed in relation to crocodile biology and management issues.

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How the physical and the physiological can conspire to defeat global climate change

Recent studies have demonstrated a remarkable range of interactions between environmental conditions and developmental attributes and outcomes in reptilian eggs. Perhaps most remarkable is the over-riding influence incubation temperature has on offspring sex. In many species, temperature will switch sex from 100% males to

100% females with a very narrow range of temperatures producing both sexes. This has led many to suggest that such reptiles are vulnerable to rapid climate change, yet they seem to have persisted through many such changes historically. In this paper, I present a possible mechanism by which species with temperature dependent sex determination are buffered from the effects of climate change. The mechanism draws upon the relationship between developmental rate and incubation temperature, taking into account the effects of extreme temperatures experienced in the nest, but beyond those that will support development when constant. This, combined with the fact that offspring sex is influenced by the proportion of development that occurs at a temperature, not the duration of exposure leads to buffering against change in average nest temperature when nest temperatures fluctuate greatly each day. The greater the daily fluctuations, the greater is the change in average ambient temperatures that can be tolerated before sex ratios are affected.

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Do the embryos initiate parturition in viviparous squamates?
In some mammalian species, hormones produced by the embryo(s) at the completion of embryonic development trigger the cascade of events that result in parturition; the potential for a similar mechanism in viviparous squamates has not been investigated. In this initial study, I examined *in vitro* steroid production by embryonic adrenals (corticosterone, progesterone, testosterone) and gonads (oestradiol, testosterone) during the prolonged gestation period (ca. 12 mo) in the southern snow skink, *Niveoscincus microlepidotus*. Tissues were dissected from embryos removed from pregnant *N. microlepidotus* collected in January (early gestation), February (mid gestation), March (fully developed embryos prior to hibernation) and November (after hibernation and just prior to parturition). Low levels of progesterone were produced by embryonic adrenal glands *in vitro*. *In vitro* corticosterone production by embryonic adrenals occurred throughout gestation; greater production occurred when tissues were incubated at 24 ºC, in comparison to production at 16 ºC, and when ACTH was included in the incubation media. *In vitro* testosterone production by embryonic adrenals and gonads only occurred in autumn; production at 16 ºC was greater than at 24 ºC. Low levels of oestradiol were produced *in vitro* by embryonic gonads. Further research is now needed to differentiate the activity of various tissues and steroid hormones in the control of embryonic development, sexual differentiation, and the potential regulation of gestation and parturition in *N. microlepidotus* and other squamates.

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The influence of incubation temperature on the morphology and microhabitat choice of the tropical Skink, *Carlia longipes*
Different habitat structures pose different problems to those organisms moving within them, and as a result we expect organisms to be morphologically adapted to the habitats they predominantly use. Incubation temperature can have a pronounced effect on morphology in squamate reptiles, which can affect the locomotory performance of hatchling lizards. Does the effect of incubation temperature on morphology in turn influence a lizard's choice of substrate? I tested this hypothesis using the skink *Carlia longipes*. In north-east Qld, adjacent populations of this skink occupy either rock or leaf litter dominated habitats. My previous work on other skink species indicates that locomotion on these two substrates is enhanced by different morphological traits. Specifically, longer legs are better for climbing on rocks, and shorter legs for locomotion in leaf litter. Freshly laid eggs of *C. longipes* were randomly allocated to two incubation regimes (cool and warm) in a split-clutch design experiment. At hatching, each lizard was sexed and measured, and had its sprinting and climbing performance quantified, before being allocated to a microhabitat choice experiment. This experiment assessed whether lizards from different incubation treatments selected those microhabitats in accordance with their morphology (i.e., whether longer legged individuals selected rocks, while shorter-legged individuals selected leaf litter).

Tara Goodsell (Poster)
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Freshwater turtles in wet and dry waterholes: tracking metapopulation patterns of the Cooper Creek turtle with microsatellites
Dryland rivers of arid Australia range in connectivity, at times expanding over vast floodplains although usually existing as isolated waterholes. The freshwater turtle, *Emydura macquarii*, inhabits these waterholes throughout southwest Qld, persisting in fragmented populations for most of the time. The waterholes vary in permanency, with relatively few remaining permanent. As this species is unable to travel far overland, the populations inhabiting ephemeral holes are decimated periodically, while populations in permanent waterholes progress towards full growth and reproductive success. This suggests that permanent waterholes contain "source" populations, while many ephemeral waterholes accommodate "sink" populations. The metapopulation structure of *Emydura macquarii* will be investigated at varying spatial scales within waterholes of the Cooper Creek and Warrego River catchments of southwest Qld. Divergence and gene flow between turtle populations will be assessed using highly variable microsatellite loci. This variation is likely to yield enough genetic difference to establish the subdivision of isolated populations. To determine patterns of gene flow, migrant individuals will be detected by comparing the genetic populations with the sampled populations in an assignment test. Source and sink populations will be identified by comparing rare alleles between permanent and ephemeral waterholes. Genetic differences that are caused by bottleneck effects between permanent and ephemeral waterhole populations will indicate which populations provide the source of alleles. This analysis will determine the divergence, metapopulation structure and migration patterns of the turtles and identify influences such as the depth and permanency of waterholes on such populations. An understanding of these processes will guide future management plans toward better conservation of dryland waterholes and of the populations of freshwater turtles they sustain.

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The role of introduced mosquitofish (*Gambusia holbrooki*) in excluding the native green and golden bell frog (*Litoria aurea*) from original habitats in south-eastern Australia
The introduction of fish has decimated many amphibian populations through increased predation, primarily on their larvae. Some amphibian species now occupy marginal habitats as a response to the presence of introduced fish predators. Such habitats may include ephemeral waterbodies where fish do not usually occur, although breeding in these sub-optimal environments may incur some cost to a species if its larvae are not adapted to develop under these conditions. We investigated this scenario of amphibian decline using the endangered green and golden bell frog (*Litoria aurea*) and the introduced mosquitofish (*Gambusia holbrooki*) in a factorial experiment by determining the responses of tadpoles to declining water levels and the introduced predator. Tadpoles metamorphosed asynchronously but did not accelerate development in declining water or when housed with mosquitofish. Mass at metamorphosis was 30% less in declining water. Tadpoles did not behaviourally respond to mosquitofish and were therefore assumed to be naive to this predator. These results suggest that ephemeral habitats may be sub-optimal for breeding, and tadpoles appear better suited to develop in permanent waterbodies free from introduced fish. The use of less favourable ephemeral habitats as breeding sites may be responsible for some of the declines reported in amphibians since the 1970s.

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Lost in the South Pacific: the Fijian crested iguana
Described in 1981, the Fijian crested iguana (*Brachylophus vitiensis*) has been recorded on fewer than ten dry, rainshadow islands in the west of Fiji. Using line transect surveys we estimated the iguana population on the small Crested Iguana Sanctuary island of Yadua Taba at almost 200 per hectare in beach forest habitat; an average of one iguana per five metres of transect. We surveyed a further 17 islands within the range of this species, and found a total of six crested iguanas on four islands. On these islands crested iguana abundance in optimal forest habitat was < 1 iguana per hectare. As crested iguanas are not hunted, eaten or traded, their rarity on all islands except Yadua Taba appears to be due to the combination of habitat loss and degradation due to forest clearing, burning and intensive goat grazing, and the introduction of invasive plant species and exotic predators such as cats and rodents.

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Distribution and abundance of frog species at restored and unrestored riparian sites on the central coast of NSW
This study aims to assess responses of frog communities to streamside riparian restoration. The data presented is the result of one summer (Oct 2001 – Mar 2002) of ongoing nocturnal streamside searches at riparian zones (18 sites) on the Central Coast of NSW. Data on relative abundance and community composition was collected from restored and unrestored riparian zones in urban and rural landscapes. Nine species in total were observed over the study period. Significantly more frogs were captured at the rural restored sites than at any of the other sites. Species richness was also higher at the rural restored sites than the urban sites. Site-specific analyses of body condition revealed frog snout-vent and mass varied at both family and species levels. Analyses of similarity in community composition and abundance resulted in the sites separating into four distinct groups, representing unrestored rural sites with one restored rural site; restored rural sites; and two groups each containing both restored and unrestored sites. No frogs were captured over the study period in seven sites, representing restored and unrestored urban sites. Clarification of the specific effects of riparian restoration activities in urban and rural riparian zones will involve further research into microhabitat, habitat and landscape level comparisons with frog species richness, abundance and community composition. An investigation into the movements of frogs in urban and rural restored and unrestored sites is also planned using mark-recapture techniques.

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Seasonal and temporal effects of calling in two sympatric microhylid species – *Austrochaperina robusta* and *Cophixalus ornatus*
Male calls are of central importance to anuran reproductive biology, as they play an important role in species recognition, male competition, and female mate choice. In many species that signal acoustically, males aggregate and engage in group calling, and this type of calling behaviour, known as chorusing, is common among anuran amphibians. Acoustic signalling and chorus attendance are often influenced by environmental cues. In prolonged breeding anurans, the environmental and social cues stimulating calling may be complex, as calling patterns are likely to change both temporally and seasonally. In order to determine the seasonal and environmental variables that influence chorus formation and continuation in *A. robusta* and *C. ornatus* I used timed tape recorders to monitor calling activity over the summer at three times each night at seven locations along a 550 metre transect. Temperature, humidity and rainfall were recorded by data loggers, and moon phase, illumination, and visibility were calculated using a computer program. The seasonal pattern of calling activity differed substantially between species, as *A. robusta* calling activity varied strongly among nights throughout the season, and did not show strong seasonal trends, while *C. ornatus* calling was less variable among nights, and showed strong trends with time. Initiation and continuation of calling in *A. robusta* was strongly affected by environmental variables, but these effects were much weaker in *C. ornatus*. Calling activity in *A. robusta* may be much more tightly focused on nights when environmental conditions favour reproduction. This might be due to relatively higher costs of calling in *A. robusta* in terms of energy or predation risk.

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Does habitat construction compensate for habitat loss in a modified landscape?
Australia has a history of European land use practices that include the construction of ponds. On the Southern Tablelands of NSW constructed ponds (farm dams) are widespread and more common than natural ponds. To plan for long-term frog conservation in such modified Australian environments, it is important to determine if farm dams and natural ponds provide similar habitat for pond-breeding frogs. Twenty-two natural ponds and 22 adjacent farm dams in the upper Shoalhaven catchment on the Southern Tablelands of NSW were surveyed to compare patterns of use by frogs. Natural ponds did not support higher numbers of species than farm dams. Thirteen species were encountered with logistic regression models (presence/absence) developed for four of these. *Limnodynastes tasmaniensis* and *Uperolia laevigata* were significantly more likely to occur at farm dams than natural ponds while *L. peronii* was significantly more likely to occur at natural ponds. *Litoria peronii* showed no preference for either pond type. All four species appeared to show a preference for waterbodies without fish. The construction of farm dams does not appear to compensate for the loss of natural

ponds in the upper Shoalhaven catchment. However, both farm dams and natural ponds have a role to play in providing spatial heterogeneity in frog breeding habitat. Natural and constructed ponds should be considered as different types of waterbodies when examining frog habitat availability in landscapes such as the upper Shoalhaven catchment.

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Habitat use by the Inland Carpet Python (*Morelia spilota metcalfei*): an assessment over two spatial scales
In this paper, the movement patterns of eight *M. s. metcalfei* were investigated within a 5 square kilometer sampling grid surrounding the Mt Meg Flora and Fauna Reserve in north-eastern Victoria. Data were analyzed at two scales to determine how the activity patterns of these snakes related to variation in habitat structure and the abundance of rabbits (a major prey species). Comparison between spring, summer and autumn was used to detect any seasonal variation in this factor. Python movements reveal distinct seasonal trends in relation to the major habitat types identified. Broad habitat use appears primarily influenced by thermoregulation in spring (the selection of insulative, fractured rock shelter sites), prey (rabbit) distribution in summer and a combination of both factors in autumn. The distribution of grid cells utilised by pythons was used to clarify the relationships identified at the broader scale. Data at this level revealed that python seek out topographic ridges where microhabitats such as granite rock crevices, hollow logs, tree hollows and filtered cover are most available. The grid cells utilised by pythons contained a higher mean abundance of rabbit burrows and rabbit sign (pellets), particularly during the summer months; however, neither association reached statistical significance. These findings are interpreted using our current knowledge of the feeding and thermal ecology of *M. s. metcalfei* and its cogeners. The management implications arising from these data are also discussed, focussing on the need to maintain structurally intact habitat and alter current rabbit control programs within these areas.

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Effects of maternal diet on offspring size and locomotion performance in two viviparous skinks, *Pseudemoia pagenstecheri* and *Pseudemoia entrecasteauxii*
Conditions during pregnancy have the potential to influence neonatal phenotype in reptiles. Additionally, the effects of external influences on the mother may increase with increasing placental complexity. The aims of this study were to: (1) determine the effect of maternal diet during pregnancy of viviparous skinks with complex placentae (*Pseudemoia pagenstecheri* and *P. entrecasteauxii*) on the size, mass and locomotor performance of offspring; and (2) determine whether such effects were greater in species with more complex placentae. Traits of offspring from females maintained in the laboratory during pregnancy, and from females that spent the majority of their pregnancy in the field, were compared for both species. Maternal conditions during pregnancy affected offspring size and mass in *P. pagenstecheri* (the more placentotrophic species), but not in *P. entrecasteauxii*. Offspring of *P. pagenstecheri* from laboratory pregnancies were significantly smaller (19.8 $\pm$ 0.3 mm SVL vs 22.4 $\pm$ 0.8 mm SVL) and lighter (0.15 $\pm$ 0.01 g vs 0.20 $\pm$ 0.02 g) at birth than offspring from mothers that spent the majority of their pregnancy in the field. These differences were not apparent in *P. entrecasteauxii,* indicating that *P. entrecasteauxii* was not significantly affected by the laboratory conditions. There was no clear effect of maternal diet on sprint speed for either pregnancy treatment in either species, or any effect on the relationship between offspring speed and body size. Offspring sprint speed did not increase as the offspring grew.

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Fleay's Barred-Frog *Mixophyes fleayi* – a declining species showing signs of recovery?
Mixophyes fleayi is an endangered species confined to montane areas of far northeast NSW and southeast Qld. Its populations are thought to have declined in the late 1970s to early 1980s, a period when a number of other stream dependent frogs declined in southeast Qld. There are no published measures of 'historical' abundance of *M. fleayi* however, making it impossible to accurately assess the extent and degree of population declines. In order to gather baseline data on populations of *M. fleayi,* surveys and monitoring have been undertaken in southeast Qld over the past six years. In 1996 a 300m monitoring transect was established at Cunningham's Gap (Main Range). The number of *M. fleayi* along that transect was determined from counts of individuals seen or heard. Censuses were undertaken on 74 occasions over six years. Prior to the 2001/2002 breeding season

counts of males exceeded 30 on only seven occasions, with a maximum of 46 in October 1998. This season, counts of males exceeded 30 on four occasions, with the three highest counts ever recorded. More significantly, in March 2002 there were 197 males, over four times the maximum recorded during the previous five seasons. We will discuss the possible reasons for the observed massive increase in relative abundance in the 2001/2002 season and the ramifications of this for interpreting survey and monitoring results for *M. fleayi* at sites less intensively studied. We will also provide a summary of relative abundance data for other *M. fleayi* monitoring sites in southeast Qld.

Anke Maria Hoefer (Poster)
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Do girls just wanna have fun? Mating behaviour of the common garden skink, *Lampropholis guichenoti*
Studies of mating systems have traditionally focused on systems that either exhibit sexual dimorphism, territoriality, parental care, or some combination of these features. A large number of studies have provided us with a reasonably good understanding of these mating systems. Unfortunately, few data are available on mating systems in species that are monomorphic, highly communal and lack parental care - and to which I will refer to as "NO-SYSTEMS". Amongst invertebrates the "NO-SYSTEM" is quite common (e.g., ladybugs) whereas it is quite rare amongst vertebrates (e.g., pelagic fish, certain reptiles). I use the common garden skink *L. guichenoti* that exhibits a non-territorial, parental-carefree polygamous mating system, and lacks sexual dimorphism as a model system to examine the mating system in a "NO-SYSTEM" species. I will present the basic setting for mating behaviour experiments, which I will conduct over the next two years using individuals of known sex, age, relatedness, and mating history. This enables me to control for any influence of sperm storage and former matings. Furthermore, as a result of an experiment on phenotypic plasticity, I will use related animals, which differ substantially in body size. Experiments will be conducted using outdoor enclosures. Slight adjustments of the basic settings will allow me to manipulate the type and the number of mates females can choose from to answer the following questions: Do females choose between related versus unrelated males? Do females mate with more than one male? Is bigger always better or does un-relatedness win over size?

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Do species with contrasting life history traits vary in their rates of extinction?
A problem in conservation biology is to identify the characteristics that make a species vulnerable to extinction following habitat fragmentation. One suggestion is that habitat specialists are less able to cope with rapid changes to their habitat or to disperse through the modified landscape than habitat generalists. I took advantage of long-term studies on two species of geckos in remnant habitat in the Western Australian wheatbelt to address the following questions: Do these species with contrasting life history traits vary in their rates of extinction? And, if so, which life history features are critical to these differences? My mark-recapture studies and incidence function analysis have revealed that the habitat generalist (*Gehyra variegata*) relative to the specialist (*Oedura reticulata*) showed a markedly higher level of persistence (96% remnant occupancy vs 77%) and higher increase in population size (3 out of 5 populations vs 1 out of 6 populations) in patches of remnant woodlands. One ecological characteristic that is believed to explain the persistence of the habitat generalist with a patchy distribution is its ability to form a metapopulation. Dispersal might occur between local populations of a metapopulation and may enable recolonisation of habitat patches.

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Ethnoherpetology of West Cape York: collaborative research with Wik and Kugu people
Western scientific understanding of ecology in Australia is still fragmentary. Our knowledge of even the distribution and abundance of many species remains limited, especially in northern Australia. The wealth of Aboriginal traditional ecological knowledge, based on thousands of generations of direct experience, has been largely ignored by Australian biologists. Indigenous peoples' knowledge of ecology has received increasing international attention among western biologists in recent times, but very little collaborative research has been conducted between Aboriginal people and biologists in Australia. This paper outlines a collaborative project with Wik and Kugu people, recording traditional ecological knowledge of reptiles and amphibians in the Aurukun region, west Cape York Peninsula. Some preliminary observations will be discussed; however, the project is currently at a very early stage. Consequently, this paper will concentrate on the background to the project, along with future directions. In particular, I will discuss some of the issues that confront a biologist attempting to integrate western and indigenous science into a collaborative approach.

David Hunter, Will Osborne
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Tadpole recruitment in remnant populations of the Southern Corroboree Frog (*Pseudophryne corroboree*).
Since the early 1980's the Southern Corroboree Frog, *Pseudophryne corroboree*, has undergone a dramatic decline. Over 85% of historic localities have become locally extinct, with the majority of extant populations having fewer than five calling males. Tadpole surveys by dip-net removal were conducted in three breeding seasons to determine broad scale recruitment patterns in remnant populations. Depletion sampling and repeated censuses indicated that the survey technique produced consistent results and detected a high proportion of the tadpoles present in pools. One third of all populations attained no recruitment through to the late tadpole stage, while populations that did attain recruitment typically had fewer than 20 tadpoles. Populations with more male frogs generally attained greater recruitment, but the number of tadpoles recruited per male did not increase with population size. The pooled data indicated no annual differences in recruitment for either small or larger populations however individual small populations had high variability. Recruitment observed in this study is consistent with patterns predicted by small population stochastic models and indicates the increasing risk of extinction in this species.

Sebastian Iglesias
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Consequences of specific dynamic action (SDA) in lizards
SDA describes the rise in metabolic rate following feeding in animals. The duration of this effect varies among species. Lizards may maintain an elevated resting metabolic rate by feeding while still under the influence of an SDA elicited by a previous meal. To test this, the metabolic response of the Eastern water skink, *Eulamprus quoyii,* was measured following different feeding treatments using flow-through respirometry. Other factors that could affect the resting metabolic rates following feeding in these lizards were also examined, including the influence of circadian rhythms on resting metabolic rate and the effect of the energy and digestible protein content of a meal on SDA.Metabolic rates of *E. quoyii* oscillate with periods of scotophase and photophase, irrespective of light conditions, which is indicative of an endogenous circadian rhythm. A diet of banana and banana with added fat to increase energy content, both elicited peaks in the metabolic rate of *E. quoyii* 20 h. after feeding. The peaks are not significantly different, suggesting that energy content has little effect on SDA. The highest peak in metabolic rate as a result of feeding occurred in lizards fed mealworms, 15 hours after feeding. Mealworms have approximately 22 times more protein than either of the banana diets, suggesting that the protein content of a meal has a marked affect on SDA. Lizards fed a meal of six mealworms, followed by three mealworms 20 h. and then 35 h. after the initial feeding maintained elevated in *E. quoyii* for more than 35 h. after the first peak in metabolic rate from the initial meal. In the field, *E. quoyii* probably sustains an elevated metabolic rate, indirectly as a result of frequent feeding on a primarily insectivorous diet, which is high in both protein and energy.

Sacha Jellinek
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The influence of habitat fragmentation on reptile species in an urbanised landscape
Habitat fragmentation is the process of habitat modification or habitat loss which leaves behind small, isolated native vegetation pockets in a landscape of agricultural, urban or otherwise disturbed land. In the past, the response of reptiles to remnant area, isolation and edge environment has received limited attention in comparison to the response of mammals, birds and insects to these influences. In this project I determined whether fragmentation had decreased lizard species richness, composition, overall abundance and abundance at the species level, or influenced lizard morphology or predation rates in comparison to continuous bushland. Urban remnants consisting of five small (< 10 ha) and four large (> 10 ha) fragments of natural bushland were paired with continuous bushland areas located around Hobart, Tasmania. These were surveyed continuously from October 2001 until March 2002 with the use of 10 pitfall traps per site. Results indicated that overall lizard species richness and abundance were not significantly influenced by habitat fragmentation or fragment size. *Egernia whitii* was the only lizard species significantly influenced by fragment size. Vegetation type and structure as well as environmental variables played a substantial role in structuring reptile communities at different sites. Edge environment did not significantly influence lizard species richness or abundance in remnant areas. Lizard morphology and predation pressure were not significantly different between fragmented and continuous areas. My results indicate that large reserves should be preserved and restored ahead of small reserves, and that these areas need to have their habitat heterogeneity maintained, thus allowing lizard species requiring specialised habitats to persist.

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Dull males do it in the dark: activity pattern, home range and sexual dimorphism in the gecko, *Ptyodactylus guttatus*

Geckoes are generally nocturnal, show no sexual dichromatism, and males are usually smaller than females. *Ptyodactylus guttatus* is an unusual gecko. It is active by day and night, is sexually dichromatic, and males are larger than females. Males also have relatively larger heads and longer hindlimbs than females. We studied *P. guttatus* that inhabited the walls of buildings at the Hazeva Field Research Station in Israel. Adult males inhabited large home ranges, which generally overlapped with one or more smaller home ranges of females. The distribution of light sources, which determined the abundance of arthropods that the geckoes eat, appeared to determine the location of home ranges. The pattern of home range overlap presumably reflects the opportunities for mating. We hypothesise that the polygynous mating system of *P. guttatus* is determined by the distribution of food resources. Large male body, head, and limb size appear to be intrasexually selected traits for home range defence. The nocturnal activity of most geckoes may place a constraint on colouration acting as a visual signal. Thus the brighter colour of male *P. guttatus* may reflect a release from this constraint.

Gregory D Kerr, Michael Bull
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Microhabitat selection by the scincid lizard *Tiliqua rugosa*: the use of natural temperature gradients within plants

We examined microhabitat choice in the Australian scincid lizard, *Tiliqua rugosa* in chenopod shrubland. Thirty radio-tagged lizards were followed during their spring period of activity (September – November 2000). Characteristics of refuges chosen by the lizards were compared with the perennial woody plants in ten 10 x 10 m randomly located quadrats at each of the three sites in the study area. We found that sleepy lizards used multiple refuge sites. Perennial woody bushes constituted an important habitat component for both active and inactive lizards. Choice of refuge by the lizards was non-random. They preferred large bushes with foliage in contact with the ground ('dome shaped'), and they chose to refuge under thorny bushes more frequently than expected if choice was random. Bushes that were used repeatedly tended to be larger and were more likely to be dome shaped. Under this type of bush daytime temperatures were lower than under smaller bushes. This choice in refuge was modified as the season progressed with lizards using larger bushes and a higher proportion of dome shaped bushes later in the season, implying an ability to discriminate among bushes. Natural temperature gradients under the bushes appear to be used by the lizards to select appropriate microclimates. The lizards shift location within bushes as ambient heat loads change with time day and season. We suggest that sleepy lizard are modifying their refuge site selection based on microclimatic needs as ambient temperatures change.

Mitchell Ladyman, Don Bradshaw
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Dehydration causes a decrease in thermal preference in Western tiger snakes, *Notechis scutatus*

Thermoregulation in tiger snakes (*Notechis scutatus*) from two distinct environments (semi-arid and wetland) is strongly influenced by hydration state. Overall, fed and hydrated snakes maintained an average body temperature (PBT) of 26.8$\pm$0.7^{o}C and an average maximum temperature of (AMT) 32.9$\pm$0.3^{o}C in a photo-thermal gradient. Dehydrated snakes, however, maintained a significantly lower PBT of 21.8$\pm$1.01C and AMT of 30.2$\pm$0.8^{o}C. When populations were compared, there was no difference between PBT of fed and hydrated Carnac Island (semi-arid) and Herdsman Lake (wetland) snakes, nor was there a difference in AMT. However, dehydrated Carnac snakes selected significantly lower PBT and AMT than Herdsman snakes, despite being less dehydrated. These data suggest that the survival of a relictual population of tiger snakes on Carnac Island has necessitated modifications of its thermoregulatory behaviour, which have the effect of enhancing water-conservation in this waterless habitat.

Simon Lane, **Michael Mahony**
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Larval anurans with synchronous and asynchronous development periods: contrasting responses to water reduction and predator presence
The larvae of pond breeding frogs experience high rates of mortality; predominantly through predation and pond desiccation. We investigated how tadpoles of two common species of frog respond to these hazards using factorial experiments. Prior to our experiment we knew that *Crinia signifera* siblings develop quickly and reach metamorphosis comparatively synchronously (c. 25-35 days), while *Limnodynastes tasmaniensis* grow and develop more slowly and time to metamorphosis is highly asynchronous (c. 60-300 days). A separate experiment was conducted for each species. The factors were Hydroperiod (either constant or gradually declining water) and Predator (presence or absence of restrained Mosquitofish). *C. signifera* tadpoles responded to declining water by accelerating development and so reduced time to metamorphosis. However the resulting metamorphs were smaller and survival rates in the terrestrial stage significantly lower, a clear demonstration of the benefit and cost of phenotypic plasticity in metamorphic traits. *L. tasmaniensis* tadpoles in declining water were also smaller at metamorphosis, but there was no evidence that they had reduced the time to metamorphosis compared to those in constant water. Moreover the survival rates of the resulting frogs did not differ. Consequently no adaptive plasticity can be inferred, suggesting that this species has a bet-hedging strategy in which some siblings are fixed to develop more quickly at the expense of size, while others take much longer but are bigger at metamorphosis. Tadpoles of both species showed clear behavioural responses to the presence of the predator. They tended to occupy the non-predator halves of the tubs, however neither species altered development rate and there was no impact on survivorship in the terrestrial stage.

Tracy Langkilde
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Habitat use in montane skinks: do social interactions affect shelter-site choice?
Montane animals may be under particular threat from global warming due to the limited availability of suitable habitat, which will contract if ambient temperature increases. Alpine and subalpine environments in southeastern Australia often contain remarkably high abundances (and sometimes, diversities) of lizards and snakes, and hence we need to know more about patterns of habitat use in these herpetofaunal assemblages. In particular, an understanding of the processes that generate these patterns may be of significant value in predicting species-specific vulnerability to climate change. I will present results from an initial study to quantify patterns of habitat use, and identify habitat factors that cause interspecific differences in distribution of six sympatric species of scincid lizards in a montane environment in southeastern Australia. I will discuss preliminary observations of the effects of social interactions on shelter-site selection, and give a brief overview of future directions for my PhD.

Bonnie Lauck
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Using fluctuating asymmetry as an indicator of amphibian population health
Traditional strategies for monitoring environmental health require large amounts of resources, take large amounts of time, and are logistically difficult. Problems are exacerbated when the study species are frogs because numbers at breeding sites can fluctuate greatly over short periods. The measurement of fluctuating asymmetry (FA) has been offered as a more sensitive indicator of environmental stress. Investigations of FA involve comparing two sides of a bilaterally symmetrical trait; e.g. length of leg. Because the development of the two sides of a bilaterally symmetrical trait are influenced by identical genes it has been proposed that any asymmetry is the result of stress experienced during the developmental period. The technique assumes that organisms developing in sites with high levels of environmental stress exhibit higher levels of FA than conspecifics developing in sites with low levels of environmental stress. Logging drastically alters the local habitat of amphibians. Fragmentation of forests due to logging may increase the 'cost' of moving through a particular landscape to breeding sites or dispersal destinations; e.g. there may be increased predation or desiccation risk. Alternatively logging may increase the number of breeding sites due to harvest machinery ruts, soil compaction and road construction, thus reducing dispersal distances and desiccation risk. Such habitat changes may change levels of population stress. I investigated if fluctuating asymmetry differs between populations of the frog *Crinia signifera* captured at logged and control sites. Higher levels of fluctuating asymmetry were observed in populations from control sites than in those from logged sites.

Frank Lemckert
Research and Development Division, State Forests of NSW, Beecroft 2119 (frankl@sf.nsw.gov.au)
How rare is the Heath Frog, *Litoria littlejohni*?
The heath frog, is a rarely encountered hylid found scattered along the coast and ranges of parts of NSW and Victoria. Only 23 records of this frog are present in the NSW Wildlife Atlas. Hence this frog is considered to be very rare and is of conservation concern in NSW. However, we know very little about this frog. Preliminary assessment indicates that much of its apparent rarity may result from it having a variable breeding season and unpredictable calling habits and some apparently variable habitat requirements. The heath frog has been recorded calling in all months of the year except December, rather than just spring/summer. At three sites in the Watagan Mountains near Sydney, this frog was recorded only 8% (1/13) and 40% (8/20) and 62% (5/8) of the time during similar survey periods. In the Watagan Mountains, it is known from five temporary pools and five permanent dams and has not been recorded from the expected slow moving streams. Assessment of the habitats associated with these breeding and some other non-breeding sites are currently being undertaken to determine if there are habitat features critical to the presence of the heath frogs in the Watagans and will be presented. The indications are that the heath frog may not be as rare as thought, but is still a rare frog worthy of further conservation consideration.

Murray Littlejohn (Plenary Talk)
Department of Zoology, University of Melbourne (m.Littlejohn@zoology.unimelb.edu.au)
The *Litoria ewingii* complex from 1957 to present: the development of a model system for speciation studies
The history of unravelling the *Litoria ewingii* complex is traced from the first morphologically-based taxonomic synthesis by Stephen Copland (1957, Proc. Linn. Soc. NSW 82: 3-108), through the critical and reductionist review of John Moore (1961, Bull. Amer. Mus. Nat. Hist. 121, Article 3), to the field-oriented evolutionary and behavioural studies initiated by Murray Littlejohn during the 1960s, when the taxonomic status of *L. verreauxii* was confirmed (Littlejohn 1965, Evolution 19: 234-243). In 1967, a small research team (Murray Littlejohn with Graeme Watson and Jasper Loftus-Hills) was formed at the University of Melbourne, and a multifaceted field and laboratory program was begun in which experimental acoustic behaviour and artificial hybridization tests led to the discovery of *L. paraewingi* and the enigmatic form "northern *L. ewingii*" (Watson et. al. 1971, Aust. J. Zool. 19: 401-416). Later on, molecular techniques complemented these initial studies (e.g., Gartside 1982, Aust. J. Zool. 30: 103-113). By 1985, a broad picture of geographic distribution, systematics, and evolutionary dynamics had been obtained (Littlejohn and Watson, 1985, Ann. Rev. Ecol. Syst. 16: 85-112). Even so, several important areas of interaction await resolution. The research on the *L. ewingii* complex has provided insights into several significant evolutionary and ecological topics, namely: regional patterns of historical zoogeography and speciation, reproductive character displacement and associated reinforcement of assortative mating, and the structure and dynamics of hybrid zones. These, in turn, have allowed the formulation of complex models of zonal interactions in the process of geographic speciation.

Rilfic Lolfongmorlfore
(Plenary Talk)
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Peter Luckock, Brian Malone, Peter Pridmore and Dennis Black
Biology Department, La Trobe University (peteluckock@hotmail.com)
Ecomorphology of sprinting and climbing performance in *Christinus marmoratus* and *Gehyra variegata* (Gekkonidae: Gekkoninae)
Ecomorphological studies often investigate causal relationships between morphology and ecology by using performance to link the two. This study assessed how sprint speed and climbing ability in geckos are influenced by morphology. Horizontal and vertical sprint performance and clinging ability were measured in laboratory experiments using two species, *Christinus marmoratus* and *Gehyra variegata*, with different subdigital pad morphologies. A number of other morphological variables, which are likely to influence performance, were also included in the analysis. Morphological comparisons indicated that *G. variegata* had a significantly shorter tail, shorter hind limbs and a larger subdigital pad area compared to *C. marmoratus*. While sprinting at maximum speed, *G. variegata* exhibited a shorter stride length but higher stride frequency

than *C. marmoratus*. Both temperature and substrate significantly influenced the horizontal sprint speed of both species. Geckos of both species ran faster at 26°C than 16°C. *G. variegata* generally ran faster over horizontal substrates than *C. marmoratus*. Climbing success on different substrates was similar for the two species. While absolute clinging ability did not differ between the species, size-independent clinging ability was greater in *G. variegata*. Field observations suggest that the locomotory performances measured in the laboratory may be related to the different foraging behaviour of the two species. *G. variegata* forages on the ground more frequently than *C. marmoratus*. The arrangement of the subdigital pads of *G. marmoratus* may also reflect the wider range of substrates that it encounters in nature.

Vimoksalehi Lukoschek (Poster)
School of Tropical Environmental Studies and Geography, James Cook University (vimoksalehi.lukoschek@jcu.edu.au)

Population genetic structure and conservation of the olive seasnake, *Aipysurus laevis*, in the southern Great Barrier Reef

Aipysurus laevis has an extremely aggregated distribution. Presence/absence data from the 1970's and 1980's show that *A. laevis* were extremely abundant on 22 reefs and absent from 17 reefs in the Swain Reefs. Twenty of these 39 reefs, comprising 13 reefs where *A. laevis* had been recorded as abundant and 7 reefs where *A. laevis* had been absent, were re-surveyed in 2001. *Aipysurus laevis* were found on only 3 of these 20 reefs; all reefs where *A. laevis* had previously been recorded. I am investigating the population genetic structure of *Aipysurus laevis* throughout its range, including a detailed analysis of the small-scale population genetic structure of *A. laevis* in the Swain Reefs complex, using microsatellite genetic markers and mitochondrial DNA sequencing . Tissue samples from 35 to 40 individuals of *A. laevis* have been obtained from each of 4 reefs in the Swain Reefs complex and from Keppel Island, an inshore island 200km away. If populations are found to be genetically distinct at the level of individual reefs, then the loss of *A.laevis* populations from10 of 13 reefs in the Swain Reefs complex, where *A. laevis* was found in large numbers 30 to 40 years ago, potentially represents a significant loss of genetic diversity, and thus a serious conservation concern. Information regarding the spatial scale at which population genetic structure occurs will be useful for determining the size and spatial scale of distribution of protected areas required to ensure viable populations of *A. laevis* in the Great Barrier Reef World Heritage Area, in the current development of their Representative Areas Program that is designed to protect biodiversity throughout the marine park.

Vimoksalehi Lukoschek (Poster)
School of Tropical Environmental Studies and Geography, James Cook University (vimoksalehi.lukoschek@jcu.edu.au)

Phylogenetic relationships of the hydrophid sea snakes

Evolutionary relationships among the hydrophid sea snakes remain the subject of considerable debate. The phylogenetic relationships among the three major groups of marine hydrophids, the *Hydrophis* group, the *Aipysurus-Emydocephalus* group, and the 'primitive'group that comprises 3 monospecific genera, *Ephalophis greyi, Hydrelaps darwiniensis* and *Parahydrophis mertoni*, have been well studied, however resolution is still weak. In addition, relationships within these groups, particularly among the 34 species in the genus *Hydrophis* and allied genera, are poorly understood. Most previous studies have used morphological characters to infer evolutionary relationships. I investigate the evolutionary relationships within the marine hydrophids using mitochondrial DNA sequences of the cytochrome *b* and 16S rRNA genes. Preliminary results from cytochrome *b* (1030bp) show that 1). The *Hydrophis* group and *H. darwiniensis*, representing the 'primitive' group, formed a clade; 2). The *Aipysurus-Emydocephalus* group formed a sister taxon to this clade; 3). *Hydrelaps darwiniensis* formed a sister taxon to the *Hydrophis* group, and 4). Relationships among the 8 species of the *Hydrophis* group may be resolved using this locus. *Pelamis platurus*, the only pelagic marine hydrophid species, fell within the *Hydrophis* group, however *P. platurus* has diverged considerably from the remaining species of the *Hydrophis* group that primarily live in shallower coastal waters.

Megan McCann (Poster)
Applied Ecology Research Group, University of Canberra (meganjmccann@yahoo.com)

Identifying the stock composition of feeding populations of Green Turtles (*Chelonia mydas*) using genetic markers

The green turtle (*Chelonia mydas*), one of the seven species of marine turtles, is listed as vulnerable within Australia, although it is still harvested for meat and eggs by Indigenous communities. There are many other indirect pressures, including fishing bycatch, diseases and boat strike. These turtles have an unusual and protracted life history, migrating thousands of kilometres between specific feeding areas and natal breeding

regions, taking around 35 to 50 years to reach sexual maturity. These life history traits hamper the ability to recognise genetically and demographically discrete stocks and the ability to manage populations over the vast distances they travel. As the turtles have a philopatrie nature, their breeding regions form genetically distinct stocks. The use of the highly variable microsatellites enables these genetically distinct stocks to be easily described and differentiated, providing a means for the composition of feeding grounds to be identified. This project aims to identify the genetic structure of the feeding and breeding grounds in the Gulf of Carpentaria and the Arafura Sea. Identification of the geographic range and the genetic isolation of the breeding populations will be compared with other Australian breeding populations. Feeding ground samples will be allocated to breeding regions using the assignment test. This will provide an indication of the representation of different breeding regions that utilize the Gulf of Carpentaria and the Arafura Sea. When complete, these data will assist managers with the complex task of developing management and conservation strategies for the protection of sea turtle populations in the Australasian region.

Clare Morrison, Jean-Marc Hero
Endangered Frog Research Centre, School of Environmental & Applied Sciences, Griffith University Gold Coast (c.morrison@mailbox.gu.edu.au)
Influence of altitude on the population resilience of amphibians in southeast Qld
Amphibians in many regions of the world, including Australia, have been experiencing dramatic unexplained population declines. In Australia the majority of these unexplained declines have occurred in populations found in pristine areas above 300m.a.s.l. Although it is well documented that life-history characteristics of ectotherms are directly influenced by the lower temperatures and shorter growing and breeding seasons found at high altitudes, little work has been carried out on the ecological implications of altitude on the reproductive and population ecology and hence population resilience of anurans in Australia. Using a combination of field surveys, laboratory techniques, reciprocal transplant experiments and museum specimen dissections, we determined the influence of altitude on a number of life-history characteristics (breeding season length, fecundity, egg size, body size, growth and development rates, age at maturity, longevity, survival and average lifetime fecundity) in five species of anurans in southeast Qld and related the results to population resilience. The trends towards shorter breeding seasons, slower growth and development rates, and older ages at maturity found in the high altitude populations result in longer generation times. In turn, longer generations will result in these populations being less resilient and subsequently more prone to decline or extinction than their lowland counterparts. The results are also discussed in terms of latitudinal patterns in species declines.

Dave O'Connor
School of Biological Sciences, University of Sydney (Doconnor@bio.usyd.edu.au)
The evolution of sociality in the Black Rock Skink, *Egernia saxatilis*
Historically reptiles have been considered as relatively non-social animals. However recent ecological studies combined with advances in genetic techniques have shown that this is not always the case. The Black Rock Skink, *Egernia saxatilis* is found in small groups generally consisting of an adult male, adult female and 1-3 offspring, although there is a large amount of variation in both group composition and the relatedness of group members. Research on *E. saxatilis* and other work on lizard sociality (primarily that on *E. stokesii*) has demonstrated a number of benefits to individuals living in a group. However this research has not been directed at answering why "family" based sociality has evolved and not simply groups of unrelated individuals or one of a variety of the other possible sex/cohort compositions. *Egernia saxatilis* displays high levels of intraspecific aggression which influences both group composition and the maintenance of "family only" territories. Juveniles living in adult territories benefit from access to higher quality resources and indirect parental protection from conspecific aggression/predation. Here I will discuss some of these benefits and the hypothesis that it is benefits such as these that have been selective forces in the evolution of family based sociality.

Louise Osborne (Poster)
School of Botany and Zoology, ANU (louise.osborne@anu.edu.au)
Badges size and male quality in an agamid lizard
Badges of status are well known in birds, where plumage colouration and badge size indicate male dominance. Badges of status have also been noted in some lizard species where badge size correlates with male dominance and territory holding ability, although not necessarily with reproductive success. Males of the Australian agamid lizard *Ctenophorus decresii* have black chest badges, which are made conspicuous during displays. I aim to see if badge size correlates with any phenotypic male qualities that may affect male-male contest

outcomes. The characters that may affect contest outcomes are snout-vent length, condition (mass relative to snout-vent length), and male head size. *Ctenophorus decresii* show considerable head size dimorphism between the sexes, with males having larger head dimensions. Males will then be paired and contest outcomes noted to test if badge size is a predictor of male fighting ability and thus quality. I will also be looking to see if rival recognition occurs by repeating interactions between pairs of individuals after five hours which is enough time for *C. decresii* to regain motivation. It has been suggested that head size dimorphism in other lizards is a result of male-male competition. I will note the effect of head dimensions on the outcome of contests to see if larger head size does indeed confer an advantage in combat.

Will Osborne[1], David Hunter[1], Gerry Marantelli[2], Sara Broomhall[1,3], Rod Pietsch[1,4], Tony Tucker[1].
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Declining alpine frogs: what do we know after fifteen years and has it helped?

Four species of frogs that occur at alpine and subalpine elevations (land above about 1400m) in the Snowy Mountains of NSW and the ACT have been demonstrated to be in serious decline. The extent of these declines is no longer subject to question, and for many years recovery efforts have re-focused on the need to stem the ongoing declines. One species, the Southern Corroboree Frog (*Pseudophryne corroboree*), faces imminent extinction, and a second taxon, the Alpine Tree Frog (*Litoria verreauxii alpina*), has dwindled to less than eight remaining local breeding populations. Oddly, two of these populations, and the largest remaining by far, are associated with deep artificial ponds. Over the last decade our group has focused on field and analytical studies aimed at identifying the cause of decline. In this talk we provide an update on these studies – which to some extent remain inconclusive. Unlike in many other cases where the amphibian chytrid is likely to be a major factor in population extinction, the declines in alpine areas do not appear to have been precipitous and instantaneous. Instead the decline rate appears to have been much, slower operating over a time scale of at least one to two decades. In such a situation other factors involved in declines may still be important and may also operate in concert with chytrid. We suggest that an increased focus needs to be given to exploring the role of the amphibian chytrid fungus in the decline of alpine frogs, but this should be done in the context of adaptive management and field experimentation.

Kirsten Parris
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More bang for your buck: the effect of caller position, habitat and chorus noise on the efficiency of calling in the spring peeper

Many animals such as frogs use acoustic signals as a means of intra- and inter-specific communication. Production of an acoustic signal can be energetically costly, and the distance over which it is effective depends on a range of variables including the location of the caller and receiver, ambient conditions and the habitat through which the sound travels. I will present a spatially explicit model of the propagation of an anuran advertisement call across a landscape, using the example of the northern spring peeper *Pseudacris crucifer crucifer*, a common frog from eastern North America. I will use the model to investigate the effect of habitat, caller position and chorus noise on the effective distance of a call with a frequency of approximately 3 kHz; and the energetics and efficiency of calling at different intensities and from different locations in the landscape. Calling next to still water or from an elevated perch increases, while calling in a chorus decreases, the distance over which a female can distinguish an individual male's call. For a given call intensity and calling rate, a male spring peeper will get the greatest "bang for its energetic buck" if it calls next to still water in the absence of chorus noise. However, when a chorus of spring peepers is gathered at a pond, calling from an elevated position away from the pond (and the chorus noise) will maximise the effective distance of an individual call, although this may entail other costs.

Sam Patmore
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Home range, daily movement patterns and habitat preference of the Green and Golden Bell Frog, *Litoria aurea*, in the Southern Tablelands, NSW

The Green and Golden Bell Frog, *Litoria aurea*, is an endangered species of frog in NSW and, was until recently, thought to be extinct in the Southern Tablelands and ACT region until its rediscovery in April 2000. This study was conducted to determine the daily movement patterns and habitat use of remnant populations of *Litoria aurea* in wetlands of the Upper Molonglo River floodplain, NSW. A radio-tracking study was

conducted to determine the home range size, movement patterns and vegetation preferences of the study species. The study involved two tracking periods; early January to mid February (encompassing the late breeding season) and early April to early May (encompassing the post-breeding, pre-hibernation period). Five frogs (three male and two female) were monitored during the first tracking period and four frogs (all male) were monitored throughout the second tracking period. The results of the radio-tracking study revealed that the frogs tend to remain in or near the breeding ponds for lengthy periods during the breeding season, particularly when the wetlands are inundated and contain adequate vegetation cover. As a result, during this period the frogs had relatively small home ranges in comparison to many other anuran species. However, some individuals were observed to undertake extensive non-breeding migrations away from the breeding ponds when conditions in the wetland became unsuitable. The frogs also displayed a strong preference for certain vegetation types, particularly the emergent aquatic spike rush *Eleocharis sphaecelata* and the native tussock grass *Poa labillardieri*. Changes in oviductal morphology of the skink, *Lampropholis guichenoti*, associated with egg production.

Trent Penman**, Frank Lemckert, Michael Mahony** (Poster)
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Habitat use and behaviour of the Giant Burrowing Frog
The Giant Burrowing Frog (*Heleioporus australiacus*) is a threatened species in NSW and Victoria. *H. australiacus* appears to be rare, but may just be rarely encountered, or survey timing and standard methods may not be appropriate for this secretive animal. It is restricted to naturally vegetated and forested habitats, however little is known of the impact current forestry practices may have upon this species. Due to its cryptic nature, there is very limited data on the species. To understand why this species is rare, a study of the ecology of the species has commenced. To identify breeding sites and to initiate a population demographic study fourteen individuals (10 male, 4 female) have been radio-tracked in the coastal forests of south-eastern NSW. In summer and autumn daily movements of the frogs were monitored and aspects of the burrowing site recorded. Movements have been found to be non-random with individuals occupying a series of "home burrows". Animals generally burrowed under the soil surface, however on occasions individuals sat exposed on the surface or partially burrowed under leaf litter. Red-bellied Black Snakes have been found to be significant predators of the species, particularly when the frogs occupied sites in and around water bodies.

Garry Peterson
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Water skinks do need water: the implications of a four-year drought for the endangered Corangamite Water Skink
The Corangamite Water Skink (*Eulamprus tympanum marnieae*) is currently considered a subspecies of the widespread, cool temperate Southern Water Skink (*Eulamprus tympanum tympanum*). Endemic to the Victorian Volcanic Plain, *E. t. marnieae* is a habitat specialist, inhabiting sites that combine deeply fissured basaltic rock piles and permanent or ephemeral lakes located east and northwest of Lake Corangamite. Only ten extant populations of *E. t. marnieae* are known, with most being extremely small and patchily distributed, while two populations are now confirmed as extinct. As a result, the lizard is considered "critically endangered". Over the past five years a monitoring program has been implemented at a total of fourteen transects across the known geographical range of *E. t. marnieae*. During the first four years of this monitoring program, southwestern Victoria suffered a severe drought. Critical declines in the size of lizard populations were observed at three transects where the associated ephemeral lakes remained completely dry throughout this period. At transects where the associated lakes were previously considered to be permanent but had become dry, populations remained relatively stable. At transects where the associated lake receded but did not completely dry, populations actually increased. The factors that appear to have caused these trends, their implications and resulting management actions will be discussed. These findings may also help explain the disappearance of the Lismore population during the 1960's.

Ben Phillips
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Cane Toads and Australian snakes
Cane toads (*Bufo marinus*) are large, highly toxic anurans. The species was brought to Australia > 65 years ago, and has already spread through much of the continent. Anecdotal reports suggest that the invasion of toads into an area is followed by dramatic declines in the abundance of terrestrial native frog-eating predators – particularly snakes. Will toads substantially affect Australian snakes? Based on geographic distributions and dietary composition, 49 snake taxa can be identified as potentially at risk from toads. The impact of these

feral prey will also depend on the snakes' ability to survive after ingesting toad toxins. Based on decrements in locomotor (swimming) performance after ingesting toxin, we can estimate the LD_{50} of toad toxins. I present this data for ten of the "at risk" snake species. Most species exhibited similar, and very low, ability to tolerate toad toxins. Based on head widths relative to sizes of toads, it is apparent that 8 of the 10 taxa could easily ingest a fatal dose of toxin in a single meal. The exceptions were two colubrid taxa (keelbacks *Tropidonophis mairii* and slatey-grey snakes *Stegonotus cucullatus*) with much (up to 76-fold) higher resistance to toad toxins. Overall, the data suggest that cane toads are a serious threat to 30% of terrestrial Australian snake species. The extreme toxicity of toads represents a strong selective force on these species and this system thus offers an excellent opportunity to study rapid adaptive response in nature.

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Between a rock and a hot place: effects of vegetation cover on habitat choice in an endangered snake
One of the hotly debated issues in contemporary Australian ecology and biogeography concerns the magnitude and direction of change in vegetation density over time. This is an important question for animal ecologists, because the degree vegetation density can affect a variety of habitat conditions (temperature, retreat-site availability, etc.) Indeed, to the extent that thermoregulating ectotherms require access to a range of thermal microhabitats, they might be particularly sensitive to large-scale fluctuations in shadiness. We examined the role of vegetation in defining the habitat of a ridge-top population of Broad-headed snake (*Hoplocephalus bungaroides*), a sedentary species that has been shown to rely upon thermally suitable rocks as retreat sites during much of the year. The amount of vegetation cover over a given retreat site was highly correlated with the radiation intensity incident upon that retreat site. Radiation intensity in turn was a good predictor of thermal regime within the retreat site. The ridge-tops were found to be heterogeneous with respect to vegetation cover, with east sides of ridges being substantially shadier (and thus, colder) than west sides. This had the practical effect of restricting snakes to the west sides of ridges. Moreover, the subset of rocks chosen by snakes as retreat-sites was more exposed and warmer than a randomly sampled set of west-facing rocks. Our results suggest that the thermal effects of habitat overgrowth be considered in any future management plan for this threatened species.

Alex Quinn
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It is widely viewed that there is a dichotomy of sex-determining mechanisms in the Reptilia: species either exhibit genotypic sex determination or temperature-dependent sex determination. However, there is some evidence to suggest that the two mechanisms are not necessarily mutually-exclusive, including the unexpected discovery of sex-specific DNA in the related green turtle (*Chelonia mydas*) and Kemp's ridley turtle (*Lepidochelys kempii*) (Demas et al. 1990). Here, I describe a study in which the methodology of Demas et al. was emulated and expanded upon in an attempt to isolate sex-specific DNA in the TSD species *Sphenodon punctatus* (tuatara), the sole remaining member of the ancient lineage Sphenodontia (Fraser, 1988). A Randomly-Amplified Polymorphic DNA survey and comprehensive minisatellite DNA fingerprinting survey (incorporating five polycore DNA probes and 14 restriction enzymes) were undertaken. Neither molecular method revealed sex-specific DNA in this species. This result fails to support the novel hypothesis that TSD involves a structural genomic rearrangement (Demas et al. 1990), resulting in the concordant sexual genotypes detected in their study. Instead, this finding suggests that either there is no genetic influence upon sex determination in the order Sphenodontia, or that temperature is overriding underlying sexual genotypes. In the latter case, detection of sexual genotypes in the tuatara will be difficult unless only individuals incubated at pivotal incubation temperature (100% concordance) are included in molecular analyses.

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Movement patterns, habitat utilisation and diet of the Eastern Long-Necked Turtle, *Chelodina longicollis*, in rice agroecosystems of NSW
Seventy-seven percent of the Worlds terrestrial ecosystems are manipulated to meet the needs of human consumption. Agricultural activity occupies 74% of the total area of N.S.W. Most eastern long-necked turtles (*Chelodina longicollis*) occur in simplified agricultural landscapes. However most studies on the ecology of *C. longicollis* have been conducted in natural or semi natural landscapes. To gain an understanding of how *C. longicollis* function in modified systems we studied the movement patterns, habitat use and diet of adult *C.*

longicollis in rice agroecosystems. Radio-telemetry revealed that turtles primarily live in the large irrigation channels but readily make migrations to utilise seasonally available rice paddies. Migrations between the major habitat types including large irrigation channels, small irrigation channels, farm dams and rice paddies we common. Both males (n = 5) and females (n = 7) displayed the same patterns of movement rates over the active season and sex did not influence movement rates. Stomach contents analysis revealed that turtles were primarily feeding on macroinvertebrates but also consumed frogs, tadpoles and fish. *Chelodina longicollis* has previously demonstrated unselective feeding behaviour, however, the data from this study suggest that they may shift toward a more selective diet as a result of increase in prey abundance and diversity.

Kylie Robert
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Designer families: sex determination in the viviparous lizard *Eulamprus tympanum*
A remarkable variety of sex determination systems exist among different taxa. Sex determination generally results from one of two mechanisms in most animals 1) genotypic sex determination (GSD), in which the sex is determined at the time of fertilisation by genetic factors alone or 2) environmental sex determination (ESD), in which sex is determined by environmental factors that act after fertilisation. Sex in many species including fishes, crustaceans, reptiles, nematodes, rotifers, polychaetes and echiurids is determined by the temperature of development and is the most recognised example of ESD. Several species of oviparous reptiles have temperature-dependent sex determination (TSD) and TSD was not expected to occur in viviparous reptiles as thermoregulation would result in relatively stable gestation temperatures. The skewed sex ratios in *Eulamprus tympanum* resulting from part of my Honours study suggested the first occurrence of TSD in a live-bearing species, and here I present further results confirming the presence of TSD in *E. tympanum*. Gestation temperature has a highly significant effect on offspring sex, with warmer temperatures giving rise to male offspring. Most animal taxa allocate approximately equal investment in the production of sons vs. daughters however, many theoretical and mathematical models suggest reproducing females may benefit by facultatively adjusting offspring sex ratios. Sex choice has the ability to enhance fitness and TSD could provide the mechanism by which mothers could facultatively shift their sex allocation patterns. I will present results that indicate facultative sex allocation by *E. tympanum*, with a shortage of adult males females will overproduce males and with an abundance of adult males females will produced mixed offspring.

Kylie Robert (Poster)
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Reconstrucing Thermochron iButtons to reduce size and weight as a new technique in the study of small animal thermal biology
Recent developments in small electronic temperature recorders designed for use in the food industry have the potential to revolutionise the collection of thermal data in small animals. Collecting temperature data in small reptiles is most often restricted to laboratory studies in thermal gradients, by the use of physical models placed in the field, or by inserting a cloacal thermocouple soon after capture in field studies ("grab & jab"). Thermal gradients measure selected thermal preferences in an artificial environment, models estimate operative temperatures in the field, and cloacal thermocouple measurements in field studies can only measure active individuals or those that take refuge in accessible areas. Each of these techniques do not provide a true representation of the animal's "natural" or "field" thermal biology, particularly in periods of inactivity, hibernation or within inaccessible refugia. Here I outline the modification of the inexpensive DS1921 Thermochron iButton's manufactured by Dallas Semiconductor, (Texas, U.S.A.) (www.ibutton.com/ibuttons/thermochron.html), a small lightweight real time and temperature recording device that can be attached externally or implanted internally into small animals. The unmodified DS1921 Thermochron iButton weighs approximately 3.0 g, is 17 mm in diameter and 6 mm in thickness. By disassembling units and then reconstructing without the external stainless steel housing, the weight can be halved to approximately 1.5 g or less and the dimensions reduce to the size of the circuit board which is 14 mm in diameter and the thickness depends upon the new battery size.

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Patterns and routes of water flux in chelid turtles
We investigated aspects of water flux in three species of chelid freshwater turtle (*Chelodina expansa, Elseya latisternum*, and *Emydura macquarii signata*) to verify a previous discovery that chelid turtles had substantially higher rates of water flux in water than out of water, and to discover if the source of water

uptake was due to drinking, or osmotically driven direct uptake. Rates of water influx for *C. expansa, E. latisternum*, and *E. macquarii* signata in water were 221, 240, and 329 ml.kg-1.day-1, and on land, 33, 30, and 45 ml.kg-1.day-1 (respectively). There was no significant difference in water flux among the species. Rates of water influx in water for these three species are comparable to those found in cryptodiran turtles, indicating that high rates of water influx in water occur throughout freshwater turtles. Most water uptake occurred by drinking, but a significant proportion of the total water influx also appeared to be entering through the cloaca. The movement of water into the body via the cloaca in E. macquarii signata is in contrast to data for a cryptodiran turtle species, where 'cloacal drinking' was not found. Cloacal uptake of water is probably not facultative, and is likely to be a consequence of the permeable cloacal bursae. Other aquatic animals generally avoid drinking, so the proportion of water influx that appears to enter by the mouth is unexpected. Why the turtles drink so much is still unknown, and is the most pertinent question to be answered by future studies.

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Mechanisms of interference competition in *Litoria ewingii* tadpoles

Intraspecific competition among tadpoles of the Southern Brown Tree Frog, *Litoria ewingii*, was investigated in a series of laboratory experiments. The effect of density on tadpole growth and differentiation was examined, along with the underlying mechanisms of interference competition. In a series of experiments using groups of large and small tadpoles separated by different partition types, the roles of physical, chemical and cellular mechanisms of inhibition were considered. Increased density had negative effects on growth and differentiation rates of small tadpoles, and the timing of metamorphosis was flexible in terms of the general state of differentiation. Tadpoles raised at high density metamorphosed at a less advanced, more 'tadpole-like' state than those raised at low density. This presumably enables individuals to escape competition in the aquatic habitat, or to escape mortality due to predation or desiccation. While the effects of different partition treatments were not entirely consistent, interference competition in *L. ewingii* tadpoles was most likely mediated by physical factors. However, a chemical basis for inhibition could not be completely ruled out. While a unicellular organism (unicell) was present in tadpole faeces, it did not cause growth inhibition. Observations of the behaviour of *L. ewingii* tadpoles indicated that body size is a factor in determining the outcome of competitive interactions, with large tadpoles clearly displacing small tadpoles from food resources.

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Interactions between tadpoles of *Litoria aurea* and *Limnodynastes peronii*

Declines and extinctions of amphibian populations are occurring worldwide. In order to halt this decline it is necessary to understand the factors responsible, but so far this has proven elusive. One particular species of amphibian that has declined considerably is *Litoria aurea*. A potential factor responsible for the decline of *L. aurea* is interactions with other frog species. In particular, interactions between tadpoles of *L. aurea* and the sympatric *Limnodynastes peronii* may influence the population dynamics, and hence survival of *L. aurea*. Laboratory experiments and behavioural observations were conducted to determine the nature of any interactions between *L. aurea* and *L. peronii* tadpoles. Field studies (Broughton Island, NSW) were carried out to determine the extent to which both species of tadpole naturally occupy the same microhabitats, and hence have the opportunity to interact in the field. Tadpole distribution in the field was also examined in relation to pond physicochemical and habitat variables. Under experimental conditions, chemical competition occurred between *L. aurea* and *L. peronii* tadpoles, affecting the development of *L. aurea* tadpoles. Both species overlap greatly in terms of vertical distribution in the laboratory and the field, indicating potential for interaction between the species when occupying the same water bodies. However, in the field, *L. aurea* and *L. peronii* tadpoles rarely co-occurred. This spatiotemporal segregation was related to pond physicochemistry and not habitat. This study also highlighted the need to disentangle the effect of treatment from density change in tadpole experiments.

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Does parthenogenesis give a two-fold reproductive advantage? A case study using Bynoe's gecko (*Heteronotia binoei*)
It has long been hypothesised that females reproducing by parthenogenesis (clonal reproduction) have a two-fold reproductive advantage over sexually-reproducing females. This is because all parthenogenetic offspring are female, hence all offspring are likely to contribute to future generations. I tested this hypothesis by comparing the fecundity of parthenogenetic and sexually-reproducing individuals from the gecko species, *Heteronotia binoei*. Parthenogenetic *H. binoei* were capable of laying up to four clutches (of two eggs) per season, whereas sexually-reproducing females laid at most two clutches (of two eggs). As the sex ratio of sexually-reproduced hatchlings is 1:1, this indicates that parthenogens can produce up to eight female offspring per season compared to the two female offspring produced by sexually-reproducing females. I also found that egg viability and juvenile survival rates did not differ between the two reproductive modes. Therefore, the results from my study suggest that the hypothesised two-fold reproductive advantage for parthenogens is the minimum reproductive advantage attained by parthenogenetic *H. binoei* over sexually-reproducing females.

Dan Salkeld
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Impact of parasitic infection on reproductive output and growth in a wild population of the water skink *Eulamprus quoyii*
Parasites can influence host life history by reducing host growth, survival and reproductive output. Consequently, they have gained importance in theoretical models concerning the evolution of sex, sexual selection, mating systems and the maintenance of genetic variation. Despite the theoretical interest, natural host-parasite systems remain understudied. For example, although there has been much research on the ecology of Australian water skinks (*Eulamprus* spp.), the importance of parasites upon their hosts, biology has been neglected. Using eastern water skinks (*Eulamprus quoyii*) naturally infected by haemogregarines (parasitic protists), I have begun to examine the impact of parasitic infection upon reproductive output and growth in a wild host population. In addition, using recently developed microsatellte markers, I intend to determine whether haemogregarine infections influence male mating success (measured by number of offspring) and secondly, whether infection affects the extent to which females seek multiple mates. I will present preliminary results from this research, as well as intended directions of further work.

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Mechanisms of sex determination in reptiles
Two modes of sex determination predominate among reptiles: Temperature-dependent Sex Determination (TSD) and Genetic Sex Determination (GSD). The mechanisms that underlie these modes of sex determination and the transition between them are poorly understood but generally fall into one of two camps: One view is that the two mechanisms are fundamentally different and that the transition between TSD and GSD typically involves a complex series of selection events. The alternate view is that the fundamental mechanisms of sex determination in TSD and GSD species are the same, with quite small molecular differences between different sex-determining mechanisms, potentially involving a few or perhaps only one gene. We argue that the distribution of GSD/TSD among taxa and recent molecular advances point strongly towards the latter perspective. First, reptiles show a complex pattern of TSD and GSD among taxa, with modes of sex determination differing even between very closely-related or sister taxa. This haphazard pattern of distribution suggests to us that TSD and/or GSD have evolved independently multiple times. Second, all the genes known to be involved in gonadal differentiation in mammals have homologues in alligators and turtles with TSD and a number of these are expressed during gonadogenesis. This extraordinary conservation of genes suggests that differences at the molecular level among reptiles with different sex-determining mechanisms may be small and that the transition between states relatively simple. We explore the opportunities presented by sister taxa, with and without TSD, for addressing this proposition.

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Low home range overlap in *Carlia jarnoldae*: evidence for territoriality?
Rainbow skinks (genus *Carlia*) tail wave frequently, especially when in the presence of conspecifics. A previous study of this behaviour in *C. jarnoldae* suggested that tail waving may be a signal of territory ownership, but

evidence for territoriality in the wild was lacking. Furthermore, *C. rostralis* maintain dominance hierarchies, rather than territories. This study examined home range overlap in male and female *C. jarnoldae*, to determine whether they maintain exclusive territories. A mark-recapture study conducted over three years provided information on the home ranges of 15 adult males and 17 adult females at two sites. Home ranges were small (> 5 m^2), and home ranges of females were smaller on average than those of males. Home ranges were maintained both during the breeding and non-breeding seasons. At each site, males and females tended to maintain exclusive home ranges, suggesting that they do defend territories. Overlap between males and females tended to be greater than overlap between individuals of the same sex. Overlap statistics did not change much between breeding and non-breeding seasons, suggesting that *C. jarnoldae* may maintain territories all year. Tail waving may be a signal of territory ownership in both male and female *C. jarnoldae*.

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Factors influencing the distribution of *Litoria raniformis* in an urban-fringe landscape: implications for conservation and management
The occurence of the Growling Grass Frog, *Litoria raniformis* was investigated at 133 sites within the catchments of the Merri, Darebin and Edgars Creeks on the northern outskirts of Melbourne. The relationships between presence of *L. raniformis* and environmental and landscape variables were assessed using two alternative statistical methodologies: multiple logistic regression (LR) and generalized additive models (GAM). On a landscape scale, *L. raniformis* was rarely found to occur at locations which were more than 2000m from other populations of *L. raniformis*. A number of habitat variables were also positively associated with the occurence of *L. raniformis*. In particular, the degree of permanence of waterbodies, and the extent of aquatic vegetation were positively associated with the presence of *L. raniformis*. Receiver operating characteristic (ROC) analysis of resulting predictive models indicated good predictive ability, however validation of the models with independent data from a separate geographic region is a high priority for future work. Little difference was found between the predictions derived using LR, as compared to GAM. The implications of these findings for the conservation and management of *L. raniformis* are discussed.

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Thermoregulation in large reptiles? Seasonal changes in body temperature of the American alligator (*Alligator mississippiensis*)
Regulation of body temperature may increase fitness of animals by ensuring that biochemical and physiological processes proceed at an optimal rate. The validity of current methods of testing whether or not thermoregulation in reptiles occurs is often limited to very small species that have near zero heat capacity. The aim of this study was to develop a method that allows estimation of body temperature null-distributions of large reptiles, and to investigate seasonal thermoregulation in the American alligator (*Alligator mississippiensis*). Continuous body temperatures records of wild alligators were obtained from implanted dataloggers in winter (n = 7, mass range:1.6-53.6 kg) and summer (n = 7, mass range:1.9-54.5 kg). Body temperature null-distributions were calculated by randomising behavioural postures, thereby randomly altering relative animal surface areas exposed to different avenues of heat transfer. Core body temperatures were predicted by calculations of transient heat transfer by conduction and blood flow. Alligator body temperatures follow regular oscillations during the day. Occasionally, body temperature forms a plateau during the day which could be predicted from random movements. Average daily body temperature increases with body mass in winter, but not in summer. Daily amplitudes of body temperature decreases with increasing body mass in summer, but not in winter. These patterns result from differential exposure to heat transfer mechanisms at different seasons. In summer, alligators are significantly cooler than predictions for a randomly moving animal, and the reverse is the case in winter. Theoretical predictions show, however, that alligators can be warmer in winter if they maximised their sun exposure. We concluded that alligators may not rely exclusively on regulation of body temperature, but that they may also acclimatise biochemically to seasonally changing environmental conditions.

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Why do thick-tailed geckos aggregate?
Thick-tailed geckos (*Nephrurus milii*) are unusual among Australian lizards in their tendency to aggregate in rock crevices in the wild. My project was therefore designed to quantify patterns of aggregation in the field, and to use controlled trials in the laboratory to identify physical and social cues for aggregation. My ultimate aim was to understand why the lizards display this unusual grouping behaviour.My field data showed that thick-tailed geckos *do* aggregate. In addition, retreat-sites used in the field were a non-random subset in terms of several abiotic variables. The geckos also displayed significant selectivity for such cues in the laboratory, aggregating even when suitable vacant shelter-sites were available, thus indicating that aggregation in the field is not simply a response to limited availability of appropriate shelter. However, the aggregative response was eliminated when the opportunity for physical interaction was removed. Lizards in physical contact with conspecifics heated and cooled more slowly than did solitary animals, reflecting the greater effective mass (and thus, thermal inertia) of the aggregated group. Additionally, exposure to rapidly cooling conditions stimulated geckos to huddle together more closely. Thus, I propose that aggregation behaviour in thick-tailed geckos has evolved for biophysical advantages rather than 'social' interactions. More specifically, aggregation may enhance fitness by permitting behavioural control of rates of heat exchange. Furthermore, because they are exposed to profound diel and seasonal cycles in temperature, the lizards' ability to control thermal exchange rates via huddling may be of significant benefit in terms of maintaining suitable body temperatures.

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Running into temporal madness: new scalational characters of head and foot useful in *Sphenomorphus* (scincidae) systematics
The genus *Sphenomorphus* represents the large residue of lygosomine skinks of the *Sphenomorphus* lineage that are not otherwise assignable to putatively monophyletic lineages, and is the reduced descendent of Boulenger's all-encompassing concept of the genus *Lygosoma* of 1887. Species currently assigned to *Sphenomorphus* are known from south-east Asia, the Indonesian archipelago, New Guinea and the Solomon Islands, the Philippines and central America. The genus has not been revised as a whole since it was recognised by Mittleman in 1950, although there have been some revisionary studies of the genus in parts of its distribution. The taxonomic neglect of this residue has partly been due to a lack of characters used in previous studies and consequently the genus has developed a reputation as being taxonomically refractory. Revisionary studies of the genus in New Guinea and the Solomon Islands have identified a number of scalational characters of the head (temporal scales, chin shields) and foot (subdigital lamellae, supradigital lamellae, imbricate scales on sole) useful in distinguishing species and clusters of species that have been little used in previous studies. They are emphasised here as a plea to other workers to consider non-traditional characters, and to accurately illustrate the head shields. Many are also useful in studies of Australian skink genera.

Rick Shine
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Why do reptiles evolve viviparity in cold climates?
More than 100 lineages of snakes and lizards have undergone transitions from oviparity to viviparity, apparently in response to cold climates. As is true for most topics in life-history evolution, the selective forces driving that transition have attracted much speculation but few direct tests. I set out to measure actual selective pressures by placing eggs of three-lined skinks (*Bassiana duperreyi*) in artificial nests at elevations bracketing the upper elevational limit for oviparous reproduction by reptiles in the Brindabella Range near Canberra. Eggs at higher elevations showed lower hatching success and produced "inferior" hatchling phenotypes (small, slow offspring). Retention at higher temperatures (simulating maternal body temperatures during extended uterine retention of eggs) significantly ameliorated these negative effects of low-temperature incubation. Thus, it is feasible to reconstruct selective forces and hence, to conduct robust tests of hypotheses about adaptation.

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Comparative abundance and distribution of rainforest vertebrates along altitudinal gradients within the Wet Tropics region of north Qld, Australia
Recent analyses of passerine birds suggest that, at comparable geographic range sizes, a higher proportion of lowland than either montane or island species are at risk of extinction. Differences in the relative population densities between species have been proposed to account for the observed discrepancy. Though widespread species generally occur at higher densities than range restricted species the relationship may not apply uniformly across altitudes or between continents and islands. Here we propose to document current patterns of distribution and abundance of vertebrate fauna of the Australian Wet Tropics to assess continental variation in the abundance-distribution relationship as it pertains to altitude.

James Smith
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Managing monitors in mangroves: *Varanus indicus* and cane toads
The Top End of Australia contains at least thirteen species of goannas, some of which are endemic to the region. The continuing colonisation of the toxic cane toad *Bufo marinus* into many coastal regions of the Northern Territory may place some goanna species at risk, thereby limiting any future opportunities to study them. More importantly, the opportunities for sustainably harvesting goannas for subsistence by many aboriginal communities may be severely reduced as a result. The Mangrove Monitor *Varanus indicus* is one of the Top End's most enigmatic and striking goanna species, and one that is potentially under threat from cane toad invasion. With this in mind, it is necessary to model the life history and population biology of *V. indicus* before the arrival of cane toads and to alter these models based on any changes that may occur once cane toads arrive. Very few studies have attempted demographic estimates of varanid populations due to low recapture rates in the field. In this study I present a new trap, which substantially increased recapture rates of *Varanus indicus* in mangrove systems in the Northern Territory. I will briefly outline some of the methodologies and preliminary population and survival estimates derived from the first year of the mark-recapture experiment. The culmination of this data will result in the development of a management plan for the species and will assist aboriginal people in assessing the impacts that their harvesting rates may have on *V. indicus* populations.

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A review of nest site selection in turtles: comparisons between species with and without TSD
Nesting in freshwater turtles is a non-random event in most species but rarely are forces driving selection experimentally tested. Offspring fitness is assumed to be a major factor influencing nest site selection because habitat characteristics and nest microenvironments affect offspring survival. Over 80% of studies on nesting habitat in turtles suggests that selection is driven the thermal environment. Invariably discussions refer to the role of temperature dependent sex determination (TSD) in this process because most studies are on North American species. However, thermal conditions during incubation have more immediate impacts on offspring fitness. Vegetation height is inversely related to incubation temperature and repeatability of overstory vegetation may be a response by the North American turtle, *Chrysemys picta,* to control incubation temperatures. Maternal control of incubation conditions meets a crucial assumption of theoretical models concerning the microevolution and adaptive significance of TSD in reptiles. I show that an Australian turtle with genetically determined sex determination (GSD) exhibits similar repeatability of nesting overstory to *C. picta* (TSD). *Emydura macquarii* is a freshwater turtle in the Murray River and nest selection is affected by the risk of direct and nest predation. Females also repeatedly nest in areas of similar vegetation structure, with most turtles preferring to nest in sand and minimal vegetation. A consistent nesting strategy of turtles with and without TSD does not preclude its microevolution, but TSD may have limited impact on nest-site selection because factors with more immediate impacts on offspring fitness may ultimately drive selection.

Adam Stow
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Family group structure in wild populations of Cunningham's skink (*Egernia cunninghami*): revealed by genetic determination of parentage and site fidelity
There are very few studies on lizards showing long-term aggregations of parents and offspring, or the persistence of breeding pairs beyond a single breeding season. This study utilises genetic and capture-mark-

recapture techniques to investigate aspects of the mating system and individual movement of the rock dwelling Australian lizard *Egernia cunninghami*. Sampling was carried out at two study sites on the Central Tablelands of NSW. To investigate anthropogenic effects on breeding pair fidelity, and philopatry of parents and offspring, sampling at each site was conducted in a deforested and naturally vegetated habitat. Analysis of the mating system using 10 microsatellite loci, and capture-mark-recapture, show high levels of site fidelity by parents and their offspring, in both deforested and naturally vegetated habitats. Parentage assignment reveals low levels of multiple breeding partners within breeding seasons and pair fidelity across two or more breeding seasons. No habitat differences were evident in the level of multiple breeding partners both within and across seasons. High levels of site fidelity, and breeding pairs associated beyond one breeding season, result in aggregations of parents and offspring over several age cohorts and thus a family-like group structure.

Devi Stuart-Fox
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Sexy males are losers: different traits predict female choice and male contest success in dragon lizards
According to some models of sexual selection, traits predicting male contest success should be used as cues in female choice because they are reliable indicators of male quality. I investigated the role of colour in female choice and male competition in two polymorphic species of small agamid lizards, *Ctenophorus decresii* and *C. vadnappa*. In *C. decresii*, chest patch brightness predicted female association whereas the hue of the orange flank markings predicted male contest success. In contrast, there was little evidence that male colour traits are important in either female choice or male contests in *C. vadnappa*. Instead, female *C. vadnappa* chose males with higher display rates. Experimental manipulation of male colour brightness did not cause females or males of either species to alter their behaviour in any predictable way. The same males tended to win contests regardless of how colour was manipulated. This suggests that colour may be related to hormone-controlled aggression levels, which determine the outcome of contests at close range. These results indicate that colour and/or behaviour may be sexually selected traits in these species and is among the first evidence for female choice of male ornaments in lizards. In addition, these results add to the growing evidence that male colour traits that are sexually attractive to females may differ from those that predict the outcome of male contests.

Jemina Stuart-Smith
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Maternal investment and incubation temperature in *Tympanocryptis diemensis*
Tympanocryptis diemensis is Tasmania's only agamid and one of only three oviparous reptiles in Tasmania; it inhabits some of the coldest habitats occupied by any agamid in Australia. I investigated maternal investment in reproduction in *T. diemensis* by examining the clutch characteristics of individual females. Although clutch size increased with increasing female size, relative clutch mass was greater in smaller females. Incubation temperature and maternal identity influenced incubation duration, changes in egg mass during incubation, and also the hatching success of the eggs. Lower temperatures increased incubation duration and resulted in greater changes in egg mass than higher temperatures. Intermediate temperatures promoted greater hatching success than extreme temperatures and cycling temperatures were more successful than constant temperatures. Incubation temperature and maternal influences persisted to the hatchling stage. Higher temperatures were associated with increased tail length, performance levels, growth rate and survival. Tail length was also associated with increased locomotory performance, and maternal identity was found to influence offspring sex. My results demonstrate that the early life stages of *T. diemensis* are profoundly influenced by incubation temperature as well as the identity of the mother. This information reveals that the mother has the potential to influence the survival and fitness of her offspring through the selection of nest sites with particular temperature regimes. This holds particular significance in terms of understanding population dynamics, success of early life stages and the life history strategy of this species.

Roy Swain, Susan M Jones
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The evolutionary significance of facultative placentotrophy
Facultative placentotrophy (FP) provides a mechanism for females to supplement nutritional resources during embryogenesis. Our previous work on the metallic snow skink (*Niveoscincus metallicus*) has indicated that FP operates in this species primarily by increasing neonatal fat reserves. We have hypothesized that this provides a selective advantage for FP by introducing flexibility into the timing of parturition. Such flexibility is advantageous in cool/cold temperate habitats where climatic conditions are often subject to rapid change, even in mid-summer. Previously we have provided support for our hypothesis by demonstrating that metallic

skinks can defer birth for several weeks and that, when this happens, embryos survive by using up their abdominal fat reserves. We now provide further support by demonstrating rapid placental transfer of oleic acid, a precursor of storage lipids, from mother to young. Data are presented to correlate the magnitude of transfer to the stage of embryonic development and the corresponding functional status of the placental membranes. Obligate placentotrophy also occurs in snow skinks. In metallic skinks it is very limited but in other snow skinks it is quite extensive. The relationship between FP and obligate placentotrophy is discussed and a hypothesis for the evolution of maternal-fetal nutritional support in snow skinks is proposed.

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Assessing reptile diversity using species accumulation curves

Using computer-generated simulations we demonstrate how species accumulation curves are influenced by species richness, relative abundance and diversity. We examined 11 non-linear regression models to determine which model(s) best fitted curvilinear species accumulation curves based on reptile pit-trapping data for a range of heterogenous and homogenous sites in mesic and arid regions of Western Australia. For heterogeneous sites, Beta-P, Hill, Rational, Clench, Exponential and Weibull models are the best. For homogeneous habitats, Beta-P, Hill, Weibull and Chapman-Richards are the best models. Number of pit-trapping days and number of specimens caught must be considered if species accumulation curves are to be used as a planning tool, as the amount of effort required to catch a nominated proportion of species in the field is influenced by both pit-trapping effort and the abundance of specimens. Trapping effort to catch a nominated percentage of the total predicted species in homogeneous and heterogeneous habitats varies appreciably among sites, but even for 75% of predicted species richness, the effort is generally much higher than typically applied in terrestrial vertebrate fauna surveys in Australia.

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Reduction in yolk volume and the evolution of viviparity

Most reptiles are oviparous, with the developing embryos relying on the contents of the yolk to sustain development until hatching (lecithotrophy). About 20% of squamate reptiles are viviparous, exhibiting a variety of placental complexities. Species with complex placentae have reduced yolk volumes, with the mother augmenting embryonic nutrition by provision across the placenta (placentotrophy). Despite assumed advantages of placentotrophy, only 5 out of about 100 lineages of viviparous squamates exhibit substantial placentotrophy. We analysed the contents of fresh yolk and neonatal lizards from a number of oviparous and viviparous species differing in placental complexity to determine whether the reduction in ovum size that accompanies the evolution of placentotrophy occurs by reduction in yolk volume, or by the elimination of some categories of nutrients from the yolk. The egg yolk of oviparous species is almost identical to that of lecithotrophic viviparous species, and modification to yolk evolves subsequently, presumably in response to increasing reliance on placental uptake of nutrients. Generally, yolk is taken up by embryos without discrimination of the nutrients, but there are some apparent exceptions, including the very long chain polyunsaturated fatty acids. Mechanisms of nutrient transport across the placenta of viviparous squamates is mostly lacking.

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Does variation in maternal provisioning control the length of embryonic development in the red-crowned toadlet (*Pseudophryne australis*)?

The embryonic stage in the red-crowned toadlet (*Pseudophryne australis*) varies among individuals of a clutch in three important features that provide a source for adaptive selection; 1) length of the embryonic period 2) stage of development at which hatching occurs and 3) the size of the hatchling. We have previously presented evidence that variation in stage and age at hatching has a constitutive basis and is not a facultative response to environmental cues. To ascertain whether the constitutive basis for this variation was differential maternal provisioning we investigated the relationship between ovum size and the age, stage and size at hatching. There was a significant positive relationship between ovum size and tadpole size at hatching, i.e, larger ova produced larger hatchlings. No relationship was found between ovum size and age or stage at hatching. The basis of this variation remains unknown but could relate to factors such as the nutritive value of yolk independent of size or possibly genetic factors. It has been postulated that variable maternal provisioning may

provide a selective advantage in uncertain environments. Our results indicate that there are possible consequences for fitness related to larger size. However, the variation in age and development stage at hatching are not related to maternal provisioning. Other factors need investigation in order to determine the basis of the bet-hedging strategy observed in this species.

Soichiro Tomo[1], Greg Johnston[2], Ikuko Tomo[3], Kazuaki Hirata[1] **(Poster)**
The muscles of frill erection in the Frillneck Lizard, *Chlamydosaurus kingii*
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The frill of the frillneck lizard is one of the largest and most spectacular display structures in the animal kingdom, relative to body size. The general musculature of the head and neck of *C. kingii* was described by De Vis in 1882. However, we still do not have a clear understanding of the mechanism of frill erection. We investigated morphological specializations of the hyoid apparatus in frilled lizard to determine how the characteristic frill display is produced. We carried out dissections of the head and neck regions of three (2 males and 1 female) formalin preserved frillneck lizards. The ceratobranchial I articulates with the body of the hyoid and extends posteriorly as a long, sharp-pointed cone that inserts into the frill and supports it from underneath the neck. The mandibulohyoideus 1 and 2. hyoglossus and branchiohyoideus muscles depress the ceratobranchial 1, and appear to abduct and rotate it. The depressor mandibularis muscle arises from the posterior surface of postfrontal and inserts onto the retroarticular process of mandible, and has two heads. The lateral head carries Gray's cartilage on its dorsal surface. When the depressor mandibularis contracts, the Gray's cartilages elevate, then tip over laterally, which results in erection of the frill.

Tony Tucker, David Hunter, Will Osborne
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PVA Models for Corroboree Frogs: helpful insight or hopeless outlook?
Alpine and subalpine populations of *Pseudophryne corroboree* and *P. pengilleyi* continue to decline. The Recovery Plan for Corroboree Frogs supports the establishment of a captive breeding colony with an eventual aim of augmenting wild populations. However, no quantitative reviews have yet evaluated whether wild populations would persist, even if large-scale captive-breeding and release plans are initiated. We therefore developed strategic models that compare relative risks of various conservation efforts or management scenarios. The outcomes of management actions were explored in a preliminary PVA (including the options of do nothing, augmentation, repatriation, and translocation), using simulations developed in deterministic and stochastic stage-based models. Vital rates and initial abundances were established from empirical data, where possible. Population trajectories were evaluated under hypothetical combinations of good case- bad case scenarios, as well as the possible outcomes of population augmentation. Population projections produced a characteristic rate of population change, stable stage structure, and elasticity analysis. Specifically, an elasticity analysis identified the key factors responsible for proportional change in the rate of increase as affected by a particular demographic parameter. The good news is that models with population augmentation gave projections that improved the population viability substantially, at both low (hundreds) and high (thousands) rates of metamorph reintroduction or augmentation. However, the results suggest that there are minimum thresholds for successful establishment, and a substantial time delay before a positive population recovery. The strategic insights outline a role for adaptive management experiments, particularly since the next decade appears critical to long-term viability of populations in the wild.

Erik Wapstra
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Mother knows best: facultative sex allocation in spotted snow skinks
Temperature-dependent sex determination (TSD) is common in oviparous reptiles but until recently was considered incompatible with a viviparous lifestyle. Here I present evidence that suggests a viviparous skink, the spotted snow skink (*Niveoscincus ocellatus*), can "select" her offspring's sex by her basking decisions. In a laboratory study, females were captured soon after ovulation and divided into two treatment groups, either with four (n = 18) or ten (n = 13) hours daily opportunity for behavioural thermoregulation. This experimental design mimicked spatia/temporal variation in weather conditions and thus, basking opportunities in the lizards' environment. Females with restricted thermoregulatory opportunities gave birth later in the season, to smaller offspring with lower post-natal growth rates - and produced predominantly sons. In contrast, females with greater thermoregulatory opportunities produced mainly daughters. These patterns were consistent with a complimentary field-based study. Near-term females were returned to the laboratory for birth (n = 72). The sex ratio of these offspring (172 offspring) was close to 1:1 overall, but the sex ratio of litters varied

significantly with birth date; again more males were produced later in the season. Female variation in thermoregulatory behaviour (i.e., time spent basking) is the likely source of this variation in birth date and thus sex ratio. When these offspring were transferred to field cages immediately after birth, later-born neonates (predominantly male) grew substantially less prior to winter than earlier-born conspecifics. Sex-specific differences in fitness (growth rate) provide an adaptive advantage for facultative sex allocation (and TSD) in snow skinks.

Jonathan K Webb, Barry Brook, Richard Shine
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Do reptile collectors threaten Australia's most endangered snake?
Reptile collectors have often been blamed for the decline of the endangered broad-headed snake *Hoplocephalus bungaroides,* but there has been little evidence to support this hypothesis. From 1992–2002 we carried out a mark-recapture study of the endangered broad-headed snake and common small-eyed snake *Rhinoplocephalus nigrescens* in Morton National Park, NSW. Each year we permanently marked all snakes with PIT tags and quantified human disturbance to sandstone rocks on three study sites. Humans caused extensive damage to fragile rock outcrops in 1996, 1997, 1999, 2000 and 2002, by breaking rocks, leaving rocks overturned, or by throwing rocks over cliff edges. Analysis of the mark-recapture data revealed that the population of *H. bungaroides* was stable over 1992–1996, but declined dramatically in 1997, coincident with evidence of illegal collecting, possibly stimulated by a government amnesty that allowed pet owners to obtain permits for illegally held reptiles. Survivorship analyses revealed that 85% of adult females disappeared from the population in 1997. There was no effect on the survivorship of the common small-eyed snake, which suggests that humans selectively removed broad-headed snakes from the study population. Our mark-recapture data suggest that reptile collectors are causing the local extinction of *H. bungaroides* from this study site. We recommend that locked gates be placed on fire trails in Morton National Park to protect existing populations of broad-headed snakes.

Harko Werkmanm, Michael Mahony
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The relationship between salinity and the growth and development of tadpoles of the Green and Golden Bell Frog, *Litoria aurea* (Anura: Hylidae)
The green and golden bell frog *Litoria aurea* was considered to be common until about twenty years ago. It is listed as endangered in NSW and is currently known from less than 40 disjunct sites, often in areas near human activity. A distinctive feature of the present distribution of *L. aurea* is the species' general association with low-lying coastal areas, with many of the populations occupying habitats in close proximity to saline bodies of water. The association with salinity represents both a potential risk to its successful management and a possible ameliorating influence in an as yet unidentified impacting process. Tadpoles of *L. aurea* were exposed to 0.035 part per thousand (as a control), 1ppt, 2ppt, 3ppt or 4ppt sea salt dissolved in deionised water. Exposure commenced from day 8 after hatching and continued through to completion of metamorphosis. Mass, body dimensions and growth stage values were recorded at 6-day intervals. A dose-dependent inhibition was recorded for all measures of growth and development. At the highest salt concentration the mean time to completion of metamorphosis was increased by 8 days, and the mean mass and mean snout-vent length at metamorphosis were reduced by 14% and 5% respectively. *L. aurea* shows no remarkably greater tolerance to salinity exposure than do other native frog species. This result has implications for management of the species within its current range. It also raises the question as to why the bell frog is currently associated with saline areas when it appears to be no more adapted to the effects of salinity than are other native frogs. Obtaining an answer may provide clues to the reasons for the decline observed in this and in other frog species over the last thirty years.

Melissa White
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Life in the slow lane – turtle responses to the 'Boom' and 'Bust' ecology in the channel country
Waterhole permanence, physical structure (pan vs channel) and intensity of illegal fishing has a marked effect on the population dynamics of the Cooper Creek turtle, *Emydura macquarii* complex, in south-west Qld. This river system is characterised by extensive periods of no flow, sometimes extending over decades, punctuated by widespread sporadic flooding. Our hypothesis is that there are relatively few permanent waterholes that enable these turtles to persist in the region – these are source populations. In the absence of other perturbations, these populations would be expected to be in a stable climax state. Turtles also occupy semi-permanent waterholes, extinguished on a time scale of 15-75 years. These will be in disequilibrium state.

Some will be sink populations. Patterns on the size distribution across waterholes are consistent with this hypothesis, but subject to additional impact of illegal fishing. Analysis of growth suggests that there may be diversity-dependent compensatory responses to population reduction either through drawdown or illegal netting. Knowledge of the attributes of dryland refugia is important to the turtles and knowledge of how quickly they can or cannot respond to population will be important in guiding management action in the Cooper drainage.

Martin J Whiting (Plenary talk)
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Sexual selection, signalling systems and social organisation in the Augrabies flat lizard, *Platysaurus broadleyi*

Augrabies flat lizards (*Platysaurus broadleyi*) occur along the rocky banks of the Orange River, separating South Africa from Namibia. At Augrabies Falls National Park (South Africa), P. broadleyi occur at extremely high densities due to unnaturally high concentrations of their primary prey, the black fly. Black flies emerge from fast flowing sections of the river, resulting in discrete prey patches. Lizards concentrate in these areas, resulting in frequent male-male, and male-female, encounters. Also, territories are at a premium. Consequently, males adopt condition-dependent reproductive strategies such that some large males also adopt sneaker strategies. These reproductive strategies appear to also be independent of colour morph (several distinct front leg colour morphs exist). Resident (territorial) males have significantly higher testosterone levels, although some floater males also have high levels. In these aggregations, lizards overnight in communal retreats which may contain more than 100 lizards. Upon emergence in the morning, resident males travel to their territories and are frequently challenged by rival males en route. During such encounters, non-resident males defer to the challenger, but will win against the same male when resident on their own territory. The costs of aggression are ameliorated through status signalling badges and the dear enemy recognition system. Resident males emerge before sneaker males and are also last to enter night-time retreats, consistent with endurance rivalry. Due to the high lizard density, levels of sexual harassment are high. Sneaker males are more likely to engage in sexual harassment than resident males. Females that reside within a resident male's territory avoid harassment. Levels of sexual harassment are highest when females travel between territories. I will also discuss constraints to signalling within the context of the handicap principle, including chromatic properties of the badge in relation to performance and testosterone levels.

David Wilson (Poster)
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Conserving the Green Python *Morelia viridis* – project proposal on an rare rainforest reptile

The green python *Morelia viridis* is a striking species restricted to Cape York Peninsula, Australia and New Guinea. Nothing is known of the green python's basic biology or ecology in the wild, and it is listed as rare/insufficient known in the current Action Plan for Australian Reptiles. It is a popular captive pet and smuggling occurs throughout its range, as does habitat clearance and alteration, however these threats to the species have not been determined. A detailed understanding of the ecology of the species is required to establish the conservation status of the species, and before we examine the effect of any threatening process. These questions include: What is the distribution and abundance of green pythons in Australia, and is this limited by habitat requirements? Why are juveniles yellow and adults green, and does this represent extreme niche divergence? How do individuals act on a daily and seasonal basis? I will answer these questions using two primary methods – transect surveys and radio-telemetry. Preliminary fieldwork has shown these methods are feasible for this species. I will do regular transects through different habitat each field season, and measure and PIT tag all individuals, forming the basis of a capture-recapture study. I will also radio-track ten adults (green) and juveniles (yellow) each season to determine home ranges, activity cycles and habitat use of each colour morph. With this ecological knowledge we will be able to a true conservation status and form a management plan for the green python in Australia.

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Stress response to temperature and chytridiomycosis in a rainforest frog, *Litoria chloris*

Environmental conditions can have a major influence on the susceptibility of organisms to infection and development of disease. In particular, temperature may strongly influence the course of an emerging fungal disease of amphibians, chytridiomycosis. We examined the stress responses and survival rates in four thermal regimes of orange-eyed treefrogs, *Litoria chloris*, with and without infections of amphibian chytrid, *Batrachochytrium dendrobatidis*. The treatments were: constant (20EC), fluctuating (13.5-23.2EC), 8EC thermal shock, and 37EC thermal shock. Frogs in the thermal shock treatments experienced the same thermal environments as in the fluctuating treatment except for 2 nights at 8EC or 2 days at 37EC. We compared the stress responses of infected and uninfected frogs in each of these treatments by measuring differential leukocyte count, fluctuating asymmetry, behaviour, and survival. Infected frogs showed higher basophilic granulocyte counts and lower neutrophilic and eosinophilic granulocyte counts than uninfected control frogs. Fluctuating asymmetry and behaviour also varied with treatment and infection status. Uninfected frogs survived to the conclusion of the experiment. Infected frogs in the constant 20EC treatment showed the lowest survival, with a mean survival of 38.4 days after infection. Infected frogs in the fluctuating temperature treatment and 8EC thermal shock treatment showed better survival: 50.3 and 58.0 days respectively; these treatments were not significantly different from one another. Importantly, all frogs in the 37EC thermal shock treatment survived with no symptoms of chytridiomycosis for at least 5 months after infection. High temperature thermal shock can therefore cure frogs of chytridiomycosis, and may be an effective treatment for captive or translocated amphibians.

Jeanne E Young, Keith Christian
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Variation in evaporative water loss among tree frogs in the wet-dry tropics.

Most frogs lose water freely from the skin with only the boundary layer (determined by size and shape) as a barrier to evaporative water loss (EWL). However, some frogs, particularly arboreal species, have cutaneous resistance resulting from skin secretions. Here we report the EWL of tree frogs from the wet-dry tropics as part of a larger study that also includes analyses of the chemical nature of skin secretions and patterns of activity in the field. The frogs fall into three broad categories with respect to cutaneous resistance to EWL: those with little or no resistance (r near 0 s cm^{-1}) which includes *Litoria meiriana*, *L. microbelos* and *L. dahlii*; those with moderate resistance to EWL (r around 10 s cm^{-1}) including *L. caerulea*, *L. coplandi* and L. wotjulmensis; and those with substantial resistance to EWL (r > 20 s cm^{-1}) including *L. bicolor*, *L. rubella*, and *L. rothii*. Although all *L. bicolor* have high cutaneous resistances (mean r = 48 s cm^{-1}), some individuals have very high resistance (r > 170 s cm^{-1}), and the causes of this variability are being examined (including seasonal changes, ontogenetic changes, and minute differences in experimental conditions such as posture and orientation to the wind).

ANSWERS to the ASH2002 Trivia Quiz

Do you wear socks with sandals?

1. Greg Johnston	6	_____	Always
2. Michael Mahony	10	_____	I wear socks with thongs
3. Sara Broomhall	5	_____	Only when it compliments my safari hat
4. Nick Clemann	3	_____	Only when around Shaz-mate
5. Heath Butler	2	_____	White socks
6. Rick Shine	8	_____	Never - I live in north QLD!
7. Nancy Fitzsimmons	7	_____	Only on religious holidays
8. Lin Schwarzkopf	9	_____	Not since I left JCU
9. Simon Hudson	4	_____	No, I keep my socks down my pants
10. Greg Brown	1	_____	Certainly not, I'm not an academic anymore

Do you have snake envy?

1. Michael Mahony	8	_____	What do you think?
2. Louise Osborne	5	_____	There is no such thing as snake envy, only turtle envy
3. John Wombey	3	_____	Snakes, they look like worms don't they?
4. Frank Lemckert	4	_____	Its not necessary
5. Nancy Fitzsimmons	2	_____	Nope, dragons rule the earth
6. Harko Werkman	6	_____	No, I'm very secure
7. Martin Whiting	7	_____	I have tortoise envy
8. Frank Seebacher	1	_____	Absolutely
9. Tony Tucker	10	_____	Never!
10. Simon Hudson	9	_____	There is no such thing as snake envy, only turtle envy

Do you have a beard?

1. Devi Stuart-Fox	5	_____	Very small whiskers
2. Dale Roberts	2	_____	Who doesn't?
3. Tony Tucker	8	_____	Yes, I also have a Swiss army knife
4. Fabien Aubret	4	_____	On my bottom
5. David Wilson	1	_____	One lonely chin hair
6. Dave O'Connor	6	_____	No, I've tried hard but never could make it
7. Andrew Stauber	3	_____	Proudly since 1976
8. Ross Alford	7	_____	Do male frogs vocalise?
9. Mike Thompson	9	_____	Of course
10. Karen Thumm	10	_____	No, but my pet death adder does