The Australasian Bat Society Newsletter

Number 35 November 2010

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– Instructions for Contributors –

The *Australasian Bat Society Newsletter* will accept contributions under one of the following two sections: Research Papers, and all other articles or notes. There are two deadlines each year: **10th March** for the April issue, and **10th October** for the November issue. The Editor reserves the right to hold over contributions for subsequent issues of the *Newsletter*, and meeting the deadline is not a guarantee of immediate publication.

Opinions expressed in contributions to the Newsletter are the responsibility of the author, and do not necessarily reflect the views of the Australasian Bat Society, its Executive or members.

For consistency, the following guidelines should be followed:

- Emailed electronic copy of manuscripts or articles, sent as an attachment, is the preferred method of submission. Faxed and hard copy manuscripts will be accepted but reluctantly! Please send all submissions to the *Newsletter* Editor at the email or postal address below.
- Electronic copy should be in 11 point Arial font, left and right justified with 16 mm left and right margins. Please use Microsoft Word; any version is acceptable.
- Manuscripts should be submitted in clear, concise English and free from typographical and spelling errors. **Please leave two spaces after each sentence**.
- Research Papers should include: Title; Names and affiliation of authors and an email address for corresponding author; Abstract (approx. 200 words); Introduction; Materials and methods; Results; Discussion; and References. References should conform to the Harvard System (author-date; see recent *Newsletter* issues for examples).
- Technical notes, News, Notes, Notices, Art etc should include a Title; Names and affiliation of author(s) and an email address for the corresponding author. References should conform to the Harvard System (author-date).
- All pages, figures and tables should be consecutively numbered and correct orientation must be used throughout. Metric units and SI units should be used wherever possible.
- Some black and white photographs can be reproduced in the *Newsletter* after scanning and digital editing (consult the Editor for advice). Diagrams and figures should be submitted as 'Camera ready' copy, sized to fit on an A4 page, or electronically as TIFF, JPEG or BMP image files. Tables should be in a format suitable for reproduction on a single page.
- Editorial amendments may be suggested and all articles will generally undergo some minor editing to conform to the *Newsletter*.
- Please contact the *Newsletter* Editor if you need help or advice.
- **Advertising:** please contact the editor for current advertising (half and full page) rates.

President	**Secretary**	***Newsletter* Editor**
Michael Pennay	Maree Kerr	Susan Campbell
Dept. Environment & Climate Change	72 Lee Steere Crescent	Dept. Agriculture & Food
PO Box 733	Kambah, ACT 2909	100 Bougainvillea Ave
Queanbeyan, NSW 2620	Ph: +61 2 6296 4823	Forrestfield, WA 6058
Ph: +61 2 6298 9718	Fax:+61 2 6230 0544	Ph: +61 8 9366 2301
Fax: +61 2 6299 4281	Mobile: 0412 311 403	Fax: +61 8 9366 2342
president@ausbats.org.au	secretary@ausbats.org.au	editor@ausbats.org.au

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– Editorial –

G'day!

Welcome to the 35th edition of The ABS *Newsletter*. I**n colour (well, the cover at least)!** What do you think of the dashing display of past (and current) presidents on the front cover? Do you love it in colour? If so, let me know, and we'll keep things this way!

Firstly, a well deserved "hats-off" to Damian Milne, Chris Pavey, Toni Mitchell, Lunar Eclipse and their team of helpers – all of whom ensured that the 14th ABS Conference ran incredibly smoothly and was an absolute delight to attend. Abstracts from this conference can be found in this edition (pages 14 to 34), and for a unique wrap up on the week, see Lisa Cawthen's perspective on page 51. Congratulations also to the award recipients and thanks to each of the sponsors and individuals who donated prizes to these awards (details page 34). I personally have two highlights from the week. One was balancing on a rock in my jocks for a couple of hours on the edge of Umbrawarra Gorge monitoring one side of a mist net and not thinking anything of the mozzies biting my butt because the bats buzzing over head (and over the mist net ☹) made it all worth while! The second highlight (and I hope I am not ostracised from the ABS for this being a non-bat related highlight!!) was discovering a myriad of different types of critters' foot prints on a sandy track at dawn one morning with Chris Grant and trying to work out what each one was and how the animal was moving. A true delight.

Since the conference in Darwin I've been lucky to have spent 10 days in Borneo (mostly underwater), where I regretted not taking a bat detector as there was *so* much activity in the rainforests at night. After the fauna rich forests (and marine reserves) of Borneo, I spent four weeks in Italy where the only wildlife we spotted were goats, sheep, chickens and cows; but in some small way, the wine and cheese made up for this. The 'bocca della veritá' in Rome ('mouth of truth', pictured) didn't bite my hand off when I told it I loved bats – so it must be true ☺.

I hope that you have a big cup / glass of your beverage of choice as you sit down and enjoy the wonderful stories and research captured in the following 86(!) pages. Ever wondered about 'negative time'? Chris Corben has and he joins Terry Reardon and Greg Ford in an insightful synopsis that 'all Anabatters' must read (page 60). Chris C shares more of his wisdom with us with four pages of information on viewing and interpreting feeding buzzes (pages 41 to 44).

Thank you to all the contributors, this truly is a bumper edition. Special mention to Robert Bender for being the *only* ABS member to enter the previous Witty Photo Competition (page 66). The two new images I've selected in this edition provide a somewhat easier avenue for you all to unleash your creative talents. So please, don't be shy, fear not possible revenge, and send your caption / thought bubble / limerick / what ever takes your fancy, through to me today!

Susan Campbell
***Newsletter* Editor**

Cover: L-R: Greg Richards, Terry Reardon, Bruce Thomson, Greg Ford, Lindy Lumsden, Rob Gration and president Michael Pennay. A wonderful line-up of our past and of course, present, ABS presidents (in chronological order).

– From the President –

Hi everyone and welcome to another edition of the Australasian Bat Society *Newsletter*. This is the first newsletter since the Australasian Bat Conference and our AGM was held in Darwin in June. For those of you who made it, thanks for coming and helping make it the enjoyable, educational and entertaining experience it really was. If you couldn't make it, don't worry, there are plenty of stories and abstracts in this newsletter for you to catch up on the events.

Personally I was impressed with the breadth of subjects presented, I was really happy to see presentations from across Australasia including Fiji, Indonesia and a strong New Zealand contingent. The highlight in particular, for me, was the fact we had a whole day devoted to student papers. This really inspired me to see the future of bat study looking so strong and vibrant.

Finally I'd also like to thank all members for the vote of confidence in my role of president, I accepted a nomination to serve as president for another 2 years and was elected unopposed (clearly personal presentation is not high on the criteria for the job judging from the front cover). I'll try my best and look forward to working with you all over the next 2 years.

Michael Pennay
ABS President

Michael Pennay and Nick Fuller engaged in a traditional greeting known well among the ABS.
Photo thanks to Chris Grant.

– Australasian Bat Society Inc.: Business and Reports –

AUSTRALASIAN BAT SOCIETY, INC.

ABN: 75 120 155 626

Minutes of the
ABS Annual General Meeting 2010
held on Tuesday 13th July
during the 14th ABS conference, at
Northern Territory Museum, Darwin.

1. Open, attendance and apologies
The meeting opened at 3.45 pm.

Present:
David Andrew, Kyle Armstrong, Grant Baverstock, Robert Bender, Gillian Bennett, Kerry Borkin, Guy Bottroff, Susan Campbell, Lisa Cawthen, Sue Churchill, Roger Coles, Chris Corben, Cathy Dorling, Greg Ford, Anke Frank, Leroy Gonsalves, Chris Grant, Rob Gration, Luke Hogan, Judith Hopper, Clare Hourigan, Tamara Inkster, Maree Kerr, Ian Kitchen, Brad Law, Darren Le Roux, Tanya Loos, Lindy Lumsden, Dan Lunney, Sandrine Martinez, Anna McConville, Debbie Melville, Damian Milne, Tony Mitchell, Nancy Pallin, Stuart Parsons, Tim Pearson, Michael Pennay, Kristy Peters, Terry Reardon, Greg Richards, Amy Rowles, Annette Scanlon, Caragh Threlfall, Marg Turton, Anne Williams, Narawan Williams, Ray Williams, Tasman Willis, Terry Wimberley and Trish Wimberley.

2. Ratification of Minutes of FAGM, at Yanga National Park, NSW, April 2009
The minutes of FAGM 2009 were endorsed as a true record.
Moved: Lindy Lumsden Seconded: Chris Grant

3. Reports from executive officers
President's Report – Michael Pennay
Michael thanked the committee and the extended committee, comprising former ABS executives, for their expert assistance at Executive meetings held during the year.

The biggest issue of the last year was the Christmas Island Pipistrelle campaign culminating in the sadly unsuccessful rescue mission. Michael thanked Lindy Lumsden for her leading role in the campaign, and stated that although it was unsuccessful, we have learned many things from it and the professional way we handled the campaign has improved our standing with the commonwealth government.

Other issues were the successful campaign to protect an Eastern Cave Bat roost in Kwiambal National Park, NSW, from demolition. This issue highlighted the lack of awareness of bat ecology and issues in the community. The result was achieved with help from the Environmental Defenders Office. Michael thanked everyone who was involved in this.

He referred to the field trip survey held at Yanga NP in association with the 2009 FAGM and that this had resulted in allocation of further environmental flows to the park, and that the water body where the Myotis was found is now known as Fishing Bat Lake.

Other bat issues were the continuing issues with flying-foxes, including the bad press in the media and the efforts of the RBG in Sydney to remove them from the Gardens. The ABS had written against this but the removal was approved under strict conditions. Many of the female flying-foxes were very underweight so the removal has been deferred to the following year.

The Southern Bent-wing Bat is still a concerning issue, although the mortality rate has decreased substantially this year.

White-nose syndrome has continued to decimate bat populations in the USA and care must be taken to ensure that it does not get into Australia.

The conservation status of New Zealand bats is also a concern.

Michael reported that the ABS had introduced discounted membership for members from developing countries.

Finally Michael thanked all for coming to the conference, particularly Damian and his organising committee.

1st Vice President's Report – Chris Grant
Chris Grant reported on his first term as 1st Vice President.

He thanked Michael Pennay for his inspirational leadership, and talked about current bat issues including the need for a strong conservation strategy for the Southern Bent-wing Bat and for a media strategy to counter the bad press on Grey-headed Flying-foxes, and learning lessons from the fight to save the Christmas Island Pipistrelle.

Chris went on to talk about strategies the ABS was putting into place to engage members including development of a new website, and how this could be used to drive the society forward, raise its profile and become known as the pre-eminent society for conservation of bats in Australasia.

2nd Vice President's Report – Lindy Lumsden
Lindy Lumsden outlined that the role of the 2nd Vice President was to ensure that conferences happen every second year and to assist in conference organisation. Lindy thanked Damian and his team for the great job in organising the Darwin conference.

In addition to this, Lindy also helps the Editor by proof-reading the ABS *Newsletter* and organising the printing and posting.

Finally Lindy spoke about the Christmas Island Pipistrelle campaign, and thanked all who were involved, in particular Michael Pennay, for their support on the issue.

Treasurer's Report – Craig Grabham
Craig Grabham presented the Treasurer's report (attached below), and thanked the voluntary auditor, Robert Bender. Craig thanked Robert, Natasha and Lindy for setting up the accounting process which made his job as Treasurer much easier.

Craig commented that ABS members should be encouraged to pay subscriptions by electronic funds transfer, as merchant bank fees from credit card processing was a major expense.

The major use of the funds received (50%) went to producing the newsletter.

The Treasurers' report was accepted.
Moved: Michael Pennay Seconded: Chris Grant

Secretary's Report – Maree Kerr
Maree Kerr presented a list of main correspondence over the year.

Most correspondence over the year regarded the Christmas Island Pipistrelle. A number of letters were sent to and received from the Hon Peter Garrett MP. A letter was received from the Minister thanking the ABS and volunteers for their assistance in the Christmas Island Rescue mission and commending Lindy Lumsden for her leadership.

Other correspondence included:

17 July 2009 – Letter to Minister for Agriculture, Fisheries and Forestry regarding White-nose Syndrome. Reply received 15 October 2009

11 Jan 2010 – Letter to NSW DECC regarding the planned demolition of a maternity roost of the Eastern Cave Bat in Kwiambal National Park. A reply was received 24 February stating that the government was considering the matter and mentioning the risks to public health and safety of the roost which was in a building identified as "dangerous." and assuring the ABS that the proposed works had been assessed under Part 5 of the Environment Planning and Assessment Act 1979 and determined not to be significant and that therefore neither an EIS nor a species Impact Statement was required.

On 24 June 2010 a reply was received from DECC stating that the proposed demolition was not going ahead.

The ABS also wrote to Minister Garrett regarding the planned removal of Grey-headed Flying-foxes from the Royal botanic Gardens, Sydney.

Newsletter Editor Report
Susan Campbell presented the Editor's report.

She requested that members contribute articles to the newsletter and that she had been trying to include a variety of articles in the newsletter. She informed the members that there are two issues a year. She is envisaging changes to instructions for contributors to update these and reflect current practices.

Susan was pleased with the feedback she had received on the newsletter.

Many members receive the newsletter electronically in full colour. The printed version is black and white. Susan advised that she was considering producing the print version of the newsletter in colour. She advised that it would cost an extra 50 cents for a colour cover and $3.84 for the inside in colour, a total of $4.34 per newsletter for a full colour version.

Susan asked members if they would support the Executive to investigate in more detail the costings of producing the newsletter in colour. The Members supported this.

Susan thanked Lindy for her assistance with the newsletter.

Lastly, Susan informed ABS that she had given a presentation on Christmas Island Pipistrelle to last years Australian Mammal Society conference, which was well received.

Membership Report
Damian Milne presented the membership report.

The ABS reached the milestone of 300 members at the end of 2009, the fifth successive year of growth experienced by the ABS in its overall membership (Fig. 1). Current indications are that the number of members will be up again at the end of 2010. There were 30 new members in 2009, and 28 members who either resigned or membership expired (i.e. more than two years unfinancial). There was also an overall decrease in the number of unfinancial members in 2009 (Fig. 2) which is encouraging as there had been an increasing trend in the number of unfinancial members over the previous four years.

Finally, on a personal note, I wish to express my thanks again to Chris Pavey, Toni Mitchell, Lunar Eclipse, the dozens of people who helped out with various odd jobs over the six days, as well as the presenters and attendees for making the ABS Conference another successful one.

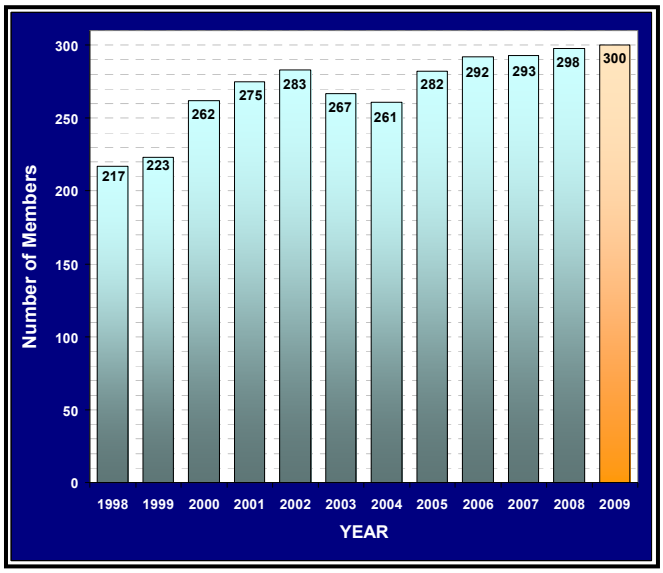

Fig. 1: Total numbers of members in the year ending 2009 compared against previous years.

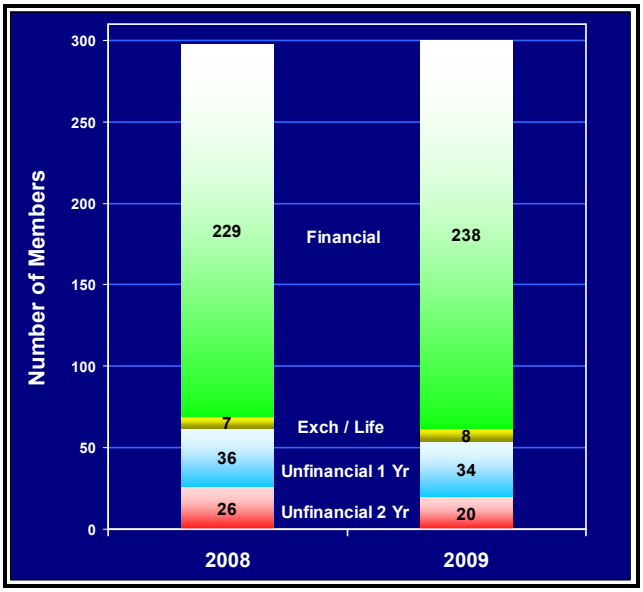

Fig. 2: Financial make up of ABS members in the year ending 2009 compared against 2008.

An Eastern Blossom Bat *Macroglossus minimus*. This great image was sent in by Lib Ruytenberg.

Treasurers report

Craig Grabham
treasurer@ausbats.org.au

TREASURERS REPORT FOR THE YEAR ENDING 31 DECEMBER 2009

	$	% (of income)
Income		
Membership subscription	$9,903.00	97.24%
Interest (Cash Management)	$179.21	1.76%
Interest (Business Transaction/Cheque)	$0.00	0.00%
Interest (Gift Account)	$0.11	0.00%
Donations (ABS Gift Fund)	$102.00	1.00%
TOTAL INCOME	**$10,184.32**	**100.00%**
Expenditure		
Membership Management (renewals postage, etc)	$382.40	9.03%
Newsletter (production & postage)	$2,387.72	56.41%
Insurance (public liability)	$453.75	10.72%
Executive (ie. webpage production, donations etc)	$0.00	0.00%
Merchant Fees (Credit Card Facilities)	$810.78	19.15%
Bank fees (Business Transaction/Cheque)	$117.40	2.77%
Bank fees (Cash Management)	$81.00	1.91%
Bank fees (Gift)	$0.00	0.00%
TOTAL EXPENDITURE	**$4,233.05**	**100.00%**
SURPLUS	**$5,951.27**	
GST Refunded from ATO	$522.00	
GST Paid to ATO	$387.00	

Membership	
Cash inflow	$9,903.00
Cash outflow	$382.40
Surplus	$9,520.60

Bank accounts	
Cash inflow	$179.32
Cash outflow	$1,009.18
Deficit	$829.86

Summary		
Membership	$9,520.60	98.9%
Donations	$102.00	1.1%
Newsletter	$2,387.72	24.8%
Insurance	$453.75	-4.7%
Bank accounts	$829.86	-8.6%
Executive	$0.00	0.0%
Net result	$5,951.27	61.8%

Surplus comprises	
Excess of member subs	$5,849.27
Donations	$102.00

ASSETS AT 31 DECEMBER	*2008*	*2009*	*Change*	
ABS Cash Management Trust (Investment)	$7,847.87	$7,946.08	$98.21	profit
ABS Cheque Account	$29,327.70	$35,622.49	$6,294.79	profit
ABS Gift Fund (Donations)	$1,063.70	$1,165.81	$102.11	profit
TOTAL ASSETS	**$38,239.27**	**$44,734.38**	**$6,495.11**	profit

NOTES

1 - GST for the 3rd BAS reporting period (July - September 2009) paid January 2010

2 - GST for the 4th BAS reporting period (October - December 2009) refunded 2010

3 - The GST amount refunded by the ATO during the 2009 period includes refund from the 4th BAS reporting period of 2008

Signed Auditor, Robert Bender:

Signed Treasurer, Craig Grabham:

Election of Office Bearers
Greg Ford, seconded by Greg Richards, moved a vote of thanks to the outgoing committee.

Nancy Pallin, Public Officer, conducted the elections.

Nancy reported that one nomination, duly seconded, was received for each of the Executive Positions. There being no other nominations, the following were elected for the next term:

President	Michael Pennay (nominated Greg Ford, 2nd Damian Milne).
1st Vice President	Chris Grant (nominated Susan Campbell, 2nd Craig Grabham).
2nd Vice President	Lindy Lumsden (nominated Chris Grant, 2nd Susan Campbell).
Treasurer	Craig Grabham (nominated Rob Gration, 2nd Lindy Lumsden).
Secretary	Maree Kerr (nominated Craig Grabham, 2nd Greg Ford).
Membership Secretary	Damian Milne (nominated Lindy Lumsden, 2nd Bruce Thomson).
Newsletter Editor	Susan Campbell (nominated Maree Kerr, 2nd Damian Milne).
Public Officer	Nancy Pallin

Nancy agreed to stay in this non-elected role. She informed the members that as the ABS is incorporated in NSW, the Public Officer must be in NSW.

General business

- **Website**

ABS members were informed of the development of a new website. This is necessary as the current host provider is no longer able to host the ABS website, and also the website needs re-vamping. It is envisaged that the new website will be interactive and will include on-line membership.

- **Honorary life members**

The ABS Constitution provides for granting of Life Memberships under clause 5.

Terry Reardon moved that the following persons be elected to the standing of Honorary Life Members:

Len Martin: Len was our founding President and is known as the Great Man of the ABS. Len was President during the discovery of Lyssavirus and ably steered the ABS through this challenge. His boundless energy was a source of inspiration and the reason for the early success and respect of the Society.

Greg Richards: Greg has been part of the ABS since its beginning, and has held a number of positions on the executive committee. He is still on the Extended Committee, a group of people who support the Executive with their expertise and corporate knowledge. Greg is a sponsor of a prize category at ABS conferences.

Michael Pennay seconded the motions.

Both motions were unanimously approved by the members.

- **Revision of ABS Clause 47.1**

The Constitution of the ABS was written in the early 1990s, and since then electronic modes of communication, particularly with regard to money management, have become standard practice.

Clause 47.3, under Funds Management, states:

*All cheques, drafts, bills of exchange, promissory notes and other negotiable instruments must be signed by any two members of the Executive, or members or employees of the Society, being members or employees authorised to do so by the Executive***.**

The ABS executive comprises members who are geographically separated and signing cheques by two members is tedious and time consuming.

In view of this, it is proposed that clause 47.3 of the Constitution is amended to allow electronic banking.

Clause 48 of the Constitution states that any amendment of the objectives and rules of the Society must be dealt with by special Resolution. A special Resolution requires 21 days written notice specifying the intention.

Action: Therefore a Special Resolution to allow electronic banking will go out with the newsletter requesting members to vote by a postal vote form or electronically.

- **Proposal for unspent membership monies**

The ABS Executive is proposing that the Society announce each year financial support for projects that meet the objectives of the Society. The Committee will develop appropriate criteria and review processes.

Michael Pennay moved, seconded by Chris Grant:

That the ABS approve that Interest received and up to 100% of funds from unspent membership subscriptions from audited accounts of the immediate past financial year be used to give financial support of up to $500 to projects that meet the Society's objectives.

Projects could be for student projects, or for education or carer projects. The Executive or persons approved by the executive will determine the successful projects according to criteria agreed by the executive.

Recipients of funding under this scheme are required to contribute to the newsletter.

The motion was carried.

- **Australasian Bat Night**

Maree Kerr introduced the concept of an Australasian Bat Night. Europe has an European Bat Night operating in over 20 European countries. Each year events and activities are run to celebrate bats.

The idea would be that events with a bat focus would be run over a certain time, mostly on one day/night, by individuals or community groups each year. Events could be listed on a central register. Local events would be publicised through local networks and the Executive would issue national media statements. The aim of the Bat Night would be to raise awareness and appreciation of bats and the threats they face.

There was general support for the idea by the Members. A date of October 31st was suggested.
Action: The Executive would investigate further.

- **Other Business**

A suggestion was made that the ABS set up an equipment store. While this idea held merit, criticism included lack of facilities to store equipment. It was agreed that this idea be considered more thoroughly.

It was resolved that ABS would contribute to the cost of publication of Proceedings of the 2007 Symposium held jointly with the Royal Zoological Society, NSW, on *Biology and Conservation of Australasian Bats*.

Action: The Executive would take this offer to RZS.

Next Meetings

The 2011 FAGM and 2012 Conference were discussed.

ABS conferences are held biennially with a Financial AGM being held on the alternate years. It has become accepted practice, that every second conference be held in a place accessible to most members – generally south-eastern Australia.

The ABS discussed the format of the FAGM. For a number of years, the FAGM had been held in conjunction with a workshop; last year it was part of a field trip. In 2007, a joint symposium was held with the RZS.

It was suggested that the 2011 FAGM or the 2012 Conference be a joint symposium with the Australian Mammal Society. It was agreed that the two societies had similar aims and that closer ties would be beneficial and could raise the profile of bats.

After discussion, it was decided that the 2012 Conference would be held in Melbourne at the traditional time just after Easter and the ABS would investigate the possibility of running it as a joint conference with the Mammal Society.

It was suggested that the 2011 FAGM be held in the Wimberley's Wildlife Rehabilitation Centre.

Actions: Talk to the Australian Mammal Society.

Close
Michael Pennay thanked the conference participants and spoke about the excellent media attention it achieved.

The meeting closed at 5.30 pm.

The greater New Zealand short-nosed Parsonii, Stu Parsons doing his utmost to capture an image at Pine Creek, July 2010. Photo thanks to Chris Grant.

– Research Notes –

Abstracts from the 14th Australasian Bat Society Conference, Darwin, 12-14th July, 2010

HABITAT USE BY THE EAST COAST FREETAIL BAT (*MORMOPTERUS NORFOLKENSIS*) IN THE HUNTER REGION.

Anna McConville, Bradley Law and Michael Mahony

Few systematic, quantitative studies on microbats have investigated species-specific landscape-scale habitat use and most habitat models are based on presence-only records that span many years. This is particularly the case for rarely captured species such as *Mormopterus norfolkensis* (listed as Vulnerable under NSW *Threatened Conservation Act 1995*). The aim of the study is to determine what factors influence landscape-scale habitat use by *M. norfolkensis* and to determine what particular elements within each landscape are important. A grid of 5km x 5km was placed over the Hunter region and each grid cell was classified into different landscape types according to the amount of vegetation cover and amount of urban landuse and a total of 30 landscapes were randomly selected. From these, bat detectors were placed at each of four landscape elements within each landscape, being cleared, paddock tree, riparian and forest patch, with a total of 100 sites sampled. Activity levels of *M. norfolkensis* were compared across both landscape class and landscape element scale. A total of 231 *M. norfolkensis* passes were recorded during the study at 39% of sites sampled. Overall, cleared and semi-cleared landscapes were found to have higher activity levels than urban or forested landscapes. Of the landscape elements, riparian sites were found to have greater activity levels across all landscape types. Habitat models are being developed for the study area and will be discussed during the presentation.

SALTMARSH AND ESTUARINE HABITAT USE BY INSECTIVOROUS BATS, CENTRAL COAST, NSW AS REVEALED BY ACOUSTIC BAT DETECTION AND RADIO-TELEMETRY.

Susan Lamb[1,2], Leroy Gonsalves[1], Bradley Law[3] and Vaughan Monamy[1]
[1] Australian Catholic University. PO Box 968, North Sydney 2059 NSW, [2] DECCW. PO Box 668, Parramatta 2150 NSW, [3] State Forests. PO Box 100, Beecroft 2119 NSW

Acoustic bat detection was used to compare habitat use by insectivorous bats overflying saltmarsh, coastal forest and urban macrohabitats in summer 2008-2009 on the Central Coast, NSW. In all, 15 species were detected and data were compared using one way ANOVA and ordination plots. Greatest species richness and activity occurred in forest macrohabitat, followed by urban and saltmarsh macrohabitats, which did not differ significantly from one another. In addition to acoustic bat detection, radio-tracking of one of the most commonly recorded species in saltmarsh, *Chalinolobus gouldii* (n = 7), was used to explore detailed habitat preferences. The study area was divided into four focal macrohabitats, including estuarine, forest, urban and water macrohabitats. Radio-tracking showed similar habitat use to that revealed by acoustic monitoring, with the majority of activity being recorded in forest macrohabitat. Sufficient data were obtained for six *C. gouldii* individuals to enable Kernel Density Estimates (KDE) and Minimum Convex Polygons (MCP) foraging ranges to be constructed. Habitat compositional analysis showed that macrohabitats were mostly used in proportion to their availability within the foraging range areas. Saltmarsh offered some species of insectivorous bats a suitable foraging resource, but when combined into the estuarine macrohabitat complex, this relatively small area was not used preferentially by *C. gouldii*.

ARE SALTMARSH MOSQUITOES (*AEDES VIGILAX*) IMPORTANT PREY ITEMS OF LITTLE FOREST BATS (*VESPADELUS VULTURNUS*) NEAR SALTMARSH ON THE CENTRAL COAST OF NSW?

Leroy Gonsalves[1], Bradley Law[2], Cameron Webb[3] and Vaughan Monamy[1]
[1] School of Arts and Sciences, Australian Catholic University, North Sydney, NSW, Australia;
[2] Industry and Investment NSW, West Pennant Hills, NSW, Australia; [3] Department of Medical Entomology, University of Sydney and Westmead Hospital, NSW, Australia.

An investigation of the importance of the saltmarsh mosquito, *Aedes vigilax*, to the diet of the little forest bat, *Vespadelus vulturnus*, was undertaken on the Central Coast of New South Wales using a relatively new technique: faecal DNA identification. The impacts of broad scale mosquito control on bat diet are yet to be established. Investigating whether bats consistently select for mosquitoes at times of high and low mosquito abundance may allow for inferences to be made regarding the impacts of mosquito control on bat diet. Little forest bats were harp-trapped fortnightly over summer 2009/10, in accordance with predicted fluctuations in the abundance of saltmarsh mosquito populations associated with the tidal cycle. Trapped individuals were held in calico bags and guano produced in these bags was collected, stored dry and frozen. Prey availability data were obtained for each trapping night using CO_2-baited encephalitis virus surveillance (EVS) traps and standard light traps. DNA was extracted from pooled guano samples and a section of the 16S mtDNA was amplified using standard polymerase chain reaction (PCR) techniques. Amplified DNA was cloned and sequenced to provide DNA sequences of prey items to provide species-level identification. A comparison of bat diet was made between two tidal treatments (spring & neap) to distinguish whether mosquitoes are a consistent part of the diet of *V. vulturnus* or whether they are actively selected for during peaks in mosquito abundances. Additionally, inferences relating to the impacts of mosquito control on bat diet will be presented.

ROOSTING ECOLOGY OF THREE MICROBAT SPECIES WITH DIFFERING SUCCESS IN AN URBAN LANDSCAPE, SYDNEY, NSW, AUSTRALIA.

Caragh Threlfall[1], Peter Banks[1] and Bradley Law[2]
[1] Evolution and Ecology Research Centre, University of New South Wales, Sydney, NSW, Australia.
[2] Forest Science Centre, Industry and Investment NSW, Beecroft, NSW, Australia.

Maintaining biodiversity in urbanizing landscapes has become a pressing issue around the world. However, the causative mechanisms for success or failure of wildlife to establish in the urban setting remain largely unresolved. A lack of suitable refuge in urban areas is a common explanation, which for microbats means a lack of roosting opportunities, however roosting requirements for many species are poorly known. This study examines species specific differences in roosting behaviour between three species in urban remnant bushland at Cumberland State Forest, Sydney, NSW, Australia. Over two tracking periods (March 2009 and November-December 2009) we radio-tracked 27 individuals from three species including Gould's long-eared bat *Nyctophilus gouldi*, Gould's wattled bat *Chalinolobus gouldii* and the Eastern broad-nosed bat *Scotorepens orion*. Individuals were located during the day on foot and were triangulated at night for every night the transmitters remained attached. Random trees available to bats (defined as containing at least one hollow, or had shedding bark able to house a bat) but not occupied by bats were also measured at a local and forest scale. Tree measurements included a hollow density index, tree diameter, tree height and senescence. Roost trees will be compared to those randomly available in the landscape at both the roost tree and forest level. Differences between species preferences such as characteristics of roost trees, roost locations, cavities selected, roosting group size and roost switching behaviour will be discussed. Both dead and live trees were used as roost sites and species differed in their use of roost trees within and outside of the remnant. Data will be used to gain an understanding of how roosting strategies differ between these species and why some species may benefit over others in urban environments.

UNEXPECTED PATTERNS OF MICRO-BAT DIVERSITY AMONG HABITATS IN THE URBAN LANDSCAPE.

Clare Hourigan[1], Carla Catterall[1], Darryl Jones[1] and Martin Rhodes[2]
[1] Environmental Futures Centre, Griffith University, Nathan, QLD 4111, Australia.
[2] University of Queensland, St Lucia, QLD 4067, Australia.

Urban landscapes are mosaics of different habitat types, consisting of large areas of residential housing, roads and paved surfaces, interspersed with parks, vegetation remnants, industrial, commercial and even agricultural land. Species composition can vary significantly between such habitats, even when species richness is similar. Although bats are an important component of vertebrate diversity, studies of bat assemblages in urban landscapes have mainly focused on species richness and bat activity, and have been largely confined to temperate regions of the Northern Hemisphere. We investigated the

diversity of the bat fauna occurring within a large mosaic urban landscape in subtropical Australia. We assessed whether species richness, species composition and bat activity varied between four broad habitat types; high density residential, low density residential, parkland and native bushland remnants. Each of ten sites within each habitat (total 40 sites) was surveyed for bats on six non-consecutive nights using ultrasonic bat detectors. Fourteen species were identified from a total of 14,930 call sequences. The species richness of low density residential areas was significantly higher than large parklands but statistically similar to that of remnant bushland. Bat assemblages in low density residential and parkland habitats differed from those in remnant bushland and high density residential habitats; however there was little difference between either low density residential and parkland or high density residential and remnant bushland. This was due to a number of species which were less common in both remnant bushland and high density residential areas. In addition, levels of bat activity were highest in the low density residential habitat. These results contradict previous studies of bat assemblages in urban landscapes, which report the highest levels of species richness, bat abundance and activity in woodland habitats. Possible reasons for these unusual patterns of micro-bat diversity will be discussed.

COLONY SIZE REDUCTION COINCIDES WITH ROOST LOSS DUE TO CLEAR-FELL HARVEST OF PLANTATION FOREST.

Kerry Borkin and Stuart Parsons
School of Biological Sciences, University of Auckland, P.O. Box 92019 Auckland, New Zealand

The impact of clear-fell harvest on bats is of concern to many biologists because of the loss of roosts, and changes to foraging opportunities; both of which have possible effects on populations. Long-tailed bats (*Chalinolobus tuberculatus*) are present throughout New Zealand in plantation forests managed with clear-fell harvest, but the impacts of such management have not yet been investigated. We determined colony size, roost loss, roosting range size (minimum convex polygons) and the use of roosts over three summers in a *Pinus radiata*-dominated plantation to test our predictions that all these measures would reduce in the presence of harvest operations. Over three summers, colony size declined from a median 8.0 to 2.0 bat, and roosting ranges shrank from 11.6 to 1.0 x 10^{-4} ha. Bats also used fewer roosts post-harvest operations. The rates of roost loss reported here are among the highest reported worldwide. Whilst there is no direct causal evidence that reductions are due to clear-fell harvest, we suspect this is the case. Such levels of roost loss may cause locally ephemeral populations of long-tailed bats that are vulnerable to predation, and which use roosts until they are lost due to forestry operations or natural causes.

LANDSCAPE GENETICS OF GOULD'S LONG-EARED BAT (*NYCTOPHILUS GOULDI*) AND THE LESSER LONG-EARED BAT (*N. GEOFFROYI*) IN FRAGMENTED POPULATIONS OF SOUTH-EASTERN AUSTRALIA.

Nicholas Fuller, Susan Carthew and Steve Cooper

Bat fauna represents a significant proportion of global mammalian diversity (approximately 20%) yet we know little about how this mega-diverse order responds to major threatening processes such as habitat fragmentation. This project aims to address this issue by assessing and comparing population genetic structure and gene-flow across fragmented and continuous habitat in two species of long-eared bat (*Nyctophilus*), one of the most abundant and species rich Australian genera of bats. We have selected species with near-identical morphology but contrasting ecology and behaviour in an attempt to assess variability in chiropteran sensitivity to this landscape threat. Gould's long-eared bat (*N. gouldi*) is a habitat specialist with a distribution limited to tall mature forests and has been listed as endangered in South Australia. In contrast, the lesser long-eared bat (*N. geoffroyi*) is a habitat generalist that displays a ubiquitous distribution across Australia and is commonly recorded within modified landscapes. We have collected 1200 samples throughout western Victoria and south-eastern South Australia from fourteen sites including five control sites within extensive continuous forest and nine sites representing forest fragments of varying size and degrees of isolation. In addition to our primary objective we also plan to utilise our dataset to assess the genetic diversity and connectivity of the endangered and fragmented SA populations of *N. gouldi*, and, to investigate dispersal strategies for each species to determine whether there is a sex bias in dispersal. We are currently developing fifteen to twenty microsatellite markers for each species to facilitate our genetic analyses. Preliminary results will be discussed.

BATS IN THE BACKYARD: DEVELOPING RECOMMENDATIONS FOR MONITORING THREATENED LONG-TAILED BATS (*CHALINOLOBUS TUBERCULATUS*) IN AN URBAN ECOSYSTEM.

Darren Le Roux and Joseph Waas
Biological Sciences, University of Waikato, Private Bag 3105, Hamilton, New Zealand.

Monitoring animal populations is crucial to formulating conservation and management strategies. This is especially important, yet challenging, for cryptic threatened species. We developed a non-invasive stratified monitoring design to identify the spatial and temporal changes in foraging activity; we aimed to use this information to establish optimal detection strategies for future research. Automated bat monitoring detectors were arranged in two tiers (i.e. between 15-30m and 4-7m). Bat activity was then measured across different 1.) nights, 2.) seasons, 3.) microhabitats (considering both vertical and horizontal dimensions), and 4.) environmental conditions (e.g. temperature). To maximise bat detections we recommend passively monitoring long-tailed bat activity using detectors placed at lower heights (4-7m) in microhabitats with open spaces and internal water bodies (e.g. ponds and channels). Monitoring bat activity during the first 4 hours after official sunset over warmer spring and summer months is also likely to yield the greatest number of detections. Our results should guide future monitoring, management and conservation efforts for this species with wider implications for monitoring bats in urban ecosystems.

TAXONOMY, POPULATION GENETICS AND CONSERVATION OF THE CRITICALLY ENDANGERED SOUTHERN BENT-WING BAT (*MINIOPTERUS SCHREIBERSII BASSANII*).

Rebecca Wood and Belinda Appleton
Genetics Department, The University of Melbourne.

It is integral to the effective long-term management and conservation of populations that taxonomic relationships are understood and resolved. This research aims to clarify the taxonomy of the Australian complex of the Large Bent-wing Bat (*Miniopterus schreibersii*) with a particular focus on the Critically Endangered Southern Bent-wing Bat (*M. s. bassanii*). Using mitochondrial, microsatellite and nuclear genetic markers, investigation into historical and contemporary population structure has provided insight into the interactions and evolutionary relationships within and between populations of the two southern forms, *M. s. bassanii* and *M. s. oceanensis*. Despite the overlapping ranges of these two taxa, the genetic, morphological and ecological differences observed indicate that they may in fact be reproductively isolated, thereby warranting recognition as distinct species. A major concern for *M. s. bassanii* is not only their declining populations but also the low genetic variation observed. As this is likely to have a long-lasting impact on their viability in the long-term, efforts should focus on promoting habitat quality and demographic stability, at least in the short-term. The importance of this research in establishing the taxonomic status and population structure of *M. s. bassanii* is emphasized by the continued decline of populations and the imminent need for their effective management and conservation.

THE EFFECT OF AN INVASIVE VINE (*MERREMIA PELTATA*) ON PRODUCTIVITY IN THE COMMON RAINFOREST TREE *DILLENIA BIFLORA*, AND ACCESS FOR ITS BAT POLLINATORS IN FIJI.

Annette Scanlon and Sophie Petit

Merremia peltata is an invasive vine that smothers rainforest and garden areas in Fiji. The vine blankets tree canopies, but how the species affects forest processes is unknown. We followed flower and fruit production in the common rainforest tree *Dillenia biflora*, a bat-pollinated species, in covered and uncovered treatments. We selected 10 study trees covered in *M. peltata*, and then removed the vine from half. The number of buds, flowers, and fruits was then noted each month from Aug 2009 to May 2010. Evidence of bat visits to flowers was recorded via bite marks. Preliminary results show trees that had *M. peltata* removed produced significantly more buds and flowers than did covered trees, although the flower abortion rate was also higher. The proportion of flowers visited by bats was not different between treatments; however, uncovered trees produced far more fruits than did blanketed trees. The study shows that *M. peltata* decreases forest productivity, including resources for bats; we emphasise the need for *M. peltata* control in protected rainforest reserves.

THE STEADY MOVEMENT AND INTEGRATION OF THE BLACK FLYING-FOX, *PTEROPUS ALECTO*, INTO THE CAMP AT THE CURRENT SOUTHERN LIMIT OF ITS RANGE - THE ROYAL BOTANIC GARDENS, SYDNEY.

Tim Pearson
Ku-ring-gai Bat Conservation Society.

The range of the Black Flying-fox, *Pteropus alecto*, has been expanding steadily southwards over recent years. From being found no further south than the NSW-Queensland border in the late 1980's, the current southern limit of their range is the Royal Botanic Gardens, Sydney, where the species has been present since 2005. Since March 2006 the numbers and behaviour of *P. alecto* in the RBG has been closely monitored. This paper reviews how the numbers of *P. alecto* have fluctuated over the period, both in themselves and in relation to the substantially larger population of the Grey-headed Flying-fox (*P. poliocephalus*) in the camp. It also looks at how over time the population of *P. alecto* has utilised different roost locations within the camp, the composition and behaviour of the group, and their interaction with *P. poliocephalus*.

ARTIFICIAL INSEMINATION OF CAPTIVE *PTEROPUS* SPECIES.

Debbie Melville[1] and Gemma O'Brien[2]
[1] University of Queensland, School of Animal Studies, Gatton, Qld.
[2] University of New England, Human Biology and Physiology, Armidale, NSW.

Threatening processes are decimating Pteropid (flying-fox) populations, with many species teetering on extinction. The survival of some species may depend upon the establishment of captive breeding programmes. Artificial insemination (AI) can aid in the management of these captive populations, providing accurate knowledge of paternity. Global semen transport also eliminates transportation of live flying-foxes and would facilitate the use of semen collected from free-ranging animals. To maximise fertilisation the correct timing of AI is vital and requires the ability to detect oestrus, which is difficult as Pteropids have no overt behavioural oestrus; therefore pharmacological induction of ovulation may be required. The small body size of Pteropids (< 1 kg) also makes insemination beyond the vagina problematic. A preliminary AI Trial combining oestrus induction together with vaginal insemination was conducted using twenty female Black Flying-foxes (*P. alecto*) divided into three sub-groups: AI, control and ovariohysterectomised. Twelve were given 25 I.U. of Pregnant Mare Serum Gonadotrophin (PMSG) and inseminated with fresh diluted semen from one of eight *P. alecto* males. The four control females were given 25 I.U. PMSG and housed for one week with males and with the four ovariohysterectomised females which received no PMSG. Weekly, then fortnightly, blood samples were collected from all females until the estimated parturition date. Progesterone levels were analysed for evidence of ovulation and pregnancy. Assays revealed that no plasma concentrations were elevated above background levels. Additionally, palpation mid-way through the estimated gestation failed to confirm pregnancy and no female underwent parturition.

IDENTIFICATION OF SUCCESSFUL AND UNSUCCESSFUL TREATMENTS FOR WING INJURIES IN AUSTRALIAN FLYING-FOXES.

Judith Hopper and Gemma O'Brien
School of Science and Technology, University of New England, NSW, 2351.

The efficacy and efficiency of treatments for healing injuries on the wings of grey-headed flying-foxes, *Pteropus poliocephalus* have been tested. Effects of gender, wound open or closed, and wound severity on success of healing were not significantly different ($p < 0.05$). The effect of injury site (e.g. over arm or membrane) was significantly different ($p < 0.1$). Treatment (listed below) was highly significant in its impact on the chance of healing success. Responses to treatment were quantified as duration for both the inflammatory and granulation phases of healing. The rate of wound healing was compared after moist and dry dressings, aqueous and oil-based topical treatments, and no intervention (controls). Over 300 injuries were allocated to treatment groups:

- honey,
- hydrocolloidal dressings,
- spray bandage,
- topical arnica,
- aloe,
- macadamia oil,
- oticleans.

Unacceptable failure rates occurred: aloe (43%), arnica (29%), spray bandage (43%), oticleans (20%) and untreated (44%).If healing occurred, time for the inflammatory phase was unaffected by any variable. Predicted time is 10.60 days ± 0.98. Time for the granulation phase, was

impacted by injury category, site, severity and treatment, e.g. 2.9 days (minor injury) to 32 days (severe injury). Differences between treatments were explored by testing bacterial growth. Honey inhibited bacterial growth but the effect of the hydrocolloidal and macadamia oil was minimal. The antimicrobial effect of honey is not like to have contributed to its efficacy because wounds on flying-foxes rarely develop infection. In contrast prevention of desiccation by oil or moist dressings may well have contributed to their efficacy

POPULATION GENETICS OF THE GREY-HEADED FLYING-FOX (*PTEROPUS POLIOCEPHALUS*).

Heather Baldwin, Peggy Eby, Jackie Chan, and Adam Stow

The grey-headed flying-fox (*Pteropus poliocephalus*) is a threatened species whose population which has experienced a rapid decline of approximately 30-35% in the last twenty years. This study investigates population structuring among permanent grey-headed flying-fox colonies. The limited genetic analyses conducted to date suggest that the grey-headed flying-fox breeds as a single panmictic population, but the strength of this conclusion is limited by the kinds of analyses used (allozymes and mitochondrial DNA), which are capable of showing only broad scale patterns and limited in their resolution. Here I use microsatellite data to address several key questions – is there evidence of population structuring and what does this tell us about breeding dispersal and natal philopatry? Is dispersal sex-biased? Samples obtained from five permanent colonies, ranging from Melbourne to Brisbane, were analysed using six microsatellite markers. Preliminary results show a pattern of high levels of dispersal and the occurrence of some natal philopatry in permanent colonies. This research is important given the current context of grey-headed flying-fox management, which includes culling, forced dispersals of colonies, and inconsistent conservation statuses between the states. If my final results show panmixia, the species should be managed as a single connected population, as actions affecting one colony are more likely to affect the species as a whole. Recommendations based on these results may include: (1) amendment of the Queensland conservation status from common to vulnerable to conform with NSW and VIC; (2) all permanent colonies be managed as equally important; and (3) reduction or elimination of culling. Alternatively, if some level of population differentiation is detected, then this may allow the identification of colonies of high conservation priority. The findings may also aid in decisions such as areas of habitat to protect and restore, and colonies on which to spend limited funds on measures for mitigating heat-stress mortality.

PALAEOECOLOGY OF THE MOUNT ETNA BAT FAUNA, CENTRAL-EASTERN QUEENSLAND.

Sandrine Martinez
Unidel Group Pty Ltd, GPO Box 1957, Brisbane, Qld, 4001.

In this study twelve microchiropteran fossil assemblages from Mount Etna, central-eastern Queensland, ranging in age from more than 500,000 years to the present day, were investigated. The principal aim was to assess the responses of insectivorous bats to Quaternary climate change in Australia. In particular, this investigation focussed on the effects of increasing late Pleistocene aridity and the subsequent retraction of rainforest habitat on bat species and bat communities. Fifteen fossil bat taxa were identified and included ten taxa identified to the species level (i.e. *Macroderma gigas, Hipposideros semoni, Rhinolophus megaphyllus, Miniopterus schreibersii, Miniopterus australis, Scoteanax rueppellii, Chalinolobus gouldii, Chalinolobus dwyeri, Chalinolobus nigrogriseus* and *Vespadelus troughtoni*) and five taxa identified to the generic level (i.e., *Mormopterus, Taphozous, Nyctophilus, Scotorepens* and *Vespadelus*). Palaeoecological analysis of the fossil taxa revealed that bats have remained essentially stable in terms of species diversity and community membership between the mid-Pleistocene rainforest habitat and the mesic habitat that occurs today in the region. The single major exception is *Hipposideros semoni*, which went locally extinct at Mount Etna. The overall resilience through time of the bat species discussed herein is perhaps due to their unique ecological, behavioural, and physiological characteristics as well as their ability to fly, which have allowed them to successfully adapt to their changing environment. This study highlights the importance of palaeoecological analyses as a tool to gain an understanding of how bats have responded to environmental change in the past and provides valuable information for the conservation of threatened modern species, such as *H. semoni*.

COLONY STRUCTURE AND HISTORIC PATTERNS OF GENE FLOW IN *CHALINOLOBUS MORIO* FROM SOUTH-EAST QUEENSLAND AS REVEALED THROUGH MTDNA INVESTIGATION.

Bruce Thomson
Unidel Group Pty Ltd, GPO Box 1957, Brisbane, Qld, 4001.

The genetic structure of three maternity colonies of the Chocolate Wattled Bat in south-east Queensland was investigated through analysis of sequence divergence in two hypervariable domains in the mitochondrial (mtDNA) D-loop region. Maternity colonies were located at the Bunya Mountains, Mt Glorious and Squirrel Creek. Overall, mtDNA diversity in each colony was found to be remarkably similar (FST indices 0.14557 – 0.14760) and within each colony, males and females were found to be more closely related to one another, than they were to either sex from other colonies. A Network analysis of the data clearly indicated two ancient populations which were genetically isolated for a period of time and have now recombined. These clades are separated by 14 to 15 mutations (4.9% divergence) and are now represented in each of the maternity colonies sampled, although their representation is asymmetric. Similar levels of mtDNA divergence (4% - 7%) have been used to infer restrictions to gene flow during the Pleistocene ice ages in Europe (Myotis myotis). It is possible that in eastern Australia, the onset of an exceptionally dry period from 170,000 to 205,000 years bp, precipitated range retractions and restricted gene flow between refugia. This pattern is also suggested by recent paleo-ecological investigations of Chiroptera in this region. A mismatch distribution of the data and associated indices strongly suggest population expansions after this time and the star-shaped Network analysis pattern of each clade is also suggestive of recent population expansion.

SPECIAL PLENARY

HENDRA VIRUS - ECOLOGY AND EPIDEMIOLOGY.

Hume Field
Biosecurity Queensland, and The Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases.

Five of the thirteen recognised Hendra virus incidents in horses have involved transmission to humans, most recently in July 2009 when a veterinarian was fatally infected.

Low infectivity but high case fatality rates are features of infection in both horses and humans. Infection appears not to transmit readily from bats to horses, nor from horse to horse, nor from horses to humans; however, once infected, horses have a 75% probability, and humans a 50% probability, of a fatal outcome. Fruit bats are the natural reservoir of the virus. All human cases are attributed to exposure to infected horses; there is no evidence of bat-to-human transmission.

Hendra virus can cause a range of clinical signs in horses, a legacy of its affinity for endothelial cells. The predominant clinical presentation may depend on which organ system sustains the most severe endothelial damage, and be influenced by route of infection and viral dose.

Animal health authorities in Australia foster increased awareness, alertness and preparedness in the horse-owning and veterinary communities, and encourage husbandry practices that minimize risk of exposure. Veterinarians should routinely consider Hendra virus as a differential diagnosis when presented with a febrile horse, should use a risk-based approach to personal protective equipment, and should maintain good infection control practices at all times.

Minimisation of the future occurrence and impact of Hendra virus requires an understanding of the factors that promote spillover from bats, an informed risk-based approach by owners and veterinary practitioners, and early involvement of animal health authorities. Research into effective vaccines and effective human therapeutics continues.

MORPHOMETRICALLY DEFINED STAGES OF FETAL DEVELOPMENT IN FLYING-FOXES.

Gemma O'Brien, Renee Gear and **Judith Hopper**
Human Biology & Physiology, University of New England, NSW 2351.

Identification of environmental hazards that may reduce the reproductive success of flying-fox populations, and assessment of prematurity in affected individuals, depends on understanding normal fetal development in these species. The present study derived a developmental timeline from morphometric analysis of external

anatomical structures. Specimens of 43 fetal and newborn *Pteropus poliocephalus* were available, either fixed or frozen. Structures were measured in situ (in mm), and body mass (BM) was measured to the nearest gram. Structures measured included head length (HL), ear length, crown-rump length (CRL); elements of the forelimb: forearm length (FAL), distance from shoulder to elbow, length of the whole thumb, the proximal phalanx of the thumb (digit 1), outstretched 2nd, 3rd, 4th and 5th digits, length of the 1st, 2nd and 3rd phalanges of the third digit, and the claw and joint on the thumb and 2nd foredigit; and hindlimb: foot length, and all hind digit claws. Measurements were graphed against FAL to determine the pattern of growth for each structure. Growth of HL, ear pinna, thumb claw, 2nd claw, mean toe claw length and foot length, occurred at two different rates – initial rapid growth was followed by slower growth. Switching from fast to slow indicates a gene switching time point. These time points identify boundaries between discrete developmental stages that end when FAL is approximately 40mm, 57mm, 68mm and 88mm. Features that were not useful included BM and CRL, which are not linear, and the remaining features which grow at a constant rate during the fetal period.

THE ESTABLISHMENT OF THE AUSTRALIAN BAT CLINIC AND WILDLIFE TRAUMA CENTRE.

Terry Wimberley and Trish Paterson-Wimberley
Australian Bat Clinic, Advancetown, Queensland Australia.

Seeing the need to develop a specialist bat facility on Queensland's Gold Coast, Trish and Terry Wimberley began the long journey in 2000 towards the development of the Australian Bat Clinic. They travelled overseas to specialist bat groups in the USA, South Africa, Mexico, the Amazon and Madagascar to increase their knowledge. Plans were drawn up to undertake the construction of specialty treatment and food preparation rooms at their private home with construction completed in October 2007. A large purpose-built flying-fox flight aviary was completed in February 2009 in time for the release of the 2008/2009 season of flying-fox orphans. The Australian Bat Clinic and Wildlife Trauma Centre officially came into being with the not-for-profit organisation becoming fully incorporated in February 2009. The Clinic is a specialist centre for both Mega- and Microchiropterans having treated 6 megabat and 19 microbat species. Wounds are also managed in other species including marsupials, birds, reptiles and platypus. The Clinic liaises heavily with several veterinarians including those from the Australian Wildlife Hospital Beerwah, Currumbin Wildlife Hospital and Dreamworld. Numerous volunteers regularly donate their time to ensure all the wildlife receive the best care. Researchers, University and TAFE students as well as international bat groups have all utilised the Bat Clinic to broaden their knowledge. Educational bat and trauma workshops are run at the centre with wildlife rehabilitators and veterinarian staff travelling from around the country and overseas to attend. Plans are in place to establish an official education centre on-site where members of the general public can learn about the ecological importance of bats.

MASS ABANDONMENT OF GREY-HEADED FLYING-FOX PUPS AT CANUNGRA IN 2008

Trish Paterson-Wimberley
Australian Bat Clinic, Advancetown, Queensland Australia, and Wildcare Australia, Gold Coast Queensland Australia.

During November 2008, following a major storm event, Grey-headed flying-fox (*Pteropus poliocephalus*) pups were found abandoned at the Canungra Flying-fox Camp on Queensland, Australia's Gold Coast. Wildcare Australia wildlife rehabilitators were first on the scene and joined forces with the Environmental Protection Agency, other wildlife care groups and veterinarian staff (from the Sunshine Coast south to the Queensland border). Dead and dying pups, which were on the ground or still hanging in trees or shrubs were stabilised on-site before transportation to the Australian Bat Clinic for veterinary assessment and hospitalisation. Over 340 live pups were rescued over a 3-day period with many suffering from pneumonia, severe dehydration, exposure, fractures and wing membrane damage which resulted in the subsequent death of approximately 10% of these pups. Vaccinated volunteers worked 24 hours around the clock for the next 3-4 months at the Australian Bat Clinic feeding the orphans with unvaccinated volunteers ensuring the vaccinated volunteers were well fed and had a constant supply of sterilised bottles, milk formula and clean wraps. After an initial stabilisation period of about 4 weeks, approximately 80 pups were transferred to other local bat organisations, leaving over 200 pups at the Australian Bat Clinic. As the pups thrived and moved onto solids the task of preparing cut fruit became a mammoth task taking up to 6 hours each day. Thanks to the overwhelming show of support shown during this

event, this large influx of orphans was relatively easily managed. The Australian Bat Clinic successfully released all their Canungra pups.

MONITORING CAVE BATS USING THERMAL IMAGING AND 'POOR MANS' MISSILE TRACKING SOFTWARE.

Doug Mills[1], **Michael Pennay** [1] and Andy Spate[2]
[1] NSW Department of Environment Climate Change and Water. PO Box 733 Queanbeyan NSW 2620;
[2] Optimal Karst Management, PO Box 814 Jurien Bay Western Australia 6516.

We have been trialling an automated counting system to measure populations of the vulnerable Eastern Bent-wing bat (*Miniopterus schreibersii oceanensis*) at two of the three known large maternity colonies in New South Wales, Church Cave at Wee Jasper and Drum Cave in Bungonia State Conservation Area. The Thermal Target Tracker (T3) system, developed by the Bruce Sabol and Eddie Melton of the U.S. Army Engineer Research and Development Center, is based on a thermal infra-red video camera that captures video footage of moving objects (such as missiles). We have used the T3 system to track bats as they exit or enter a roost, the thermal camera captures the heat that is radiated by the bat, enabling it to be distinguished against the static background. The video footage is digitally processed, enabling flying bats to automatically be tracked and counted. To assess the accuracy of the T3 system, manual counts were conducted using the infrared thermal video footage. From comparisons of manual counts versus the T3 counts the results are extremely promising, with the majority of the fly-out counting errors within 1.5% of the manual counts. We estimate the adult population at Church Cave was 17,797 bats in 2008/09, and 16,425 bats in 2009/10 (7.7% lower). The combined adult and juvenile population was estimated to be 26,150 in 2008/09 (breeding/weaning success rate of 46.9%) and 30,173 in 2009/10 (breeding/weaning success rate of 83.7%). The adult population estimate for Drum Cave was 19,287 bats in 2009/10, with a combined adult and juvenile population of 35,361 (breeding/weaning success rate of 83.3%).

RAPID BAT BIODIVERSITY SURVEYS IN DEVELOPING COUNTRIES: GUESSWORK MEETS KNOWLEDGE IN UNEXPLORED ECOSYSTEMS.

Greg Richards
PO Box 9, Gungahlin, ACT 2912.

In developed countries such as Australia there is a great deal of background information upon which more than adequate bat fauna assessments can be based. Such is not the case in the Third World where very little previous work has been conducted, especially the documentation of microbat echolocations calls, which avail the use of Anabat systems. Considering that major agencies such as the World Bank now require high standard EIS's for key developments, this paper discusses the trials and tribulations of studying in remote South-east Asian locations, and outlines methods that can be used for generating biodiversity assessments in previously unexplored ecosystems. The primary survey method using call detection is refined by using mnemonics generated from the basic characteristics of unidentified calls. Bats are initially identified by a "code", which allows later identifications as live bats are captured and reference calls are obtained. Through this method, even though at the end of a survey some species may still be unidentified, they remain as conservation units and allow refined conservation planning to be carried out.

PRELIMINARY RESULTS OF BAT-DETECTOR SURVEYS IN INDONESIA.

Arjan Boonman
Queen Mary University London, LIPI Indonesia,
JL Bukit Permata 86, Bogor, Indonesia.

I have started doing bat-detector work in Indonesia since March 2009 working together with LIPI and Queen Mary University London. First aim was to gather a database of bat calls from large parts of Indonesia, focusing on the little explored eastern regions (Sulawesi, Flores, Papua) and Java. I used a batcorder and a D240X detector and worked all year round, weather permitting. I will present some preliminary results in my presentation. In many places in Indonesia: *Scotophilus kuhlii*, *Pipistrellus javanicus*, *Saccolaimus saccolaimus* and *Myotis muricola* are the commonest species. Using a bat-detector, *Kerivoula/Murina* is only very rarely recorded. I will present a description of several species I have recorded so far. The identification of the species couldn't always be verified and I hope the audience will interact and add all they know to my overview.

HOW MUCH EFFORT IS ENOUGH? SURVEY PROTOCOLS FOR DETECTING BAT FAUNAS IN URBAN ENVIRONMENTS.

Fiona Caryl[1], Rodney van der Ree[1], Caroline Wilson[1], Lindy Lumsden[2] and Brendan Wintle[3]
[1] Australian Research Centre for Urban Ecology (ARCUE), Royal Botanic Gardens Melbourne, Melbourne, VIC, Australia; [2] Arthur Rylah Institute of Environmental Research (ARI), Department of Sustainability and Environment, Heidelberg, VIC, Australia; [3] Applied Environmental Decision Analysis Research Facility (AEDA), School of Botany, University of Melbourne, Melbourne, VIC, Australia.

The Australasian Bat Society make recommendations regarding the survey effort, methods and reporting of bat surveys conducted with acoustic detectors. Typical inventory surveys should involve detector deployment for at least three complete nights in each major habitat in the survey area; ideally in conjunction with capture methods. Whilst this is generally entirely feasible in forested environments, conducting bat surveys within urban areas is more problematic because of physical and social constraints. As part of a larger project investigating the impacts of urbanisation on microbat faunas within Melbourne, we conducted a pilot study to develop a survey protocol specifically for surveying within urban environments. We determined bat species occupancy probabilities at fourteen urban "green spaces" using two methods: 1. an acoustic detector left *in situ* for three entire nights; 2. an observer performed a 30 minute survey within three hours of sunset on three separate occasions. We present results of species detectability rates between the two methods, which can be used to inform about the minimum survey requirements required for impact assessments and species monitoring within urban environments.

AN INVESTIGATION OF WEATHER PROTECTION DEVICES ON ANABAT DETECTORS AND THEIR IMPACTS ON DETECTOR PERFORMANCE.

Michael Pennay
NSW Department of Environment, Climate Change and Water, PO Box 733, Queanbeyan, NSW, 2620.

Anabat bat detectors, commonly used for passive monitoring of bats can easily be damaged by rain and require some form of weather protection. Common devices to protect the microphone from damage include; sound reflection devices, tubing over the microphone or weather proof membranes. Despite the widespread use of weather protection devices, there is little quantifiable analysis of the impact these devices have on the capacity of the detector to record bat species. The impact of a range of weather protection devices were measured in two experiments; A controlled threshold experiment measuring the maximum distance 2 sample tones could be detected from a static detector, and a field experiment aimed at quantifying the impact of weather protection devices on the actual detectability and identification of real bats in a natural situation. The field experiment revealed no significant difference between detectors or nights however there was a significant difference between weather protection treatments. The threshold experiment revealed that all weather protection devices reduced the range of the detector down the central axis however one weather protection device had a greater overall range than the control. The results demonstrate that weather protection devices can have a significant impact on the performance of the detector including its range, the number of identifiable calls, and number of species recorded. Only one weather protection device tested in this study did not result in the significant loss of data or range. The potential impact of weather protection devices should be seriously considered by those designing studies or experiments where they are to be used.

POPULATION DYNAMICS AND CAMP HEALTH OF A RECENTLY RELOCATED COLONY OF GREY-HEADED FLYING-FOXES.

Rodney van der Ree[1], Caroline Wilson[1], Joanne Ainley[1], Grant Baverstock[2] and Tony Mitchell[3]
[1] Australian Research Centre for Urban Ecology, Royal Botanic Gardens Melbourne and School of Botany, University of Melbourne, Vic, 3010.
[2] Geelong City Council, PO Box 104, Geelong, Vic 3220. [3] Department of Sustainability and Environment, 171 Nicholson St, Orbost 3888, Vic, Australia.

In 2003 a colony of Grey-headed Flying-foxes was relocated from the Royal Botanic Gardens Melbourne to Yarra Bend Park in Kew. Since early 2004, an extensive research and monitoring program on the colony and camp at Yarra Bend has been undertaken to provide basic ecological information on the species and inform management actions. This research includes regular estimates of population size (monthly

flyout counts and fortnightly static counts), reproductive output, sex-ratios and mortality rates within the camp. We also conducted a 2-year study to assess the reliability of static counts using a double-blind approach. Regular counts at the other Victorian camps (e.g. East Gippsland and Geelong) have also been undertaken. The health of the vegetation has included repeated assessments of the extent of defoliation using fixed-point camera surveys and subjective assessments categorising trees on a range of "health" criteria. The colony of GHFF at Yarra Bend has continued to fluctuate seasonally as it did at the RBGM, with winter lows between 5000 and 10,000 individuals, and summer peaks typically reaching ~25,000 – 30,000 bats. Approximately 80% of females appear to raise young each year, with very low rates of mortality within the camp, except after extreme high temperatures (~>39 – 40ºC) when hundreds to thousands of bats have been collected. The trees that GHFF occupy year-round have also been impacted, with higher rates of defoliation recorded. The colony of GHFF at Yarra Bend remains an important camp for the species and ongoing management must continue to focus on making the roosting vegetation sustainable in the long-term.

A SUCCESSFUL TRANSLOCATION METHOD FOR NEW ZEALAND'S SHORT-TAILED BATS (*MYSTACINA TUBERCULATA*) USING SOFT-RELEASE OF CAPTIVE-BRED JUVENILES.

Brian Lloyd[1] and Lynn Adams[2]
[1] Royal Forest and Bird Protection Society, PO Box 266, Nelson, New Zealand.
[2] Department of Conservation, P.O. Box 5086, Wellington, New Zealand.

Since humans arrived in New Zealand less than one thousand years ago, one of New Zealand's three native bat species has gone extinct and the range and abundance of the other two species have declined dramatically under the impact of habitat destruction and predation by introduced mammals. In recent years, habitat destruction has slowed, but declines in bats continue as a result of predation by feral cats, rats and mustelids. Similar impacts have been observed for most other components of the New Zealand's fauna. Consequently, mammalian predator control and translocation to predator-free area are the principal method for conservation of many of New Zealand's threatened animal species. However, these methods have proved problematic for bats. Both species are wide-ranging tree-roosting species, which makes in-situ conservation by predator control challenging. There have been no successful translocations of bats for conservation purposes, presumably because of bats homing abilities. An initial attempt at translocating short-tailed bats to a predator free island in 1994 failed when the transferred bats disappeared shortly after release. In 2004 and 2005 the Department of Conservation attempted translocation of short-tailed bats from the Tararua Range in the North Island to Kapiti Island, a predator free island 5 km from the mainland. To avoid bats returning to their natal area, captive-born juvenile bats were transferred. Forty-two late-stage pregnant female bats were taken into captivity. Thirty-eight pups were born in captivity. After the pups were weaned the females were released at their capture site and the twenty-three healthy remaining pups were transferred to an enclosure on Kapiti Island and held for an acclimatization period before being released. At least ten of the released bats remained free-living on the island, but occasionally feeding and roosting in the enclosure. The translocation method proved successful at overcoming the bats homing instinct, as bats remained on the island. However, the translocation failed, as eight months after release, the first cohort of bats were discovered to be suffering severe lesions to the pinnae, which were lethal without veterinary intervention. Subsequent observations showed the infection was probably a herpevirus contracted on Kapiti Island. Two and a half years after the first transfer, twelve remaining bats were transferred to Auckland Zoo.

GROUP SIZE OF BATS USING ARTIFICIAL ROOST BOXES.

Robert Bender
Friends of Organ Pipes National Park.

A bat roost box project has been undertaken at Organ Pipes NP on the NW fringe of Melbourne since late 1994. Over 14,000 bat capture records have been obtained from 168 monthly and recently bi-monthly checks of the 37 boxes. There are now over 1,500 records of bats found in individual boxes, an average overall of 9.5 bats per box. But the size of bat groups found varies from a very common solitary bat, to a maximum of 86 bats in one box. This paper explores the variation in group size by year, by season and month, by box and by box type. Experimenting with different box designs has resulted in six different types of boxes, classified by internal volume, size of entrance slit and thickness of timber used. Box design has a major influence on

the distribution of group sizes found using the box, so the pattern of group size attracted to use roost boxes can be influenced by manipulating the design.

ROOSTING AND FORAGING BEHAVIOUR OF *TAPHOZOUS AUSTRALIS* IN THE CENTRAL QUEENSLAND COAST BIOREGION.

Maree Cali, Tina Ball and Eddie Adams

We investigated the foraging behaviour of the Coastal Sheathtail Bat (*Taphozous australis*) from three locations in the Central Queensland Coast (CQC) bioregion, central eastern Queensland. A total of 15 roost sites were located and 43 bats caught. Of the *T. australis* captured a radio-transmitter was attached to a total of 1 female and 6 male bats. Roost and foraging locations were combined (795 fixes) to establish habitat mapping for the species in the CQC bioregion. *T. australis* tended to utilise airy boulder sea caves with multiple entries located on the rocky foreshore of peninsula's and were not located in caves further than 50m from Highest Astronomical Tide (HAT). Even though one bat was recorded travelling a distance of ~15km from its roost site, all foraging was within 3km of the coast, confirming previous speculations that this species is confined to the coast (Duncan et al 1999, Richards 1995). Our results reveal that *T. australis* foraged in mangroves, mangrove ecotones, forest and rainforest of the coastal lowlands and hillslopes. This information should be used to guide habitat protection for this species in the CQC bioregion, and perhaps throughout its geographic range. *T. australis* was also observed, on several occasions, taking advantage of insect aggregations attracted by artificial lights located in urban areas adjacent to remnant vegetation. As a result of this study in the CQC bioregion, ~84797 Ha of known essential habitat and ~102 287 Ha of potential essential habitat has been identified.

THE FUNCTION OF CURVATURE IN VESPERTILIONID ECHOLOCATION.

Arjan Boonman
Queen Mary University London, LIPI Indonesia, JL Bukit Permata 86, Bogor, Indonesia.

Many vespertilionid bats use an echolocation system composed of frequency modulated pulses ending in a QCF component. Generally, the FM component is believed to carry distance information whilst the QCF component is thought to be used for detection purposes. The precise curvature of the pulses has also been interpreted as optimising the acuity in receiving single echoes, even if high flight speeds are used. Here I present an alternative explanation for the curvature changes typically observed in vespertilionid bats. I hypothesise that the main task of the bat is to separate overlapping echoes. To maintain an identical echo-separation performance across frequency, cochlear filters require higher sweep rates at high-, than at low frequencies. This requirement is reflected in the pulse design used as observed in a range of vespertilionid species occurring all over the world. The pulse design is a trade off between receiving a maximum amount of acoustic energy while maintaining the highest possible performance in separating returning echoes.

THE PROBLEM WITH LINKAGE. DO BATS REALLY SAVE ENERGY BY LINKING FLIGHT WITH CALL PRODUCTION?

Stuart Parsons
School of Biological Sciences, University of Auckland, P. O. Box 92019 Auckland, New Zealand.

Most aerial hawking bats typically produce a single echolocation call per wingbeat cycle, with calls produced either late in the upstroke or early in the downstroke. The timing of call production correlates with the action of wing adductor muscles in the thorax. The contraction of adductor muscles is thought to increase abdomino-thoracic pressure, which should increase subglottal pressure for the production of high intensity echolocation calls. This is the theoretical mechanism by which the action of the wing muscles allows the bats to produce echolocation calls without any additional energetic input – bats are already compressing the thorax, so shouting at the right time costs almost nothing.

However, closer inspection of the literature highlights three major problems with the current linkage hypothesis, several of which have been evident since the earliest studies. First, bats inspire on the downstroke. Can echolocation calls be produced when bats are breathing in? Second, at least half the bat species studied to date do not produce echolocation calls at the predicted phase of the wingbeat cycle. Although these species do produce calls during expiration, production coincides with the contraction of muscles incapable of increasing subglottal pressure. Third, bats that are agile on the ground,

such as the common vampire bat and the New Zealand lesser short-tailed bat, echolocate while on the ground at rates and intensities equivalent to those produced in flight. Is the cost of terrestrial locomotion so much lower than that of flight that bats can afford both without linkage, or could some other as yet undescribed mechanism be at work?

In this talk I will review the anatomical, physiological and biomechanical evidence for linkage of echolocation call production with flight, and highlight where current theory falls short in providing an adequate explanation for observed phenomena. I will then propose new theories and new research that may help better explain the exceptions to the linkage rule. Finally, I will speculate about how terrestrially agile bats might afford biomechanically independent echolocation and locomotion.

ACOUSTIC IDENTIFICATION OF *SACCOLAIMUS*.

Chris Corben

With increased interest in surveying for the little known species *Saccolaimus saccolaimus* in northern Australia, a critical question is whether or not this species can be acoustically recognised from other species in the region. I compared the calls of *S. saccolaimus* recorded in Borneo with those of *S. flaviventris* recorded near Brisbane and found them to be surprisingly different and easily distinguished. With the caveat that things might be different in northern Australia, I suggest that observers could easily be trained to quickly scan passive bat detector recordings and identify a substantial subset of *Saccolaimus* calls for survey purposes. Results from the work of other researchers in Cape York show that *S. mixtus* calls are much closer to *S. saccolaimus* than to *S. flaviventris*, complicating the identification of *Saccolaimus* in northeastern Australia.

ECHOLOCATION CALLS AND HARMONICS IN AUSTRALIAN HORSESHOE BATS.

Roger Coles
School of Biomedical Sciences, The University of Queensland, Brisbane, Queensland, Australia, 4069.

The two forms of *Rhinolophus philippinensis* in Australia are size morphs and may represent separate species but all three versions of the genus, that includes *R. megaphyllus*, are very close genetically so the situation remains unclear (Churchill 2009 *Australian Bats* 2nd edition, Allen& Unwin). Interestingly, this group of bats is clearly separated phonically, particularly by the CF component of the echolocation call. Individuals of *R. megaphyllus* have CF ranges from 67-74 kHz forming a clinal variation with latitude along the east coast of Australia. With a much more restricted distribution in north Queensland and Cape York, variation in CF for both morphs of *R. philippinensis* is 27-35 kHz (larger) and 40-42 kHz (smaller) although observations are limited. To investigate the acoustical properties of these echolocation calls in detail, full bandwidth recordings (high speed digital sampling) have been made in the field, to study geographical variation and the harmonic structure. Typically, Horseshoe bats emit a dominant CF component and heavily suppress the other harmonics making it impossible or very difficult to unequivocally determine the harmonic series. Limitations are imposed by the choice of bat detector, signal recording (distortions) and analysis methods, that can all produce spurious harmonics. Therefore the echolocation calls of *R. megaphyllus* and both morphs of *R. philippinensis* have been recorded both in air and in a light gas mixture (heliox) under field conditions. This technique 'unmasks' the first harmonic and allows the harmonic structure of individuals calls to be determined, and then the acoustical relationship between species can be determined definitively. The results show that each version of *Rhinolophus* relies on the second harmonic for normal echolocation call emission, despite the very low CF used by the large morph of *R. philippinensis*. Furthermore the first harmonics are not related in the Australian species nor between the morphs. This finding contradicts the conclusion drawn for the echolocation calls of three size morphs of *R. philippinensis* found in Indonesia (Kingston & Rossiter 2004 *Nature* **429**:654-657). It is claimed that so called 'harmonic hopping' between morphs is based on the same fundamental frequency, and may be leading to speciation. A re-examination of these published data from the Indonesian morphs suggests that the first harmonic frequencies are not in fact related as previously assumed.

LANDSCAPE PATTERNS OF BAT ACTIVITY REVEALED BY SIMULTANEOUS ANABAT CALL DETECTION AND SPOTLIGHT OBSERVATION DURING VEHICLE TRANSECTS IN FORESTS IN THE BEGA DISTRICT, SOUTH-EAST NSW.

Dan Lunney[1], Harry Parnaby[1] and Chris Corben
[1] Department of Environment, Climate Change and Water, PO Box 1967, Hurstville, NSW 2220.

We explored patterns of bat activity by vegetation type, elevation and land tenure during vehicle transects across forests and farmland. We ranked 18 vegetation alliances into 5 categories based on broad patterns of soil fertility and moisture regimes, as a proxy for habitat productivity. Among the findings were that the proportion of bat calls recorded in each vegetation type departed significantly from time spent for most of the 21 species and phonic groups. Activity of most species was highest in the most productive vegetation types. Species with similar calls could be recognized by combining spotlight observation of flying bats with the call display of Anabat, thereby enabling a higher level of species recognition than from calls alone. Our results demonstrate that this approach has great potential to reveal differential habitat use by bats, a neglected area of research in Australia, and suggests that management prescriptions for bats need to pay greater attention to retaining the most productive vegetation.

EUCALYPT PLANTATIONS: DO THEY BENEFIT BATS?

Bradley Law, Mark Chidel and Trent Penman
Forest Science Centre, Industry and Investment NSW, PO Box 100 Beecroft, NSW 2119.

Extensive areas of eucalypts are being planted for land rehabilitation and timber on previously cleared farmland. Environmental benefits are a major selling point for this land use change, but data concerning the response of biodiversity are scarce. We compared insectivorous bat activity within 4-6 year old eucalypt plantations with paddocks and remnant woodland in a heavily cleared agricultural landscape on the Liverpool Plains of north-west NSW. The ultrasonic survey of bats found that the plantings were typically used by 7-8 species and activity averaged 87 passes per night. However, the activity within plantings was similar to tree-less paddocks and it was about six times less than in small remnants. The very high activity levels and feeding buzzes in small remnants could be related to the widespread rich, basalt soils on the Liverpool Plains. Neither planting area nor shape influenced bat activity, rather total activity and species richness was correlated positively with the number of remnant trees on the site. State Forests supported the only records of two threatened species.

Radio-tracking four different bat species supported the findings from the ultrasonic survey, in that plantings were not preferentially used by individual bats. The percentage nocturnal use of plantings was relatively small, although similar to the extent of plantation in the landscape immediately surrounding our tracking area. In contrast to providing foraging habitat, plantings did not provide roosting habitat. Most bat roosts were in tree hollows, which were absent in the plantings. Although decorticating bark was abundant in eucalypt plantings, only *Nyctophilus geoffroyi* was observed beneath bark and only in remnant trees. Overall, our results emphasise the importance of retaining remnant trees in the landscape and within plantings.

THE IMPLICATIONS OF THE BLACK SATURDAY BUSHFIRES ON *MINIOPTERUS SCHREIBERSII OCEANENSIS* AND *MYOTIS MACROPUS* AT KINGLAKE NATIONAL PARK.

Rob Gration
SMEC Aust.

On February 7th 2009, Victoria experienced its worst ever bushfires. The bushfires claimed 173 lives, 414 people were injured and 2029 homes were destroyed and displaced an estimated 7500 people. One of the most severely impacted regions was Kinglake. Kinglake is located approximately 35km north of Melbourne. The nearby Kinglake National Park, encompassing the Wallaby Creek Catchment area, covers an area of 22,340 Ha, approximately 98% of which was burnt during the bushfires. The resulting impact on flora and fauna is currently being assessed. I was commissioned by Parks Victoria to undertake post fire surveys for *Miniopterus schreibersii oceanensis* and *Myotis macropus*. Both species have been previously recorded at the base of the Wallaby Creek Catchment Area in the Toorourrong Reservoir. The objectives of the study were to compare the current survey results with historical data; assess the impacts of the bushfires on *Miniopterus schreibersii oceanensis* and *Myotis macropus* and to provide recommendations for their management. Two stationary Anabat® detectors were operated across 7 sites for between 1 and 7 nights at each site. The detectors were strategically placed to record bat activity levels, habitat utilisation of bats in general but with an emphasis on *Miniopterus schreibersii oceanensis* and *Myotis macropus* and, to record bat calls that could be potentially

attributed to the targeted species. The subsequent trapping program concentrated on areas where the calls of the targeted species were potentially recorded and historical records. The survey results indicated a marked decrease in capture rates and roosting and foraging activity compared to the historical records. It is therefore implied that the 'Black Saturday Bushfires' had a significant impact on both *Miniopterus schreibersii oceanensis* and *Myotis macropus*.

CONSERVING FLYING-FOXES IN IPSWICH, QUEENSLAND, AUSTRALIA.

Debbie Melville
Noah's Ark Wildlife Coalition, Ipswich Qld.

The Woodend Flying-fox Colony in Ipswich is an important and permanent roost site for Black (*Pteropus alecto*), Grey-headed (*P. poliocephalus*) and Little Red Flying-foxes (*P. scapulatus*). Camp numbers fluctuate greatly but typically swell around September in time for the *P. alecto* and *P. poliocephalus* birthing season and again during summer when *P. scapulatus* arrive in large numbers. It is believed that the first flying-foxes began using the site during the mid 1980's following the clearing of a nearby roost site. The last 3 decades have heavily involved a lot of human-flying-fox conflict typical of roost sites around the country. To ensure flying-foxes always have a roost in Ipswich, Noah's Ark Wildlife Coalition purchased a 7.5 h property in 2004 (about 40% of the current roost site) and established the Noah's Ark Ipswich Bat Sanctuary. The main aim of this not-for-profit organisation is to revegetate the heavily weed-infested property in order to save existing roost trees and plant native trees for the future and thereby encourage the flying-foxes to move away from neighbouring houses and utilise Sanctuary trees. While the main aim is focused on providing suitable roost habitat, the group is also in the process of transforming the Sanctuary house into an Education, Rehabilitation and Research Centre. The Centre has held rehabilitation workshops for local wildlife care groups, conducted community talks and had local school students participate in education days where they were able to 'get up-close and personal' with some education flying-foxes. The next goal is to complete an on-site release cage for orphaned and rehabilitated flying-foxes.

TORPOR IN AUSTRALIAN BATS: IMPLICATIONS FOR ENERGY CONSERVATION, PREDATOR AVOIDANCE, AND MINIMIZING EXTINCTIONS.

Fritz Geiser and Clare Stawski
Centre for Behavioural and Physiological Ecology, Zoology, University of New England, Armidale NSW 2351, Australia.

Torpor, which is characterized by substantial reductions in body temperature (T_b) and metabolic rate (MR), is the most effective means for energy conservation available to mammals and is widely employed by bats. Six of the seven Australian bat families from all climate zones, including the tropics, contain heterothermic species that are capable of using torpor. These are the Pteropodidae (blossom-bats), Emballonuridae (sheathtail bats), Rhinolophidae (horseshoe bats), Hipposideridae (leaf-nosed bats), Vespertilionidae (e.g. long-eared bats), and Molossidae (freetail bats). The T_b in some hibernating Australian vespertilionids can fall to minima of 2 to 5 ºC, and the MR during torpor can be as low as 0.5% of that of active individuals. Further, recent evidence suggests that torpor may not only be important for energy conservation, but also for predator avoidance, because it is frequently employed by subtropical bats in summer when food is abundant, and especially when they are fat. The ability to reduce energy and thus foraging requirements in heterothermic mammals in general appears to be the main reason why only 6% of the confirmed extinct mammals over the last 500 years likely were heterothermic, whereas the vast majority of extinct mammals were homeothermic and unable to employ torpor. In mainland Australia, despite some range reductions, not a single bat species has become extinct, whereas many homeothermic rodents and marsupials have. This suggests that torpor use permits mammals not only to survive adverse conditions, but also helps them in dealing with habitat degradation and introduced competitors/predators.

THE USE OF BATS FOR ENVIRONMENTAL EDUCATION.

Chris Grant
Department of Environment and Heritage, PO Box 231, Berri, SA, 5343.

The communication of environmental messages forms a significant component of the work of many bat workers. The authors are no exception, and have spent considerable time and energy developing ways to engage with people of all age groups. This presentation explores some of the ways to make environmental education effective using bats and bat themes. Harnessing the fun elements that can be associated with bats

appears to be a powerful tool for dispelling other contrary and negative perceptions. This talk discusses some of the techniques we have found effective, including the secrets to the amazing Bat Cave©

THE PROBABLE EXTINCTION OF THE CHRISTMAS ISLAND PIPISTRELLE: CAUSAL FACTORS AND RESCUE ATTEMPTS.

Lindy Lumsden
Arthur Rylah Institute, Department of Sustainability and Environment, 123 Brown St. Heidelberg, Victoria 3084.

The Christmas Island Pipistrelle *Pipistrellus murrayi* was endemic to Christmas Island and was the only species of microbat on the island. The species was common and widespread in the 1980s. The first evidence of decline was in 1994. This decline continued rapidly, with the species progressively contracting westwards until by the mid 2000s it occurred only in the far west of the island. Decline trajectories suggested there was a high risk that that the species would go extinct by 2008/09. As the cause of the decline was unknown, it was considered that the best chance of saving the species from extinction was to establish a captive breeding colony. Despite advocating for several years, stressing the urgent need to commence this program, the decision was delayed. By the time the ABS was given permission to undertake a rescue mission to capture the remaining few individuals in August 2009, it was too late. Only one individual could be located and despite innovative techniques being developed, it evaded capture and then also disappeared. It was last heard on 26 August 2009 and no further calls have been recorded. Reluctantly it was assumed that the species went extinct on that date. This presentation will discuss what went wrong and what lessons have been learnt that we can use to try and ensure other species do not suffer the same fate.

POSTERS

BAT HOME RANGES IN PLANTATION FOREST CHANGE POST-CLEARFELL HARVEST OPERATIONS.

Kerry Borkin and Stuart Parsons
School of Biological Sciences, University of Auckland, P. O. Box 92019 Auckland, New Zealand.

The impact of clearfell harvest on home ranges of bats is poorly understood, but home ranges may alter as both roosting and foraging opportunities change. New Zealand's long-tailed bat (*Chalinolobus tuberculatus*) is resident in exotic plantation forest, but no investigation of their home range has taken place there. To test our hypothesis that home ranges would be smaller post-harvest due to reductions in older stands, bats were captured and radio-tracked over three summers in an intensively managed plantation forest, and their home ranges determined. Home ranges were traditional, overlapping between years, and when bats were in different reproductive conditions. Home range sizes and range spans of bats were smaller post-harvest than pre-harvest. Post-harvest home ranges of repeatedly radiotracked female bats overlapped with their pre-harvest home ranges but changed slightly; suggesting that clearfell harvest operations result in bats either moving slowly into less familiar areas or contracting their home ranges. A mosaic approach to clearfell harvest will be most sympathetic to bats' needs to balance roosting and foraging opportunities.

URBANISATION AND ITS EFFECTS ON THE DISTRIBUTION AND ACTIVITY OF INSECTIVOROUS BATS IN SYDNEY, AUSTRALIA.

Caragh Threlfall[1], Peter Banks[1], Bradley Law[2] and Trent Penman [2]
[1] Evolution and Ecology Research Centre, University of New South Wales, Sydney, NSW, Australia;
[2] Forest Science Centre, Industries and Investment NSW, Beecroft, NSW, Australia.

Urbanisation affects indigenous fauna in many ways; some species persist and even increase in urban areas, whereas others are lost. This study examines the impacts of urbanisation and habitat loss on insectivorous bats across the urban landscape of Sydney, New South Wales, Australia. We present data on species richness and activity (bat passes per night) collected systematically using ultrasonic bat detectors from 30 randomly selected landscapes (each 25 km^2). To compare the relative effects of habitat cover and level of urbanisation, landscapes were categorised using a Geographical Information System (GIS) into classes including: urban (>5 dwellings/ha and <10% vegetation cover); suburban (10-40% vegetation cover); and vegetated (<5 dwelling/ha and >40% vegetation cover). Within the 'suburban' landscape category, we also investigated a landscape productivity

hypothesis and compared the relative effects of contrasting geology (shale, sandstone, and shale/sandstone transition) on species richness and activity. Four landscape elements were sampled within each landscape, including remnant bushland (>2 ha), riparian areas, open space/parkland and residential/built space (n=6 replicates of each landscape, 120 survey sites total). Nightly activity and species richness were compared across all landscape categories and elements. Both nightly activity and species richness were significantly higher in intermediate areas along the urban gradient, in suburban landscapes. Average nightly activity was significantly higher in bushland sites compared to open space sites, across all landscape categories. There was no clear effect of habitat element sampled on species richness, and there was no landscape by element interaction. Variation in underlying geology underpinned variation in activity and richness between landscapes. We suggest that productivity in shale areas is higher thus affecting insect density and bat response.

WHAT FACTORS INFLUENCE THE USE OF ROOST BOXES FOR INSECTIVOROUS BATS UNDER BRIDGES - A CASE STUDY FROM NORTHERN NSW.

David Hannah[1], Ross Goldingay[2] and Mitchell Cambridge[1]
[1] Tweed Shire Council, [2] Southern Cross Uni.

The Tweed Shire local government area is situated on the far north coast of NSW, Australia. Within the Tweed, some timber bridges are known to provide roosting habitat for insectivorous bat species including one threatened species, *Myotis macropus*. Many of these timber bridges, however, are being replaced with concrete bridges due to reaching their structural design life. To help mitigate the loss of roosting habitats, artificial roost structures in the form of timber boxes are being deployed under the new concrete bridges where bats have been known to roost. A number of box designs have been employed to date with variable success. Consequently, a program of monitoring a range of roost types for *M. macropus* in the shire has been initiated through a joint partnership with Tweed Shire Council and Southern Cross University. Ultimately, research aims to better understand the roosting requirements of insectivorous bats utilising bridge structures with a view to optimising the design of artificial roost habitat and minimising long term impacts to threatened insectivorous bats as a result of bridge upgrades in the shire.

BAT OCCURRENCES WITHIN CAPE RANGE PENINSULA, WESTERN AUSTRALIA.

Mike Sarell and **Joanna Burgar**

To date there are records from 14 species of bat within Cape Range Peninsula, derived from a variety of detection methods with varying levels of certainty. Included in the occurrences is one species of fruit bat while all other species are Microchiroptera. Since 2005, there have been three studies, primarily focusing on cave dwelling bats, aimed at elucidating which bat species occur within Cape Range. Detection methods included echolocation call analysis for all three studies while two studies also trapped individuals for identification purposes. Previous records are derived from anecdotal observations from Cape Range National Park staff or from specimens from either the Western Australian Museum or from the personal collection held by Norm McKenzie. Nine species are recorded from either specimens or capture detection: *Pteropus alecto*, *Taphozous georgianus*, *Chalinolobus gouldii*, *Nyctophilus arnhemensis*, *Nyctophilus geoffroyi*, *Vespadelus finlaysoni*, *Chaerephon jobensis*, *Mormopterus loriae* and *Austronomus australis*. *Mormopterus beccarii* was detected with high certainty using ultrasound (bat) detectors while *Saccolaimus flaviventris* and *Scotorepens greyii* were detected with only moderate certainty. Two species ranked as vulnerable, from a conservation perspective, also potentially occur within Cape Range: *Rhinonicteris aurantia* and *Macroderma gigas*. The Western Australia Museum has a record of a preserved specimen of *R. aurantia* from the Cape Range Peninsula and there have been unconfirmed sighting of *M. gigas* within the region. Because of the at risk nature of these species, range expansions would have conservation implications. Further studies within the Cape Range Peninsula are necessary to conclusively determine if *M. gigas* and *R. aurantia* inhabit the peninsula.

THE EFFECTS OF URBANISATION ON THE DIVERSITY AND ABUNDANCE OF NOCTURNAL INSECTS: IMPLICATIONS FOR MICROBAT CONSERVATION.

Caroline Wilson[1], Rodney van der Ree[1], Lindy Lumsden[2], Fiona Caryl[1], and Brendan Wintle[3]
[1] Australian Research Centre for Urban Ecology (ARCUE), Royal Botanic Gardens Melbourne, Melbourne, VIC, Australia; [2] Arthur Rylah Institute

of Environmental Research (ARI), Department of Sustainability and Environment, Heidelberg, VIC, Australia; [3] Applied Environmental Decision Analysis Research Facility (AEDA), School of Botany, University of Melbourne, Melbourne, VIC, Australia.

The few studies focusing on microbats in cities indicate that urbanisation has a negative effect on species richness and diversity, probably due to a reduction in the availability of prey and roost sites. However, quantitative data on the effect of urbanisation on resource availability and how this influences microbat populations is currently lacking. Therefore we aim to quantify the relationship between the diversity and foraging activity of microbats in urban areas and the diversity and abundance of their invertebrate prey. We also aim to investigate the habitat and landscape variables which influence insect distribution. This study was carried out between January and March 2010 in the city of Melbourne, south-east Australia. Nocturnal aerial insects and microbats were sampled at 60 study sites distributed along an urban-rural gradient. Ten sites each were located within six land-use categories (industrial areas, residential areas, golf courses, recreational parks, remnant bush reserves and riparian vegetation), representing varying levels of human modification. Light traps were used to survey insects at each of the study sites, and Anabat detectors were set up simultaneously to record microbat activity. Results will be presented on the effects of urbanisation on microbat prey availability. This study will help us manage urban areas more effectively to conserve both microbats and their prey; and help determine why microbats respond negatively to urbanisation. Practical implications for management will be discussed. As part of this research project, we will also examine microbat roosting behaviour and seasonal roost tree characteristics in an urban environment over the next few years.

MORPHOMETRIC VARIATION THROUGH TIME IN THE AUSTRALIAN GHOST BAT (*MACRODERMA GIGAS*) AT MOUNT ETNA, EASTERN QUEENSLAND.

Sandrine Martinez
Unidel Group Pty Ltd, GPO Box 1957, Brisbane, Qld, 4001.

Middle and late Pleistocene faunal assemblages located at Mount Etna, central eastern Queensland, document morphological change over the last 500 000 years in the carnivorous Australian Ghost Bat *Macroderma gigas*. Fossil *M. gigas* specimens from Mount Etna differ from Holocene Ghost Bats from the same locality in being significantly smaller in craniodental features. The Pleistocene Ghost Bat populations from Mount Etna are more similar to modern populations from the Kimberley region, north-western Western Australia, than colonies from elsewhere in Australia including Mount Etna. Whether Mount Etna's Holocene Ghost Bat population is part of a continuous lineage evolving in situ since the late Pleistocene or represents recolonization by more northern populations of Ghost Bats remains unclear. Regardless, the morphological changes are likely to be an adaptive response to changes in prey availability as a result of increased aridity in central eastern Queensland since the late Pleistocene.

WHOSE CALLING? DEVELOPING A TASMANIAN STATE-WIDE BAT CALL IDENTIFICATION KEY.

Lisa Cawthen, Sarah Munks and Bradley Law

The incorporation of acoustical surveys into monitoring and research of Tasmanian bats has been largely hampered by the absence of a published state-wide bat call identification key. Bat calls were recorded from hand-released and free-flying bats using Anabat bat detectors. This poster presents my preliminary results into the inter- and intra-specific differences in the characteristics of the calls of Tasmania's eight species of bat - Gould's wattled bat (*Chalinolobus gouldii*), Chocolate wattled bat (*Chalinolobus morio*), Eastern falsistrelle (*Falsistrellus tasmaniensis*), Large forest bat (*Vespadelus darlingtoni*), Southern forest bat (*Vespadelus regulus*), Little forest bat (*Vespadelus vulturnus*), Lesser long-eared bat (*Nyctophilus geoffroyi*) and the endemic Tasmanian long-eared bat (*Nyctophilus sherrini*). This key will be used in Anascheme to identify the calls collected as part of a larger study investigating how forest availability affects insectivorous bat habitat use, species composition and demographics.

RADIOTRACKING STUDY OF *TADARIDA AUSTRALIS*.

Margaret Turton

The White-striped Free-tail Bat (*Tadarida australis*) is a large insectivorous molossid that occurs across southern Australia. Monitoring of a maternity colony of this species has been carried

out over a period of several years. In April, the population of the maternity colony decreases as the juveniles become independent, and adults also leave for other areas. At present there is no information as to where the juveniles or adult bats disperse to when they leave the roost at the end of the maternity season. This current study was aimed at gaining a better understanding of the movements of adult and juvenile *T. australis* when they leave the main maternity roost at the end of the breeding season. Five *T. australis* were radio-collared and both day roosts and foraging areas were radiotracked. Extensive movement between roosts by the bats was noted, with bats moving between the main roost (in a building) and tree spout roosts in Scribbly Gums (*E. haemastoma*) located in adjoining woodland. Results from this study will be presented and findings discussed.

MICROCHIROPTERAN BAT ACTIVITY IN COASTAL SALTMARSH ON THE NEW SOUTH WALES CENTRAL COAST, AN ENDANGERED ECOLOGICAL COMMUNITY.

Leroy Gonsalves [1], Bradley Law [2] and Vaughan Monamy[1]
[1] School of Arts and Sciences, Australian Catholic University, North Sydney, NSW, Australia
[2] Industry and Investment NSW, West Pennant Hills, NSW, Australia.

Coastal saltmarsh is an endangered ecological community in NSW as a result of widespread mangrove transgression and urban encroachment. It provides suitable habitat for a large suite of arthropods, marine life and migratory shorebirds. Recent surveys have revealed coastal saltmarsh also to be an important secondary habitat for microchiropteran bats. We report the results of a detailed investigation of microchiropteran bat activity in three spatial zones within coastal saltmarsh undertaken on the New South Wales Central Coast using ultrasonic bat detectors. Echolocation calls were collected concurrently along two saltmarsh edges: landward (a saltmarsh-casuarina ecotone) and seaward (a saltmarsh-mangrove ecotone), and within the interior. Anabat SD1 detectors recorded echolocation calls in each zone for four consecutive nights in March 2010. Calls were identified using automated call identification software in association with a suitable species key for the study area. A total of 1,232 bat calls were recorded. In all, 12 species and 1 species group were detected flying in saltmarsh. Within each zone, 8 species and 1 species group were detected. Additionally, feeding activity was determined by identifying feeding buzzes. Feeding buzzes were recorded from 2 species (*Chalinolobus gouldii*, *Mormopterus ridei*) and 1 species group (*Vespadelus spp*). A comparison of both total bat activity and feeding activity within each zone was made. The findings of this study will be of importance to land managers and wildlife biologists as both landward edges and saltmarsh interior continue to decline as a result of the urbanisation of fringing landward habitats and on-going mangrove transgression.

EFFECT OF THE LUNAR CYCLE ON BODY TEMPERATURE AND ACTIVITY PATTERNS OF THE EASTERN TUBE-NOSED BAT (*NYCTIMENE ROBINSONI*) IN THE AUSTRALIAN TROPICS.

Alexander Riek[1,2], Gerhard Körtner[1] and **Fritz Geiser**[1]
[1] Centre for Behavioural and Physiological Ecology, Zoology, University of New England, Armidale NSW 2351, Australia. [2] Department of Animal Sciences, University of Göttingen, Albrecht-Thaer-Weg 3, 37075 Göttingen, Germany.

Pteropodid bats, such as *Nyctimene robinsoni* (body mass ~ 50 g) forage at night and rely on vision to find their food sources and thus are likely affected by changing predation pressure during nocturnal illumination, such as during different phases of the moon cycle. Therefore the aim of our study was to investigate how the lunar cycle influences T_b and hence the energy balance in a small free-ranging bat in a tropical environment. Daily body temperature (T_b) fluctuations in five free-ranging bats were measured via radio-telemetry using implanted temperature-sensitive radio transmitters. Average daily core T_b ranged from 34.7 ± 0.6 to 37.3 ± 0.8 °C (mean ± SD) over an average daily T_a range of 17.1 ± 1.1 to 23.5 ± 1.8 °C. On days at moon illumination of 51 to 100 % ("Full moon period") T_b on night hours of 22:30 – 04:30, was significantly lower ($P < 0.001$) than during the "New moon period" (illumination of 0 – 50%) with no differences among individuals ($F_{1, 523} = 0.76$, $P = 0.385$). These T_b differences during the lunar cycle reflect changes in intensity of activity, which are likely due to increased predation pressure during moon-lit nights. Our study provides the first evidence in a mammal that moon illumination results in a substantial reduction in T_b which has implications on foraging and energy expenditure.

A SUCCESSFUL BLEEDING TECHNIQUE USED ON AUSTRALIAN MICROCHIROPTERA.

Carol de Jong and Craig Smith
Biosecurity Queensland, DEEDI, 39 Kessels Rd. Coopers Plains, QLD, 4108.

Sampling blood from bats (Chiroptera) can be valuable for a range of studies including antibody detection for disease surveillance, analysis of blood biochemistry and populations genetics. However, collecting sufficient volumes of blood, plasma or serum from smaller microbats can be challenging. We describe a technique for sampling small quantities of blood from microbats and report the volumes taken from 1129 bats. A sterile needle was used to puncture either the brachial or the propatagial vein. Blood was collected using a micropipette and sterile tip and immediately diluted 1:10 in phosphate buffered saline, eliminating the need for anti-coagulants. On average we collected 4 µl of blood/g of the bats' mass (SD=1.6; Min=0.1; Max=12.0) and partial clotting was observed in approximately 2% of samples. Extraneous bleeding was also observed so we recommend collecting less than 6 µl of blood/g of the bats' mass. No deaths were recorded whilst bats were in our care and we observed the short-term (3 months) survival of bats which we had sampled.

A SIMPLE TECHNIQUE USING GEOGRAPHIC INFORMATION SYSTEMS (GIS) TO MEASURE BAT AIRFRAME MORPHOLOGY.

Michael Pennay
NSW Department of Environment, Climate Change and Water, PO Box 733, Queanbeyan, NSW, 2620.

Traditionally measurements of bat morphology for the study of flight mechanics or airframe design has involved tracing the outline of bats, or complex calculations of surface area based on a series of linear measurements of body parts. This poster describes a simple and accurate technique to measure bat wings and flight membranes (or any other object) for morphological studies using a Geographical Information System (GIS) package (ArcGIS). As the name suggests, GIS programs are traditionally used for mapping and measuring geography and land systems at large scales, however using standard tools and techniques GIS can be a powerful tool for measuring objects in the macroscopic (or even microscopic) scale.

THE BAT FAUNA OF YANGA NATIONAL PARK AND THE LOWBIDGEE REGION OF NSW.

Michael Pennay
NSW Department of Environment, Climate Change and Water, PO Box 733, Queanbeyan, NSW, 2620.

Yanga National Park is a large floodplain conservation reserve on the Murrumbidgee River downstream of the Lachlan junction. Due to drought, and over extraction of water for irrigation large parts of the floodplain are highly stressed. Some parts of the reserve have received environmental water allocations to support ecological assets. A bat survey of Yanga by the Australasian Bat Society in March 2009 found 12 microbat species occur within the reserve. The survey revealed extensions in the known range of 3 species, including the first records of *Myotis macropus*, *Vespadelus darlingtoni* and *Nyctophilus gouldi* on the lower Murrumbidgee river. Prior to the surveys the bat fauna of the reserve was unknown. Some bat species captured were exceptionally small, the mean weight for individuals from 3 species were > 30% less than the average weight in for the species in NSW. The bats with the greatest deviation in body mass were generally those at the edge of their range. The observations generally supported Bergmann's rule which states that body mass decreases with increased aridity. The environmental watering appeared to have a positive affect on bat activity with high capture rates in these areas. Greater levels of activity were recorded on bat detectors in watered areas than those in unwatered areas. A small number of white-striped mastiff bats were also radio tracked to roosts all of which were very large river red gums fringing Mercedes Swamp, an irrigated wetland. Suggesting that microchiropteran bats are also beneficiaries of the environmental water allocations.

Caught in the spot light, Luke Hogan enjoying the post-conference trip to Pine Creek, July 2010.

Photo thanks to Chris Grant.

Congratulations

The judging committee for the 14th ABS conference consisted of Stuart Parsons, Greg Richards, Arjan Boonman, Nancy Pallin, Maree Kerr, Bruce Thomson, Susan Campbell, Chris Pavey and Michael Pennay. Our job was certainly a tough one and I'm very pleased to announce the following winners.

Best poster

- Caroline Wilson (ARCUE): *Effects of urbanisation on the insect abundance and diversity.*
- Honourable mention to Carol de Jong.

Prize: Kunz & Parson's bat book made available to the ABS by Foot Print Books.

Best conservation paper

- Maree Cali: *Roosting and foraging behaviour of* Taphozous australis *in Queensland.*

Prize: $US 500 from BCI

Best student paper

- Rebecca Wood (Uni. of Melb.): *Taxonomy, population genetics and conservation of* Miniopterus schreibersii bassanii.
- Runner-up Darren le Roux
- Honourable mention to Nick Fuller

Prize: Kunz & Parson's bat book donated by Rob Gration. Runner-up received a bat chirper also from Rob and Nick received a unique batty gift kindly donated by Robert Bender.

Best overall paper

- Fritz Geiser (UNE): *Implications of torpor use for Australian bats.*
- Runner-up Bradley Law
- Honourable mention to Chris Grant

Prize: $AUD 500 from Greg Richards and Assoc. Runner-up received a Kunz & Parson's book donated by Stuart himself. Chris received a round of applause. ☺

Strategy from Christmas Island Pipistrelle workshop: Lessons learned – how to avoid future extinctions

Objective: To identify which bats are a conservation priority and to prepare and implement Recovery Plans

Notes transcribed by Maree Kerr from discussions at the 14th ABS Conference, Darwin, July 2010.

Requirements

1) Need evidence for decline
2) Need to reduce bureaucratic delays

Strategies

1) Identify our priorities
2) Prepare chronology of events
3) Prepare timeframe of what we need to do
4) Estimate costs
5) Understand government processes and identify where delays occur
6) Drive the agenda forward
7) Apply findings
8) Prepare recovery plans
9) Implement recovery plans
10) Develop and improve techniques in translocation and / or captive breeding of endangered species.

Actions

1) Form a subcommittee to conduct an independent review of the conservation status of all bat species in Australia.
   a. Set up criteria to determine priorities
   b. Get input from ABS members
   c. Identify species of concern
   d. What are the characteristics of these species and habitats that put them at risk?
2) Supply evidence to Government for review of the Bat Action Plan.

Things to take note of

1) Government responsibilities and level of expertise
   a. The major problem with Commonwealth being in charge of threatened species' management is that they don't have the resources or on-ground responsibility (except on Commonwealth land and off-shore islands)
   b. State governments have more on-ground expertise and people

   c. Need for a major revision of relationships between governments – federal and state – on working protocols for threatened species' management.
2) Documentation is a powerful tool
   a. Provides information to develop and inform
   b. Provides prescriptive actions for management (e.g., mining industry)
   c. Informs State/ Commonwealth governments
3) ABS is in a position to lobby using such documentation (gained through the work with Christmas Island Pipistrelle)
4) ABS has a stronger relationship with Government (through the Christmas Island Pipistrelle campaign).

Christmas Island Pipistrelle experience

1) ABS worked with the Government. When nothing came from repeated advice and recommendations given to Government, ABS began lobbying.
2) Captive breeding was suggested.
3) Modelled decline/ extinction curves and analysed data to look for causal evidence of decline (e.g., disease, predation etc.)
4) Cause of decline is still unknown.

Southern Bent-wing Bat

1) We know some causes contributing to decline
2) We have greater information on this species
3) A recovery plan is being written.

A new take on the bat dance? Maree Cali's interpretative batting, Pine Creek, July 2010.

Photo thanks to Chris Grant.

Flying-foxes far from home

Katie Whiting

Senior Ecologist
School of Arts & Sciences
SMEC Australia Pty Ltd

katie.whiting@smec.com

Grey-headed Flying-foxes have been making some very strange movements this year, with many new satellite camps being discovered within their normal range, and some satellite camps and individuals being observed far west of their normal range, even as far as Adelaide.

For me, these strange observations all started whilst working as the Project Ecologist on the Tarcutta Bypass in early May this year. As I was driving down the Hume Highway, that familiar musty odour assaulted my nose, but initially I ignored it as Grey-headed Flying-foxes had never been recorded this far west. However, on my way back north I saw something that I couldn't quite ignore - Grey-headed Flying-foxes circling the highway.

I had stumbled upon a camp of about 500 bats roosting in very tall River Red Gums, on either side of the Hume Highway bridge over Tarcutta Creek. The camp was within 250 m of the construction area of the Tarcutta Bypass, near the location for the new bridge over Tarcutta Creek where pile driving was to occur. The Tarcutta Hume Alliance alerted the relevant government agencies and we developed a management action plan in the event that they moved into the tree clearing and construction area.

The question that was plaguing me was: If these bats occupied the camp up to or during the birthing season, would sudden construction noises (such as driven piles occurring 250 m away) cause pregnant mothers to lose their young?

For their short period of occupation (May to July), the numbers of the flying-fox camp, their proximity to the construction area and their behaviour was monitored twice weekly. During each monitoring session, we selected three bats and monitored each of their behaviours for 10 minutes. During the this time, we also counted the number of bats flying out, which we assumed was akin to the individual feeling stressed or disturbed. Monitoring began prior to construction

activities being undertaken to gather baseline data about normal behaviour. This was continued during pile driving activities into June as numbers steadily rose to 2300 individuals, to see if there was any response.

Top – Bottom (photos by Katie Whiting):
The Grey-headed flying fox camp at Tarcutta Creek.
Sleeping flying-foxes during afternoon monitoring.
Flying-foxes roosting in both native and exotic trees.

Bats appeared to fly out in response to several disturbance factors which included no obvious source of disturbance, the presence of the observer, pile driving, birds of prey, passing cows and even the adjoining landowner's little yappy dogs. Bats seemed to be equally disturbed (i.e. similar numbers of bats flying out soon after disturbance) by all of these factors, however were apparently undisturbed by ambient traffic noises such as the frequent semi-trailers that pass through the famed "Halfway point on the Hume".

Late July came and the bats vanished as quickly as they had appeared from Tarcutta Creek. This generally coincides with the time that flying-foxes leave ephemerally occupied camps and fly back to maternity sites to commence the birthing season in mid-August. Although, it could also be an indication that this was an unsuitable breeding area due to the disturbances from construction noise.

And so my question remained unanswered (but thankfully so) regarding the impacts to pregnant bats from pile driving in close proximity to their camp. I did, however, gain some useful insight into their behaviour, making the ever hopeful inference that if construction noises in close vicinity didn't bother the bats more than other disturbances such as people, raptors, cows and little yappy dogs prior to the birthing season, that they might not be bothered at this distance by pile driving during the birthing season.

Ghost Bat *Macroderma gigas* count at Kohinoor Adit, Pine Creek, 15th and 16th July, 2010

Chris Grant[1], Terry Reardon[2], Damian Milne[3]

[1] *Bush Management Advisor, Dept. of Env. & Natural Res., Murraylands, SA*
[2] *Research Scientist, South Australian Museum*
[2] *Scientific Officer, NRETA, Northern Territory*

Chris.Grant@sa.gov.au

Introduction

The extremely worthwhile and enjoyable post-ABS conference field trip was to Pine Creek.

While there we visited Kohinoor Adit, very close to Pine Creek itself. Kohinoor Adit is home to the largest recorded colony of the Ghost Bat, *Macroderma gigas* which is IUCN Red Listed as "Vulnerable". As part of the ABS post-conference tour and in line with a general desire to perform field work and share practical field skills in association with our conferences, we endeavoured to assess the current population size of Ghost Bats in Kohinoor Adit using visual counts and thermal imaging with video-playback and software counts.

Main exit of Kohinoor Adit, Pine Creek. (Photo thanks to Ian Kitchen).

Background

Between 1981 and 1990, a number of exit counts were conducted at Kohinoor. The number of bats counted ranged between 300 and 1500* bats (Table 1). Since 1990, however, the colony has not been formally counted. In light of the status of the Ghost Bat, it seems to be a priority to regularly monitor the population at this and other important Ghost Bat colonies.

Within the immediate vicinity of Kohinoor Adit there are a number of other mine shafts. At least six bat species have been recorded from these shafts in the past including Ghost Bats, Dusky Leaf-nosed bats (*Hipposideros ater*), Northern Leaf-nosed Bats (*H. stenotis*), Orange Leaf-nosed Bats (*Rhinonicteris aurantia*), Common Sheath-tailed Bat (*Taphozous georgianus*) and Northern Cave Bats (*Vespadelus caurinus*) (Schulz et al 1986).

*It is important to note that the counts were not undertaken in a consistent manner. The number of observers and the number of alternative exits that were observed differed between counts.

Table 1: Ghost Bat exit counts at Kohinoor Adit, Pine Creek, Northern Territory.

Date	Count	Source
24 Jul 1981	300	Churchill pers. comm.
19 May 1983	445	Pettigrew et al. (1986)
Oct 1983	300	Pettigrew et al. (1986)
Jun 1984	780	Pettigrew et al. (1986)
Jun 1984	778	Pettigrew et al. (1986)
14 May 1985	1100	Pettigrew et al. (1986)
15 May 1985	1100	Pettigrew et al. (1986)
24 Apr 1987	1300	Churchill pers. comm.
11 Feb 1988	1400	Churchill pers. comm.
17 Aug 1988	1300	Churchill pers. comm.
9 Jan 1990	1500	Churchill pers. comm.

The count

On the 15th of July 2010 a group of us set up around the adit with Anabats, video recorders and eyes and ears. Sitting absolutely still on dusk proved to be a harder task than expected due to the diabolical onslaught of mosquitoes, but we soldiered on and fed them without complaint. The first bat exited around 7:00 pm, with the flyout proper starting around 7:15 pm as dark fell and continuing for another 45 minutes. Visual counting of bats without illumination proved almost impossible once dark fell. None-the-less it was an amazing experience to sit so close to where these magnificent bats were flying out and hear their wing beats, and a couple of us got even more intimate with bats colliding into us. I suspect our activity around the adit entrance delayed the commencement of exit by the bats. It is easy to forget that bats within the cave are far from oblivious to what is going on outside and in my own experience it is common for cave-dwelling bats to delay their exit in such circumstances.

The best viewing positions for the flyout on the first night proved to be from above the mine. We found the bats tended to fly out away from the adit rather than directly down the cutting. This was probably not representative of their normal behaviour as it seemed they were put off by the positioning of video cameras and Anabat bat detectors (with LED's glowing – doh!!) in the cutting, in conjunction with the pre-flyout disturbance. Confirmation came on the second night when the bats exited by flying directly down the cutting.

People positioned above the adit entrance counted an average of 292 bats (sd 57) on the first night. Below the cutting observers counted an average of 60 bats (sd 40). It appeared that

the number of people around the entrance caused a certain level of disturbance, and so greater care was taken on the second night to avoid noise before the count and by assembling well away from the adit and approaching quietly. Anabats near the entrance this time had LEDs switched off and the volumes were turned down low, and no video cameras were placed directly in the flight path. Despite this, the count on the second night was slightly lower (264 bats, sd = 30). Bruce Thomson's lonely vigil a the top adit (which is an alternative entrance to Kohinoor) revealed 76 bats leaving via this exit, so it is possible that some individuals used this exit as an alternative due to the disturbance the night before.

Terry Reardon's thermal imaging camera was placed near the end of the cutting pointing directly into the adit entrance and was the other method used to assess the population on the night of the 15th of July 2010 (refer Mills et al "Monitoring cave bats using thermal imaging and 'poor Mans' missile tracking software" abstract in this *Newsletter* edition for methodology). The image was recorded digitally and replayed on a large TV screen the next day to five observers. Images were clear and mostly individual bats could be easily seen and counted. The only opportunity for error was due to fatigued observers being confused by several bats exiting at once. The count of one observer was disregarded due to his unreliability and inability to sit still and concentrate for the duration of the count. The counts of the remaining four reliable observers were combined and averaged, giving an estimate of 545 bats (sd 8). The unreliable ~~President~~ observer was adeptly castigated (have to be careful typing that word) by his peers. It needs to be noted that the thermal camera images showed that a number of bats did not exit the cave, so these counts constitute minimum numbers. Again, based on previous experience I suspect that with less activity around the adit the bats would have been less reluctant to exit and we would have achieved a more complete count.

The estimate from the T3 thermal tracking software was 564 (sd 25) and it proved to be highly consistent and more reliable than counts performed by human observers.

Discussion

The results clearly show that use of the thermal imaging camera with playback count is the superior method in terms both of obtaining a worthwhile count and reducing impact on the bats.

Table 2: Population estimate at Kohinoor adit using various methods.

Method	Count	sd
Visual below cutting	60	40
Visual at mine entrance	292	57
Thermal camera with playback count	545	8
T3 thermal tracking software	564	0

It is worth reflecting on the importance of monitoring the populations of cave-dwelling bats such as the Ghost Bat, but doing so using a consistent and effective method. Ongoing population counts are probably the easiest and most replicable method of monitoring the well-being of a species. To be replicable and comparable, however, consistency in method of application, time of year and comprehensiveness of count (considering the problem of non-exit of bats) must be achieved. Observer bias is a major obstacle to achieving this with all methods other than a form of tracking software. The beauty of thermal imaging is that recordings are available for rechecking by a variety of methods, allowing rechecking by human or software counting methods. Used with care it is a relatively non-intrusive method and provides the best solution available at this time.

Many thanks to all participants for their involvement. Thanks to Sue Churchill for access to her unpublished data, and to Lindy Lumsden, Terry Reardon and Damian Milne for their comments, input and information amounting to, well lets face it, most this article.

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Human observers conducting manual counts of the ghost bat fly out from Kohinoor Adit, Pine Creek. (Photo thanks to Terry Reardon) [Ed*: are Chris' eyes even open? I think there's only two reliable counters in this game, and neither are male!*]

Bat homes in Kew attract a Gould's Wattled Bat

Robert Bender

185 The Boulevard, Ivanhoe East, 3079 Victoria

rbender@netlink.com.au

Kew is a north-eastern middle suburb of Melbourne, 9 km from the CBD. Its northern boundary is the Yarra River, Melbourne's major stream, and very weedy along both banks. A dry billabong of the Yarra lies about 100 metres west of Burke Road (Melway 45 J1). For the past two years Stanley Barker has been clearing weeds in one fairly large patch around the billabong, solo, and is now developing a Friends group.

Figure 1: Revegetation site near riverside path.

Stanley has been regularly joining the bat box checking team at Wilson Reserve, on the north bank of the Yarra, about 1 km further west, for a couple of years and got the idea of setting up his own bat homes. In 2009 he nailed ten capped poly-tubes to Red Gums in his revegetation site, two to a tree.

Figure 2: Two of the tubes positioned on a Red Gum, facing south.

In May 2010 he recorded the first bat, a torpid animal right at the top of one tube. On 22 July he invited me along to visit the site and have a look at the tubes, and he hoped we might be able to extract the bat and learn its species and gender. It was not in the tube occupied since May, but was found in another tube on the next tree. It was torpid, and roosting just below the cap, so I managed to wiggle it with one finger so it crawled out backwards into my hand.

Figure 3: (above) Gould's wattled bat in tube and in hand (below).

It turned out (no surprise) to be a male Gould's Wattled Bat. So after a few photos, I returned it to its tube and replaced the lid and it went back to sleep. It is quite possibly one of the bats which has been using the boxes at Wilson Reserve and just moved a little way along the river for the winter. There is an opportunity here for somebody to start a monitoring project, as the tube colony may well grow.

Anybody interested should contact Stanley on 0403 419 565 or barker_sv@yahoo.com.au

Feeding buzzes

Chris Corben

www.hoarybat.com

corben@hoarybat.com

Attack phase and feeding buzzes

Attack-phase pulses and feeding buzzes tend to get ignored, and are generally viewed as much less important for species identification than search-phase calls (here, pulses equal calls). However, there are situations in which attack-phase pulses and feeding buzzes can be useful. In this note, I want to explain how feeding buzzes are useful for recognising bats of the genus *Miniopterus* from bats of other families, and why that can be important. I also illustrate some interesting feeding buzzes from other genera, and argue that attack phase pulses can be useful in understanding a species' echolocation repertoire.

Seeing feeding buzzes

Feeding buzzes are more difficult to detect than search-phase calls because they are emitted at lower amplitude. That's because they are echolocation calls designed for use at close range to a target. Therefore, you have to be closer to a bat to record its feeding buzzes, and it is commonly the case that feeding buzzes will be missed in sequences where the search-phase pulses are easily detected.

A second point is that feeding buzz pulses are generally of short duration, so in a frequency dividing system like Anabat, they produce few dots on the screen. This is one reason why I now

recommend that Anabat users employ a data division ratio of 8 (Div 8), rather than 16 which used to be recommended. Div 16 records less data, and also produces a smoother display with a degree of averaging which is usually more appropriate than Div 8. However, the smoothing aspect is not compelling, because it is always possible to view data recorded at 8 as if it was recorded at 16, but it is not possible to go the other way. Data storage limits are rarely of any consequence now, because of technological changes since the early days of Anabat. Using Div 8 can make a very conspicuous difference to the visibility of feeding buzzes.

Anatomy of a feeding buzz

A feeding buzz is often recognised as having two phases (Fig. 1), following the attack-phase pulses. See for example, Britton and Jones (1999) "Echolocation behaviour and prey-capture success in foraging bats: laboratory and field experiments on *Myotis daubentonii.*" The Journal of Experimental Biology **202**, 1793-1801.

Attack-phase

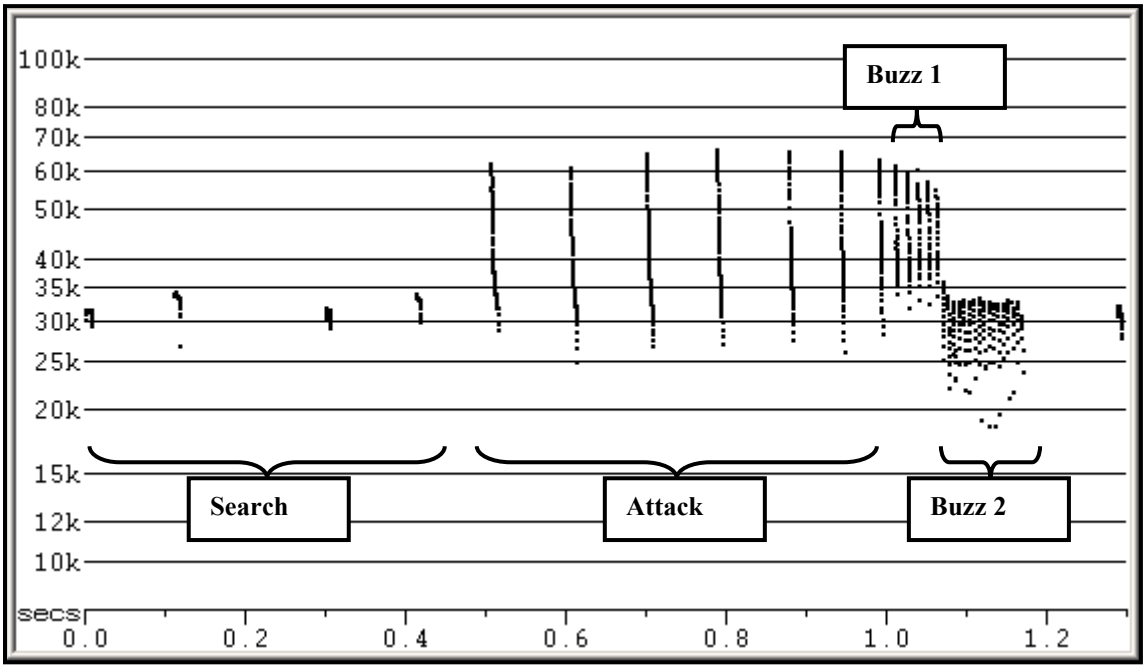
The attack phase blends the search-phase pulses into the feeding buzz, and can be characterised by changing features such as increasing slope, frequency sweep and Pulse Repetition Rate (PRR).

Phase 1
In phase 1, the pulses usually cover a similar range of frequencies to those covered by the attack-phase pulses just prior to the buzz, but at an abruptly higher PRR. The distinction between attack and phase 1 pulses may not always be clear cut, as the attack-phase may show a progressive change which blends it into the phase 1 part of the buzz.

Phase 2
In phase 2, the pulses drop in frequency from the phase 1 pulses, and they usually show a higher and more constant PRR. The amplitude of the phase 2 pulses is further decreased from phase 1, and phase 2 pulses are usually only seen in recordings of bats at close range. Phase 2 may be very distinct from phase 1, as in Fig. 1, or the distinction may be much less apparent.

I am not sure to what extent these buzz phases (and the attack phase) can grade into each other. Certainly, it is most common to see only part of a buzz, because it is given at reduced amplitude compared to typical search-phase calls, so it can be difficult to distinguish between variability of the buzz and variability of the extent to which it is detected. There is certainly a great deal of variation within an individual bat, as you would expect, because the nature of the buzz will vary with other factors, such as the distance at which a potential prey item is first detected.

Figure 1 (below): Search, Attack and Feeding Buzz of *Mormopterus norfolkensis* showing two distinct phases of the buzz. Mogareeka, NSW, 11 Feb 2005. Truetime, F6, Div. 8.



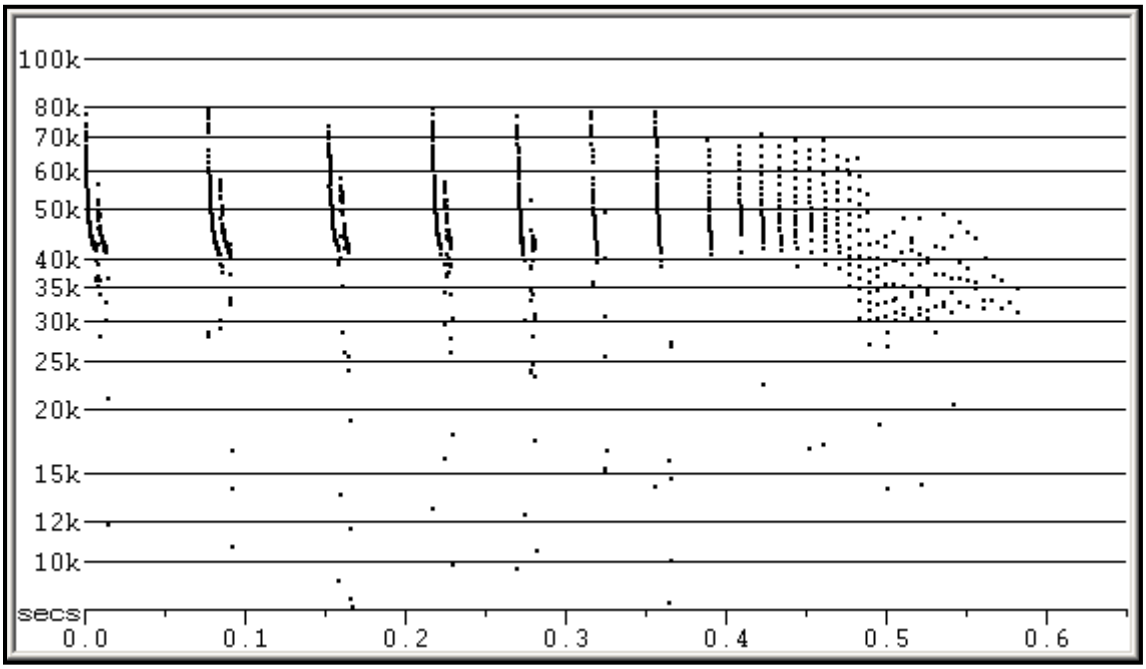


Figure 2. Attack and Feeding Buzz of *Vespadelus regulus*, Perup, WA 8 Mar 2009. Truetime, F5, Div. 8. Note the nearly specular echoes following each of the first five attack phase pulses.

Vespertilionide feeding buzzes

Vespertilionide feeding buzzes vary widely, as you would expect in such a large, diverse family. However, the general pattern is that phase 1 is distinct from the attack phase, and its pulses show a similar frequency range to the attack-phase pulses preceding it.

In Fig. 2, both phases of the buzz are clearly distinguished, though under field conditions phase 2, is often not seen, or not clear. Usually, the attack phase shows pulses which rise in frequency compared to the search-phase pulses, especially in their maximum frequencies. There is often a marked drop in maximum frequency at the start of the phase 1 buzz, as in Fig. 2, but the phase 1 pulses still show close similarity to at least the later attack phase pulses.

***Miniopterus* feeding buzzes**

Feeding buzzes in *Miniopterus* are distinctly different from those of Vespertilionide bats. This can be a useful feature, since many search-phase calls of *Miniopterus* are easily confused with calls from Vespertilionide bats. In Australia, many *Miniopterus* search-phase calls show close resemblance to calls of either *Vespadelus* or *Pipistrellus*.

Figure 3 shows a feeding buzz from a *Miniopterus* recorded in Darwin. While there is substantial variation in *Miniopterus* feeding buzzes, the common feature is that the phase 1 buzz appears to be missing, or perhaps is just not distinct from the attack phase. In Fig. 3, it is obvious that the maximum frequency of the buzz pulses is already much lower than in the attack phase pulses by the time the pulse repetition rate is profoundly elevated. This is the feature which makes *Miniopterus* buzzes distinctive. In effect, all of the buzz seems to be in phase 2. In addition, it is very common to see the pulses immediately prior to the buzz dropping in frequency relative to the pulses preceding them.

I have seen this type of feeding buzz in four populations of *Miniopterus* in Australia (*oceanensis* in the east, *orianae* in the top end, *australis* in the east and *australis* in Cape York). I have also seen the same behaviour in at least two unknown species of *Miniopterus* in Sabah, and in *Miniopterus schreibersii* in southern Europe.

Not all buzzes are feeding buzzes. A bat can also buzz in response to the presence of other bats, and there can be a distinctive type of buzz given as a bat approaches water to drink (a drinking buzz). *Miniopterus* do not always produce buzzes showing the characteristics I have outlined above, but it appears to me that their feeding buzzes always have a form like this. Other buzzes I have seen from *Miniopterus* have not closely resembled feeding buzzes of other species.

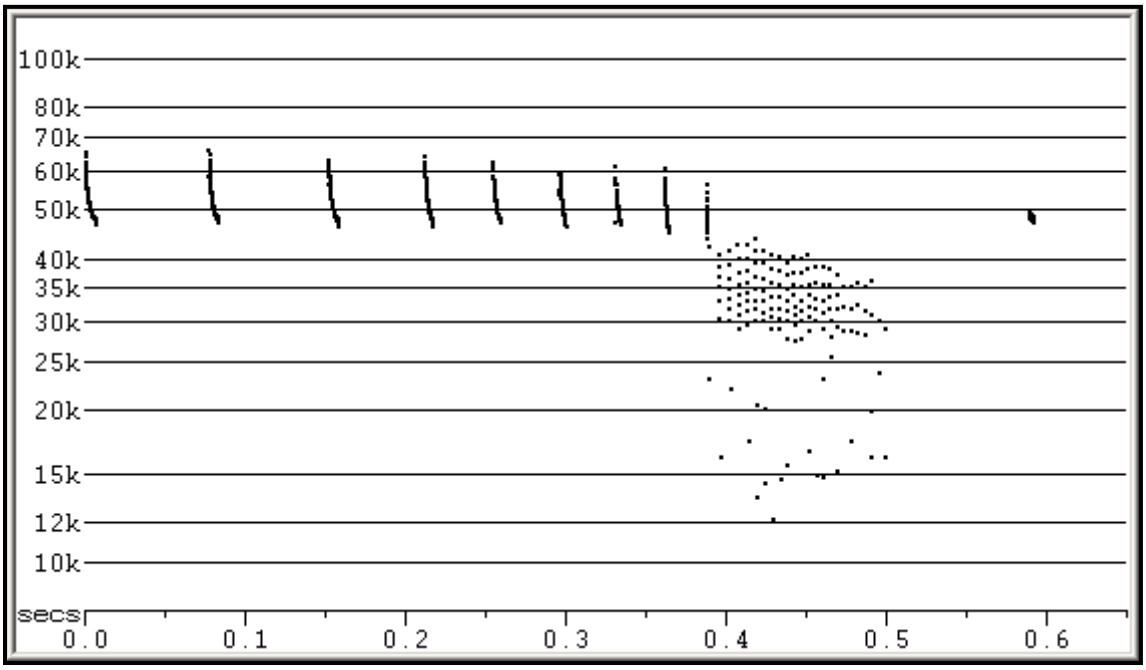


Figure 3: Feeding buzz of *Miniopterus (oceanensis) orianae*, Darwin, NT, 13 July 2010. Truetime, F5, Div. 8. Many *Miniopterus* buzzes show a much more marked drop in maximum frequency of the buzz than this example. Some show less. Note also the typical drop in frequency of the lower end of the pulse immediately prior to the buzz.

Chaerephon buzzes

Chaerephon jobensis occasionally produces an attack/buzz which seems very unusual in showing many pulses which start with an initial upsweep (see Fig. 4). I have seen this also in Sabah bats which I identified as *C. plicata*. Their identification was based on a process of elimination, since there didn't seem to be any other species known from the area which could fit my acoustic and visual observations.

In Fig. 4, the PRR of the pulses showing the upsweep was quite low (17 to 25 pulses per second), so the question of whether this was really phase 1 of a buzz or the end of the attack phase remains. In this instance, there was a preceding sequence of search-phase pulses with a PRR of about 2, followed by an attack phase where the PRR increased to about 8. The pulses depicted show PRR varying from about 11 to 25, while the very poorly depicted phase 2 shows a PRR of about 57.

Mormopterus feeding buzzes

Figure 1 shows a typical feeding buzz for *Mormopterus norfolkensis*. This sort of feeding buzz is commonly seen in other *Mormopterus*, also. Their buzzes are distinctly different from those of Vespertilionide bats in showing a reduced phase 1 buzz and a very prominent phase 2, with a nearly constant maximum frequency for the phase 2 pulses. The *Mormopterus* buzz is somewhat in between the buzz of a *Miniopterus* and that of a Vespertilionide bat. This can be a useful feature, because under some circumstances, bats, such as *Chalinolobus gouldii* can be confused with *Mormopterus*. The feeding buzz can help resolve this.

Attack-phase & the Search-phase continuum

The preceding has mostly concentrated on the feeding buzz. However, the attack phase has some value of its own.

Although the term "search-phase" has often been used as if it represents a definable and consistent part of a bat's repertoire, for most species it actually represents a very wide range of phenomena, which I have referred to as the search-phase continuum. What defines search-phase is that a bat isn't specifically targeting a food item, or some other target such as the entrance to a roost. However, search-phase pulses can vary over an extremely wide range of call types, depending on the distance to objects from which the bat is perceiving echoes, which in turn, depends on where the bat is hunting in relation to the structures in its environment.

At one extreme, a bat could be flying in zero clutter (meaning it isn't detecting echoes from anything) and in a straight line, in which case its calls will generally show the longest durations, lowest frequencies and lowest slopes of its repertoire. Such calls are often called commuting calls. Commuting calls are of a type appropriate to detecting echoes from distant objects, such as potential food items. At the other extreme, a bat could be flying in extreme clutter, where it is continually very close to echo-producing objects, requiring that it produce calls suitable for the immediate task of avoiding collisions.

The types of calls seen in search-phase sequences from a specific species at a particular locality might vary dramatically over very short time intervals, but they may also not vary much, depending on where the bat is hunting at the time. So it is quite likely that only a small part of the search-phase continuum will be encountered during a given recording session. It is also likely that another visit to the same site in different weather, or at a different time of year will show the same species consistently giving a different type of call in its search-phase sequences, perhaps as a result of hunting prey flying in different parts of its habitat.

The value of the attack-phase to a human observer is that in a very short time period, you can see calls which are representative of a wide part of the species' search-phase continuum, because in effect, the attack phase occurs as the bat moves into a situation where it is getting echoes from increasingly short distances. The effect is similar to that of a bat moving rapidly into increasing clutter. It is useful to assume that any pulse shapes encountered in an attack sequence could also be seen as an extended series of similar pulses in a search-phase sequence. Therefore, attack phase sequences, brief as they are, provide insights into parts of the repertoire which we may not often see.

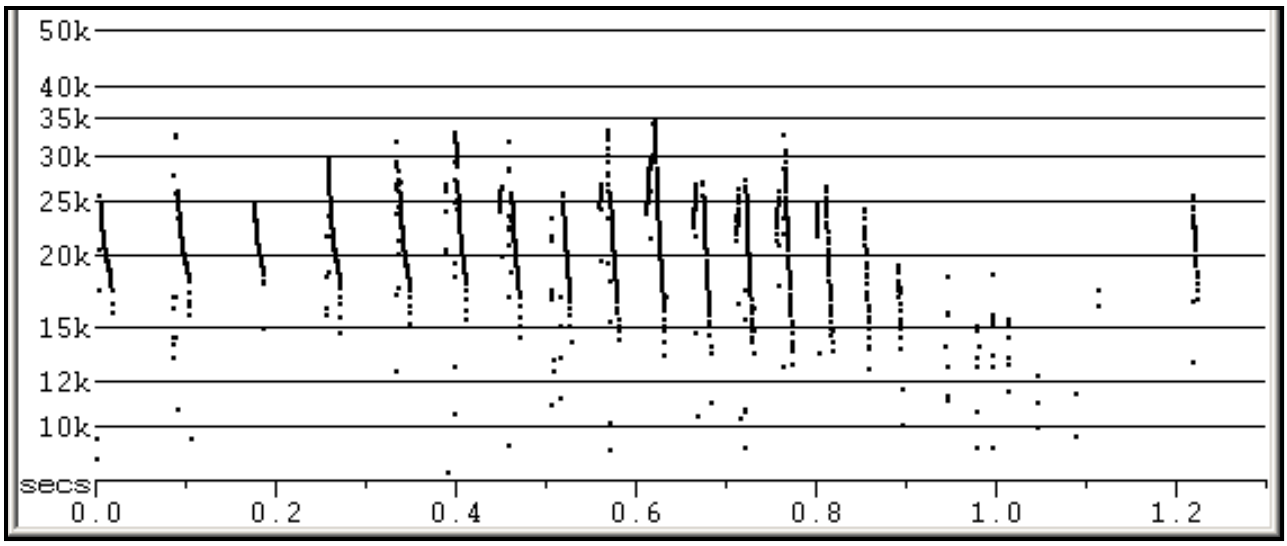


Figure 4. Buzz of *Chaerephon jobensis*, Pine Creek, NT, 15 Jul 2010. Truetime, F4, Div. 8.

Flying-foxes in cities and towns

Ken and Janet Sanderson

ken.sanderson@flinders.edu.au

Flying-foxes have been seen in some unusual places in 2010. In South Australia flying-foxes camped outside Naracoorte hospital for a while and were there on 21 April when there was a Flinders University Biodiversity and Conservation class on field camp at Naracoorte Caves. Here are some in a pine tree. They also favoured pencil pines, perhaps because of the shelter.

Shortly after this flying-foxes were seen in Fullarton Park in Adelaide. We went there one Saturday afternoon after Terry Reardon told us where to look, and got this picture before sunset at 5:16 pm on 22 May after some noise set them flying. A colleague in Medical Science (John Power) had seen flying-foxes feeding at a backyard palm tree in Norwood about a week earlier.

The presence of flying-foxes in Adelaide caused some concern as people mostly didn't want big numbers in their back yards, and there was even a cartoon in the local Messenger Press newspaper reflecting this (from late May or early June 2010).

Not long after this the flying-foxes left Adelaide. There have been flying-foxes in other cities for much longer. In July we visited the Sydney Botanic Gardens and photographed flying-foxes there, and at about the same time saw a TV program about Sydney with Griff Rhys Jones which had a small section filmed in the Sydney Botanic Gardens about the resident animals, and how the people who look after trees in the Botanic Gardens would like to move the bats on.

We also saw an animal dead in power lines in Bright Street, Marrickville, not far from Newington College.

Notes on a day roost of the Little Pied Bat *Chalinolobous picatus* (Gould) (Microchiroptera: Vespertilionidae) in Central Queensland

Jason Richard and Steven Marston

Authors contact details available from Rob Gration

rgration@yahoo.com.au

Chalinolobous picatus is listed as a Rare species in Queensland under the *Nature Conservation Act (1992)* and subordinate regulations, and Vulnerable in New South Wales under the *Threatened Species Conservation Act (1995)*. The species was listed as near threatened in the Action Plan for Australian Bats (Duncan *et al.* 1999).

There are surprisingly few published accounts of roosting behaviour in this species although it has been observed roosting in small tree hollows (Pennay and Freeman 2005) and has widely been reported as a cave roosting species (Strahan 1995, Churchill 1998).

The day roost of two Little Pied Bats was discovered on the 10th May 2010 during vegetation clearing works at the Wesfarmers Curragh Coal Mine near Blackwater in central Queensland (23^{0}28'35", 148^{0}52'30"). The bats were found to be roosting under decorticating bark approximately 10 m above the ground in a Brigalow (*Acacia harpophylla*) of approximately 12 m in height and 100 mm diameter at breast height.

The roost tree was a live tree which held some dead limbs. The Brigalow tree was located approximately 10 m from the top of bank of Blackwater Creek and was a component of the midstorey tree layer beneath remnant Coolabah (*Eucalyptus coolabah*) and Poplar Box (*Eucalyptus populnea*).

Until relatively recently, the Little Pied Bat was considered to be a cave roosting species, although Ayers *et al.* (1996) noted that the species was likely to use tree hollows, mine shafts and tunnels, and abandoned buildings and Pennay and Freeman (2005) confirmed that the species utilises tree hollows. We are unaware of any previous records of this species roosting under decorticating bark. As loose sheets of bark are more common on mature, senescent or dead trees, retention of these features is likely to be important for the Little Pied Bat throughout its range and is an important management consideration. However, as this observation suggests, smaller trees which support favourable roosting conditions are also utilised. This emphasises the importance of conserving remnant patches of vegetation with a high structural integrity and containing a mix of size classes in the tree and shrub layers.

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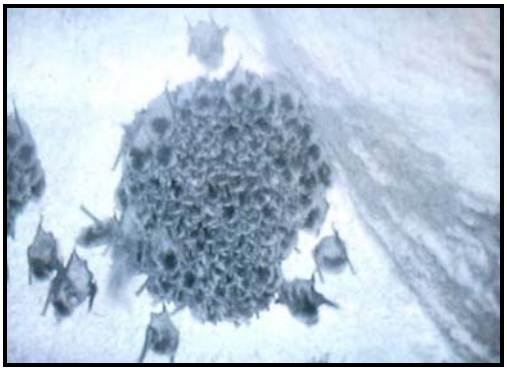
Little Pied Bat *Chalinolobous picatus*, photos by Jason Richard (this page and next).

Bat recording at Naracoorte, April 2010

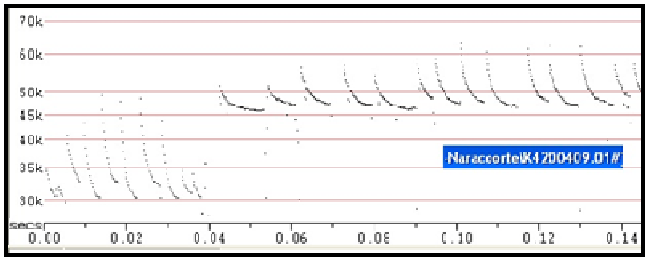
Ken Sanderson

ken.sanderson@flinders.edu.au

From 19-23 April 2010 a Flinders University Conservation and Biodiversity field trip for 44 students and 6 staff was conducted at Naracoorte Caves under the leadership of Duncan Mackay. We stayed at Wirreanda Bunkhouse, about 500 m from the nearest cave entrance, of Cathedral Cave, with entrances to Wet Cave, Blanche Cave and Bat Cave just a little further on. One group of 3rd year students had a project studying activity of bats in Bat Cave using the special infrared cameras located in the cave and controlled from a building above the cave. They observed bat activity four times daily and I accompanied them in some of their evening sessions. The pictures show students observing bat activity, and a cluster of bent wing bats they observed.



Some evenings I recorded bats with Anabat detectors as I walked between our campsite and the caves, and later recorded bats overnight at the campsite. Near the cave entrances calls were almost all (491/492) from Southern Bent-wing Bats *Miniopterus schreibersii bassanii* in about 1 h recording. Calls of bent-wing bats also dominated at our campsite in 2 evenings of recording, with 601/688 (87%) of calls, and small numbers from five other species, White-striped Free-tailed Bats *Tadarida australis* (2%), Southern Free-tailed Bats *Mormopterus* sp 4 (1%), Gould's Wattled Bats *Chalinolobus gouldii* (6%), Large Forest Bats *Vespadelus darlingtoni* (1%) and Lesser Long-eared Bats *Nyctophilus geoffroyi* (3%). We caught lots of moths, flies and beetles in light traps that might have been prey for bats.



Gould's Wattled Bat and Southern Bent-wing Bats recorded at 0409 hr on 20 April 2010 at Wirreanda, Narcoorte caves (buildings shown below).

A few classes were held underground in caves (below, photo of class listening to Liz Reed telling them about cave formation, cave fauna and fossils).

Bat survey of near-shore islands within the Lord Howe Island Group

Martin Schulz[1] and Nicholas Carlile[2]

[1]57 Bournemouth St, Bundeena, NSW 2230

antarcticmartin@yahoo.com.au

[2]Biodiversity Conservation Science Section, DECCW, P.O. Box 1967, Hurtsville, NSW 2220

Nicholas.carlile@environment.nsw.gov.au

The Lord Howe Island Group is situated in the South Pacific Ocean, some 760 kilometres north-east of Sydney. The largest island in the group is Lord Howe Island itself, which is approximately 11 km long and 2.8 km wide at its widest point, covering an area of 1455 hectares (Department of Environment and Climate Change 2007). On Lord Howe Island no megachiropteran bats species have been detected, while two species of microchiropteran bats have been recorded. The Large Forest Bat *Vespadelus darlingtoni* has primarily been located around the settled area in the north of the island, while the Lord Howe Long-eared Bat *Nyctophilus howensis* is only known from a single skull collected in Goosebury Cave at the north end of the island (Parnaby 2009).

Situated close inshore off Lord Howe Island are a number of small islands and rock stacks. In December 2009 single nights were spent on the three largest near-shore islands as part of a seabird nesting survey conducted by the NSW Department of Environment, Climate Change and Water (Table 1). Since no bat researchers have overnighted on these islands the potential presence of bats including the enigmatic *N. howensis* were investigated. Two techniques were used: a) a single SD1 Anabat detector was deployed at either a single location or at two different localities during the course of a night. b) additionally, two 50W spotlights were used intermittently for a varying number of hours after sunset to search for flying bats while scanning and identifying incoming seabirds. On Roach Island, given the absence of trees (Table 1) one of the locations of the Anabat detector was adjacent to a large sea-cave that tunnels completely through the northern end of the island.

No bats were located on the three largest near-shore islands off Lord Howe Island during the current survey (Table 1). Although the presence of bats on the more distant Ball's Pyramid located

23 km south of Lord Howe Island is also considered unlikely it is recommended that any biologists overnighting on the world's tallest sea stack be encouraged to deploy one or more bat detectors each night for the duration of their stay.

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Table 1: Near-shore islands surveyed within the Lord Howe Island Group, December 2009

Island	Grid Ref	Closest distance to main island (km)	Area (ha)	Date of visit	Presence of trees
Blackburn Island	31^{0}32'05", 159^{0}03'38"	0.8	2.4	10/12/09	Patches of Banyan Figs *Ficus macrophylla* and a number of old Norfolk Island Pines *Araucaria heterophylla*
Roach Island	31^{0}30'02", 159^{0}04'09"	1.2	11.9	12/12/09	Nil
Muttonbird Island	31^{0}32'26", 159^{0}06'29"	1.2	2.7	13/12/09	Nil

Just the tip of the bent-wing – decades of mis-description

Terry Reardon

South Australian Museum

Terry.Reardon@samuseum.sa.gov.au

Marg Turton recently emailed to a few of us, a picture for identification, of a very sorry looking soaked bat that had been found in water-filled brick pit near Sydney. The picture was clear enough to show the characteristics of the wings enabling us to be certain that it was a bent-winged bat, *Miniopterus* probably *oceanensis.*

Identifying bats from pictures is sometimes difficult and even in what should have been an obvious choice in this case; I did check Churchill (2008) just to reassure myself. In doing so, I noticed for the first time that the diagram on page 179 is drawn incorrectly – the diagram shows an extra phalanx (finger bone) drawn on the third finger between the first short one and the long phalanx (shown between the arrows on page 179) and this can been easily appreciated by comparison with the picture shown on page 183.

This all struck me as odd because all vespertilionids (when *Miniopterus* was included) are supposed to have three phalanges on the third digit (plus the metacarpal) although the terminal (distal) phalanx is often cartilaginous rather than bone. Nearly all the Australian literature says that a diagnostic feature for the identification of bent-wings is the great length of the 'terminal' phalanx or digit compared to the first on the third finger.

I wondered whether the loss of the third phalanx might be another feature to separate Miniopteridae from the Vespertilionidae? I spent some time looking at the literature and wrote to one leading overseas researcher in the field and got no clear answer. In fact there seems to be no explicit assertion anywhere that there are only two phalanges on the third finger and very little anywhere about the elements of the third finger other than the one comment that all vespertilionids have three (Miller 1907).

So after getting back to work after the holidays I examined the wing bones of some *Miniopterus* specimens and a disarticulated skeleton. It is clear that there are in fact three phalanges on the third finger…the terminal one is short and cartilaginous.

So, to be clear; past descriptions or keys (e.g. Dobson 1878, Wood Jones 1925, Ride 1970, Hall and Richards 1979, Reardon and Flavel 1987, Thomson 1991, Churchill 1998, 2008) have interpreted the 'terminal' digit incorrectly by assuming both the second very long phalanx and the short cartilaginous third are but the same phalanx.

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The mystery bat that met an unfortunate end in an old brick-pit full of water. Nope, those feet aren't big enough for *Myotis macropus*, and the true identity is that of a bent-winged bat, *Miniopterus* probably *oceanensis.* Photo thanks to Marg Turton.

– Reports, Viewpoints –

What a view! (of the sunset that is), with a rather rabbley lot congregating for beverages at the Darwin Ski club, a welcome watering point after day 1 of the 14th ABS Conference. (Image thanks to Rob Gration).

The 14th Australasian Batto Migration

Lisa Cawthen

lcawthen@utas.edu.au

Battos from throughout Australasia migrated to Darwin for the 14th Australasian Bat Society Conference between 12-14th July 2010. They came from all directions, from New Zealand and Fiji, Indonesia, Tasmania and mainland Australia. Darwin became a hub for bat lovers, researchers, consultants, carers and anyone with some type of affinity to the Chiroptera.

For those of us who had arrived early and made our roosts comfortable, the pre-conference welcome function awaited us at the Darwin Ski Club; a charismatic beachside open air establishment where the gorgeous sunsets never failed to impress on a nightly basis (this location ended up being the evening haunt for many a parched batto). Were you were a newbie or a regular to the world of bats, everyone seemed like long-lost friends or kindred spirits. The names of people you kept reading about in publications, news articles and web lists were soon sharing a beer with you – or touting a six piece collector's edition of bat stubby cooler sets…). As the night wore on, mega bats appeared over head and the youngest of us seemed to trickle back to our roosts as the student presentations loomed the next morning and some last minute practicing was in order. Those with their priorities in order partied on with an Anabat emitting the chirps of a bat or two, letting everyone know that even the micro bats made it to the party.

The next day a trail of battos, some sporting bat t-shirts and bling, staggered, skipped and danced towards the Darwin Museum and Art Gallery, the location for our grand migratory meeting. With the organisers sporting purple bat t-shirts it was time to get serious, swap USBs and watch as one after another the battos trailed in – all 110 of

them! The first day was student presentations and a workshop on new bat survey techniques. From the salt marshes of New South Wales to the forests of Fiji, the effects of timber harvesting and urbanisation, bat management, IVF, the threat of invasive flora, range extensions, palaeoecology – students were doing it all! Gourmet food during breaks and lunch time kept us going, an endless array of delicious nibbles and mouth wattering delights. It was hard to remember to eat or even grab a drink at times – so many people to talk to. It was certainly hard tearing yourself away from a good batty conversation.

The second day was just as impressive. Trish and Terry Wimberely had the audience enthralled in their new Australian Bat Clinic, and I'm pretty sure a batto migration to Queensland is on the cards for most us after listening to their talks. For anyone with a few $10,000 in the bank, Michael Pennay and Terry Reardon's work using thermal imaging and 'poor man's' missile tracking software, which let's face it, just sounds cool, had you buzzing! For those trying to be cost-effective and scrapping at the bottom of their budget, Terry also came through with a cheap alternative to fixing those old Anabat microphones which might have seen one too many rain drops or dewy mornings. [Somewhat ironic: upon my return to Tassie, many of my microphones needed some serious repair after being inundated with rain.] Our fearless president, or was it Premier?, Michael Pennay, further impressed us with his trial of new and old school methods for weather proofing Anabat microphones and to the relief of many of us, those PVC elbows are the way to go – acting like an ear to improve bat call detection. A poster session at lunch show-cased more fantastic research and the day was topped off with some fantastic footage of a golden-tipped bat feeding supplied by Greg Richards. There were so many talks and posters that were amazing, my tattered note book filled to the brim is testament to this.

Images (Rob Gration and Anna McConville) at right top – bottom:

- Chris Corben sharing his immense knowledge on all things geeky with a couple of attentive listeners.
- Roger Coles kicking back and contemplating whether this part of Umbrawarra Gorge is a good spot to net a Ghost Bat or two.
- Many hands making light work of a mist net.

After the AGM, where the executive were reinstated with no complaints, we eagerly trailed down to the Darwin Trailer Boat Club, the location of the conference dinner. Table selection was imperative at this point, not only for conversation, but more importantly – the chance to score some free bat stubby coolers during dinner games. My table came through in the end, led by our fearless Premier Pennay. [*Ed: At this point I would like to apologise for the many mistakes in the anagrams, I blame it on the fact that talks during the conference were too interesting to be able to concentrate or trivial matters such as anagrams for the quiz….* ☺]. Chris Corben, never without the Anabat and spotlight, soon had us mesmerised by the microbats that endlessly foraged along the beach. Our president had his own toy up his sleeve and whipped out a thermal camera to experiment with. In reflection, I wonder what the public must have thought of us? Ghost-busters perhaps?

On the last day Chris Grant showed, with some debate, whose bat cave was better and how to lead the way with bat education – an inspiring talk! Stuart Parson shamelessly promoted his new book "Ecological and Behavioural Methods for the Study of Bats' (a.k.a. the battos' bible), which would later be a prize for lucky presenters. The afternoon ended on a serious note, with Lindy's presentation and workshop on the courageous efforts spent trying to save the Christmas Island Pipistrelle from its probable extinction.

Of course, for many of us this was just the beginning of our conference adventures. The post-conference field trip was to be the icing on a rather amazing multi-layered chiropteran cake. For those on the bus, you may have been quizzed or interrogated by an un-relentless student (me) on all things batty. Alternatively, you may have been praying to the bat gods that you made it to Pine Creek in one piece at the hands of whoever was driving. [*Ed: as one of the designated drivers, I must place protest with this statement, I think the drivers did a stirling job of holding their nerves amongst the 130km/hr local traffic!!*]. Either way, we all made it there intact. Pine Creek was home to some great accommodation, a pub and Macey's café, our three staples for those not camping in the nearby National Park.

Images (Anna McConville) at left top – bottom:

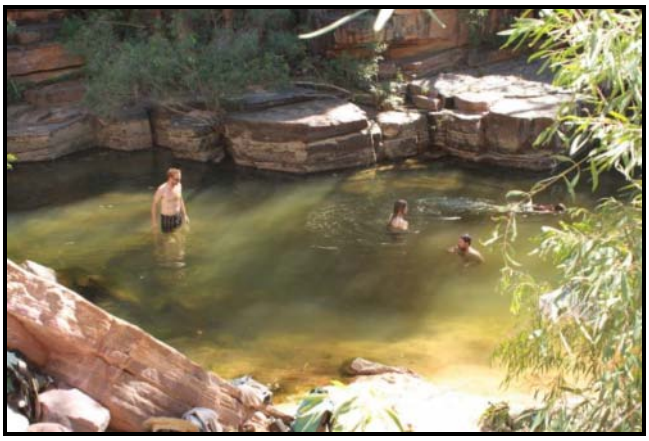
- Brad Law getting his toes wet
- Narawan Williams with a nice little python

Field trip attendees were split into two groups which alternated between bat trapping at Umbrawarra Gorge and surveying the Ghost Bat population at Kohinoor Adit. On the first night at Kohinoor Adit you could taste the anticipation in the air. Perhaps to our detriment the bats were spooked by our presence as we wandered around the mining area with some people taking up positions at nearby adits. Terry set up his thermal camera to count emerging Ghost Bats to compare with our own estimates. Counts ranged from 400 down to 10 depending on where observers sat [*Ed: see Chris Grant's report on page 36*]. Irrespective of position, the sensation of these giant microbats swooping past as they flew out of the adit was impressive. The next day some of us were lucky enough to see the thermal camera footage of the Ghost Bats emerging from the mine. Who needs Life of Mammals when you have "life of the Pine Creek Ghost Bats!". At the same time, the other group was intrepidly surveying Umbrawarra Gorge for bats and to everyone's surprise managed to capture a Ghost Bat in a harp trap! The next day when my group made it to the gorge, with reassurances from Damian that the likelihood of crocodiles taking out one of us was low, we explored the gorge with a swim (life is hard doing bat surveys, but what better way to check out the habitat!). We then set up harp traps and mist nests and waited. Soon the sky was filled with bats and the sound of bat calls bellowed from Anabats in all directions. Capture success, as they say in the books, was less compared to the first night, but impressive nonetheless with a *Nyctophilus daedalus* and a *Hipposideros ater* amongst our catch.

The end was nigh. You could feel a sense of sadness, I think I said goodbye to some people six times, hugging, exchanging numbers and e-mails, only to see them again, and again, and again on the road, at Darwin and in the airport! This was my first Australasian bat migration and was the most amazing event I've ever been to in my life (not counting bush dances as a kid). Words can't really do the conference justice, so for those that couldn't make it, come to Melbourne in 2012 to experience it all for yourself.

Images (Anna McConville) at right top – bottom:

- An ever cautious Lindy Lumsden retrieving Australia's largest microbat out of a harp trap.
- A close up of the lucky fella, a Ghost Bat *Macroderma gigas*, from Umbrawarra Gorge.



Images (Anna McConville):

- Top and left: A magnificent Northern Blossom Bat *Macroglossus minimus* trapped in a harp trap at Umbrawarra Gorge.
- Craig Grabham, Brad Law and students cool off in the refreshing (croc free) waters of Umbrawarra Gorge.

ABS on Facebook

The Australasian Bat Society now has a Facebook page. The page is another means of helping our far flung membership get updates on what's going on, a place for volunteer requests, discussions, questions, and a good medium for photos. For those who don't use Facebook – don't worry – the Listserver and *Newsletter* will continue to keep you updated just as they do now. Please check us out and feel free to contribute at:
http://en-gb.facebook.com/pages/Australasian-Bat-Society/122051564496903

If you have a Facebook profile you can "like" the page to get updates and contribute.

Adelaide flying-foxes

ABC Online (25/5/2010) reported that the Environment Department in Adelaide were using loud noise to try and scare off an estimated 1300 Grey-headed Flying-fox colony from an eastern suburbs property in Adelaide. Not a common sight in Adelaide, the flying-foxes may have been searching further afield for food after floods in Queensland and northern New South Wales may have damaged food sources in the more traditional parts of the species' range.

Hendra still in the news

Again, ABC Online (22/5/2010) reported on the push for increased funding for a horse vaccine against Hendra virus. Mirroring Hume Field's thoughts, Hendra virus expert Peter Reid from the Queensland Health Centre also suggests that the loss of flying-fox habitat is brining the bats into more frequent contact with people (and their horses) in suburban areas. With increased contact comes the increased risk of disease transmission and calls have been made to the Federal Government to provide $2 million to help fund trials of a vaccine for horses.
http://www.abc.net.au/news/stories/2010/05/22/2906661.htm
See also: Australian Veterinary Journal Volume 88, No 4, April 2010, pages N21-22.

WNS stories on web

Robert Bender

rbender@netlink.com.au

Robert has forwarded a couple of relevant web-pages for those members who are following the White-nose Syndrome story in the USA.

This one concerns possible cave closures to curb the westward spread of WNS:

http://www.biologicaldiversity.org/news/center/articles/2010/land-letter-08-26-2010.html

and this one more generally relates to the demise of U.S. bat populations:

http://www.biologicaldiversity.org/news/center/articles/2010/boston-globe-08-06-2010.html

Reprieve for Sydney bats

On the back of news from Dr Tim Entwisle, the Executive Director for the Botanic Gardens Trust, ABC Online (22/6/2010) reported that the planned eviction of the flying-fox colony at Sydney's Royal Botanic Gardens has been delayed until next year. The decision was made based on welfare concerns for the bats out-weighing the potential risk faced by mature trees in the gardens that are used as day roosts.

Support for Anabat users

Claire Hourigan

clhourigan@yahoo.com.au

There is a new forum and support page for Anabat users at http://www.titleysupport.com which is provided by Titley. It is set up to help solve problems and answer technical questions concerning Anabats. It is mostly set up to support the newer models (SD1 & SD2) but you can probably get help and advice for older models as well. A number of members have expressed interested in getting some information on how to use the filters correctly in Analook – perhaps even a manual! Titley is only likely to provide such a service if they realise that we

(i.e., Anabat/ Analook users) want and need such information. So join up on the forum and voice your opinions!

Just chillin'

Michael Pennay shares this rather chilling fact with you: The Grey-headed Flying-fox colony in Canberra stayed on during winter 2010 despite at least 10 frosts down to a minimum of -3.7 degrees over a period of four weeks reported by the BOM.

Only on Foxtel…

Below is a letter to Foxtel CEO regarding Edward 'Bear' Grylls.

Dear Sir: The membership of the VAFA has asked me to communicate its concern in relation to your choice of Edward 'Bear' Grylls as a Foxtel representative / promotions person.

Grylls was recently filmed illegally smoking out a cave of bats, hitting them with a tennis racquet as they emerged, and then stomping them to death.

The clip, shown on Discovery and You Tube was, offensively, entitled 'bat tennis'.

Bat conservation and animal cruelty are key concerns of the VAFA and allied organisations and the object of our public lobbying and direct action campaigns.

I urge Foxtel to reconsider its stance in relation to this individual and to affirm its corporate commitment not to be associated with animal cruelty and illegal activities of the type perpetrated by Edward 'Bear' Grylls on this and other occasions. Thank you.

Lawrence Pope
President Victorian Advocates for Animals Inc.
www.vafa.org.au

Good news story!

Michael Pennay shared a great good news story concerning some lucky folk that had microbats roosting in the roof of their house. After encouragement from Michael, Hugo from Belligen in NSW built a bat house, from a bit of firewood that had a knot hole in it. After sealing the cracks and closing the top and bottom Hugo was amazed to see a family of bats move in. Even better, turns out the bats are using this great house as a maternity roost. The bat house is hung just near the hats on a wall (marked with an arrow) so that the (human) family can watch the bats come and go.

A great home if you can find one! A wonderful individually designed bat house as an alternative to having bats in the roof!

Tolga Bat Rescue & Research

Keep up to date with this group's news via their Newsletters at:
http://www.tolgabathospital.org/about_newsletters.htm

More strange flying-fox sightings

Back in May Greg Richards alerted members to an interesting story in the Mercury (by Helen Kempton; 10/5/2010) on a fox that was found dead in netting around an apple tree in Sandy Bay, Tasmania. Alas, it was not an elusive red fox *Vulpes vulpes* that Tassie is trying so hard to eradicate, but rather a young Grey-headed Flying-fox, not sighted in Tassie in more than 50 years.

Flying-fox friendly fruit

Keiko Osawa
fruitbat@mwc.biglobe.ne.jp

Ed: Say that one ten times fast, then backwards! Keiko Osawa from Japan sent a message through to the Listserver just after the previous Newsletter. Whilst it was some time ago, I thought it was worth re-printing here.

Conflicts between fruit growers and bats have been a big issue in Japan as well as in Australia.

The Ogasawara Islands are located in the Pacific Ocean 1000 km south of Tokyo and consist of several islands smaller than 25 square kilometers.

Pteropus pselaphon is endemic to the Islands. It is critically endangered and the estimated number is no more than several hundreds.

The Islands are in the subtropics and produce valuable tropical fruit. The Islands are also a tourist destination.

To solve the feeding damage problem is key to the conservation of *Pteropus pselaphon*. We know the only effective solution is to net the fruit trees. But fruit growers are reluctant to install nets. If netting is financially beneficial to fruit growers, it can be an incentive.

We have an idea to seal a "flying fox friendly fruit." sticker on fruit produced in the netted orchards. We hope wildlife-conscience consumers readily pay extra money for "flying fox friendly fruit". That might encourage orchardists to net their fruit trees. I heard this idea somewhere (ABS mailing list?). Does anybody know if this idea was already implemented in Australia?

I would be happy if someone could suggest any more idea to encourage fruit farmers to live fruit bats together in harmony.

Black Flying-foxes in Melbourne

Thanks to Lawrence Pope for forwarding an article from The Age (10/7/2010) which reported the arrival of Black Flying-foxes into Melbourne this year. Ten years ago, textbooks identified the most southerly point of their range as 500 km north of Sydney. However, a combination of climate change, habitat loss and severe weather in the north may have pushed the bats south and west.

With many of the bats underweight, VAFA was encouraging residents to allow bats access to their backyard fruiting trees to help sustain them before conditions up north improve.

Around about the same time, Lawrence was urging Bendigo residents (Bendigo Advertiser, 7/7/2010) to be proud of their colony of Grey-headed Flying-foxes in Bendigo's Rosalind Park and noted that the bats' droppings wouldn't harm trees or plants in the local gardens.

A word on lyssavirus exposure

Michael Pennay
President ABS
president@ausbats.org.au

The ABS has been invited to participate in the Bat Liaison Group established by Biosecurity Queensland which deals with biosecurity issues involving flying-foxes (Hendra, Australian bat lyssavirus mainly).

As part of the discussions with Dr Hume Field and Dr Janine Barrett I have tried to clarify two things:

1) the status of ABLV in microbats (there is a common belief it is only known from *Saccolaimus flaviventris*) and

2) the status of ABLV in bats in other parts of Australasia.

The answers are:

- among the micros, Australia has only found ABLV-**virus** (DFAT/PCR) in *Saccolaimus flaviventris*
- Hume Field tested serum from some (but not all) species of microbats for ABLV-**antibody.** http://espace.library.uq.edu.au/eserv/UQ:13859/field_thesis_05.pdf. In brief he found antibodies (evidence of past ABLV infection) in **15** of 1234 individual microbats – which were members of five of the (then) six families of micros in Australia.

Of the then six families he found at least one ABLV antibody-positive bat in the following:

- *Molossidae* – ***Chaerophon*** *and* ***Tadarida***
- *Vespertilionidae* – ***Chalinolobus*** *and* ***Vespedalus***
- *Hipposideridae* – ***Hipposideros***
- *Megadermatidae* – ***Macroderma***
- *Emballonuridae* – ***Saccolaimus***

The answer to the second question is that there has been inadequate testing to prove ABLV occurs in bats outside of Australia, however recent finds of bats with serologic evidence suggestive of ABLV infection in Philippine bat species, the known presence of rabies and probably rabies-like lyssavirus in Asia, and the known movements across Torres Strait of *Pteropus* species (as well as occasionally across Bass Strait and even the Tasman!) and movements between Pacific Islands of *Pteropus tonganus* indicate that, although unknown, it is highly likely that bats throughout Australasia carry or are capable of carrying Lyssavirus.

The simple message is that all bat workers in the region should assume that any bat of any species is capable of carrying Lyssavirus and that they should take appropriate precautions, in particular, pre-exposure vaccinations against rabies (ABLV).

National Wind Farm Development Guidelines

Mark Venosta
Snr Consultant Zoologist
Biosis Research Pty. Ltd.

mvenosta@biosisresearch.com.au

The National Wind Farm Development Guidelines (Draft) have just been released by the Environment Protection and Heritage Council. The intent is that these will provide an overarching guidance that will assist regulators at all levels of government in applying standards to the development and operation of commercial-scale wind farms. The draft Guidelines are being released for a period of twelve months to allow further consultation with relevant stakeholders. I (ABS member, Mark Venosta) prepared the bat section of Technical Appendix D *Birds and Bats.* The link to the guidelines is below. This may be of interest to members of the ABS and colleagues.
http://www.ephc.gov.au/taxonomy/term/25

Australian White-nose Syndrome fact sheet

Tiggy Grillo
Projects Coordinator
Australian Wildlife Health Network

tgrillo@zoo.nsw.gov.au

The WNS fact sheet on our website has been updated, the new link is:
http://www.wildlifehealth.org.au/AWHN_Admin/ManageWebsite/FactSheets/UploadedFiles/119/White-nose%20Syndrome%20and%20Australian%20Bats%206%20Apr%202010%20(2.0).pdf

Or you can access the page via:
http://www.wildlifehealth.org.au/AWHN/FactSheets/Fact_All.aspx

– Gadgets, Techniques and Photos –

The buzz on *Miniopterus* calls … all ANABATers must read this!!!

Terry Reardon, Greg Ford and Chris Corben

Terry.Reardon@samuseum.sa.gov.au

Greg.ford@bigpond.net.au

corben@hoarybat.com

It all began one wet and cold winter's afternoon. In keeping with a policy of seeking independent verification of call IDs for 'difficult' regions, Greg Ford emailed a small bunch of ABS people requesting assurance re identifications of some Cape York bat calls. Amongst the calls was one which Greg had identified as *Miniopterus australis* - apart from having the right frequencies and call shape, it also displayed the very distinctive post-attack buzz pulses that Chris Corben had shown us in Darwin (see Chris's *M. s. orianae* example, Figure 1). In Darwin, a few of us were a little puzzled by Chris's claim because we had never noticed these characteristic pulses amongst the thousands of *Miniopterus* calls we had looked at.

When Terry opened Greg's *M. australis* call, he could not see the 'buzz' component that Greg was talking about; so he quickly shunted off a reply including the following words - "you must be hitting the scotch or something". Greg replied with a screen dump of an *AnalookW* sonogram with the characteristic pulses circled. Figure 2a shows the file as Greg saw it with the buzz pulses indicated by the rectangle. But what Terry saw when he displayed the original file on his screen was quite different – notably, the apparent absence of buzz pulses (Figure 2b).

Something was amiss. Terry called Greg, who was sitting in his warm car watching his son freeze at soccer training. He had is laptop with him so we tried to work out why the same file appeared so differently on our respective screens. We eventually noticed there was a difference in the far bottom left corner of the *AnalookW* screens: Greg's showed 'Div: 8' but Terry's showed 'Div: 8/16'. This, we concluded, meant that the call might have been recorded in Div 8, but why the difference on the screens?

When Terry went to 'Change Divratio' in the 'View' tab in *AnalookW* and changed the setting to from 'a) 4,8->16; 5,10->20' to 'Original', his *AnalookW* screen suddenly displayed exactly what Greg was seeing.

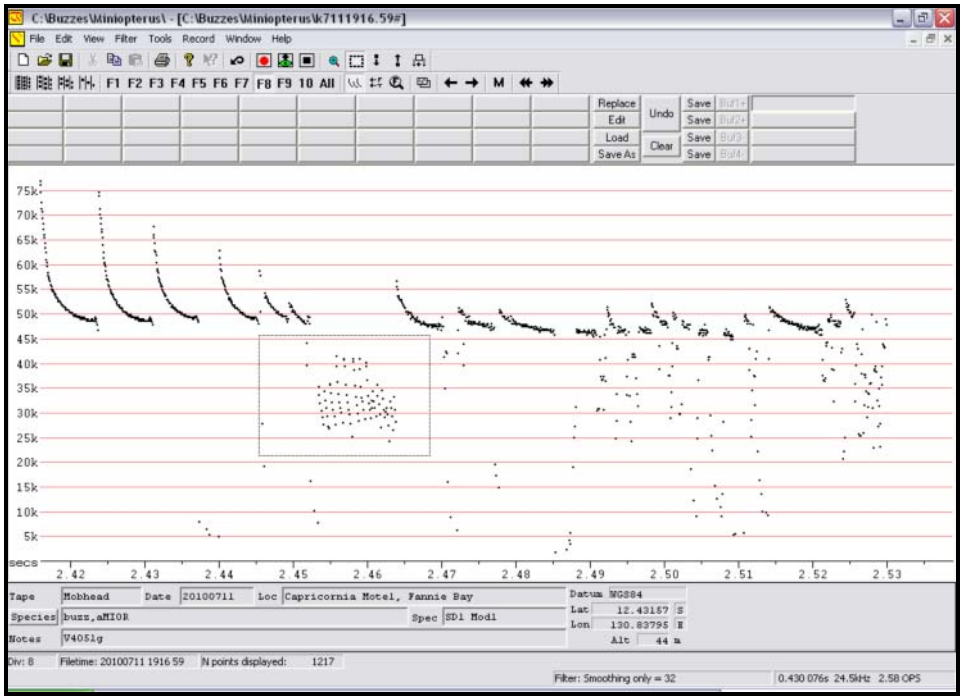
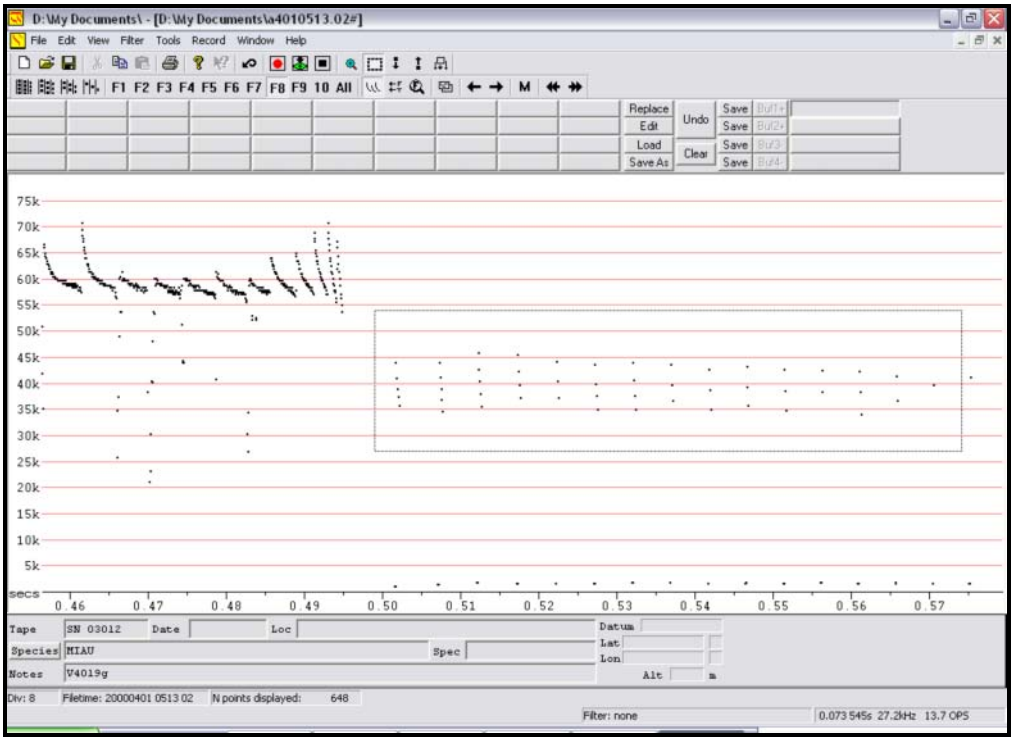


Fig. 1 (above): *Miniopterus schreibersii orianae* call recorded by CC in Darwin; showing distinctive buzz at much lower frequency than search and attack pulses (boxed).

2a



2b

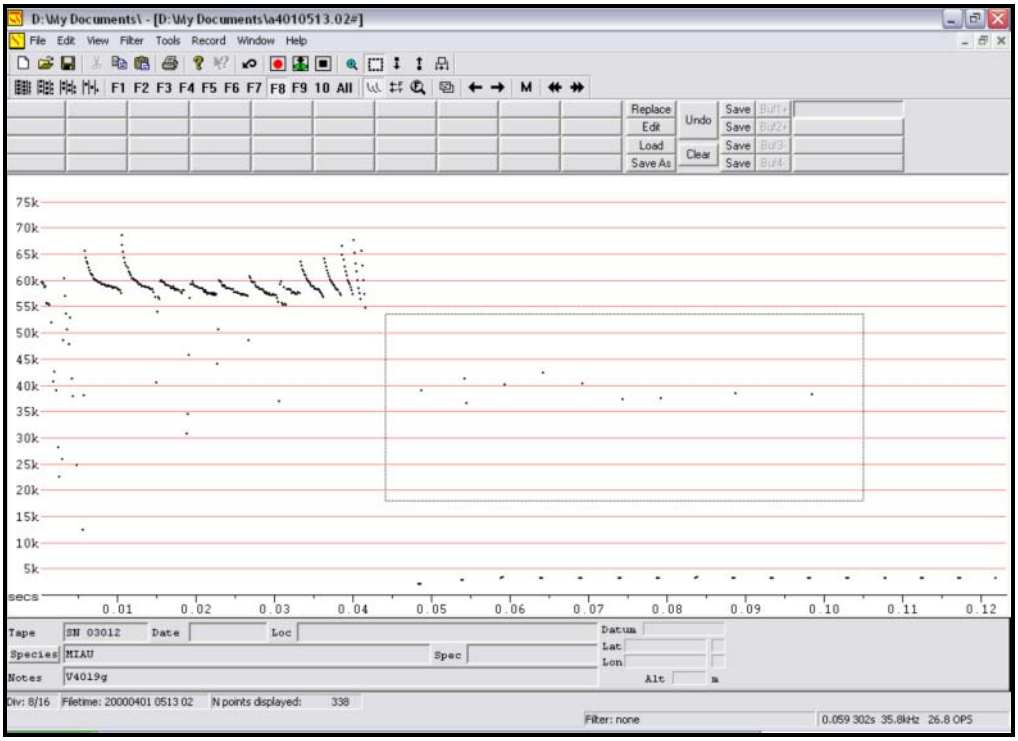


Fig. 2 a) *Miniopterus australis* call as seen by GF, showing distinctive buzz at lower frequency than search and attack pulses; b) the same call as seen by TR, showing apparent lack of buzz pulses.

Now both of us, and probably many of you reading this, thought that 'Change Divratio' fixed the problem where calls were recorded at one division ratio (e.g. 16), but downloaded in another (e.g. 8). We had both played with this setting previously when we were faced with this scenario, but it had no effect on what we saw on the screen (so we thought the selection wasn't enabled).

So, in an effort to clear up our confusion, Terry forwarded a précis of our discussion and the problem file to Chris Corben. What transpired, via Chris's response and subsequent discussions, was somewhat of a revelation and quite important for all of us who spend time recording and/or analysing Anabat data.

Here is Chris's explanation (verbatim) of the 'Divratio' function and **why it is important that we should record on Division Ratio 8 from now on**. It is why those of us who have been recording on Division ratio 16 have not been aware of the unusual *Miniopterus* feeding buzzes in the past.

From Chris Corben (CC):
CC: "Terry wrote to me asking about his ability to see feeding buzzes. I reattach the offending file here to illustrate the point. I think the answer will have more general interest, so I am sending to all of you. Perhaps this is something I should write up for the newsletter. Even better if someone else feels like doing that!

"Open this file* and make sure no filter is in effect. Hit Esc. Also, go View, Change Divratio and make sure Original is checked. Hit F3."
**If you the reader want to try this you can email Terry or Greg for the file, but essentially you can see what Chris is explaining on Fig. 2 and also in the images shown in Appendix 1.*

"Now you can see there is a feeding buzz just past 1.5 seconds into the file. It is a classic *Miniopterus* feeding buzz, where all the buzz seems to take place at frequencies well below those of the attack sequence. The extent to which this is true could also reflect how much of each buzz pulse is actually detected.

Now, click on View, Change Divratio and select the a) option and the feeding buzz nearly disappears. At least, it is reduced to so few dots that it is not easy to see it as a feeding buzz.

What has happened is that the original file was made at a divratio of 8, but you are now looking at it as if it was recorded at a divratio of 16. Had the call been recorded at 16, this is what you would have seen in the file, and the feeding buzz would have been hard to perceive. **This is one of the reasons I now recommend using 8 instead of 16 for nearly all purposes.** The reason for using 16 was mainly about storage space, but this just isn't an issue in most situations anymore.

If you magnify in and look closely at that buzz you will see that both the number of dots in the feeding buzz pulses and the number of pulses detected is reduced at 16 versus 8. You can see 19 pulses at div 8 but only 9 at div 16, and 8 of those are only one dot each. This is expected, but not intuitively to the extent you see here. For example, the first buzz pulse consists of 5 dots at div 8 but only one pulse at div 16. You might think that you should see half the number of dots at 16 versus 8, but in fact it can be less. This happens because it takes three transitions before the first dot will display, so it takes 7 transitions to display 5 dots. If you use div 16, that 7 dots could be reduced to 3 or 4 depending on whether or not the first transition is actually kept. So you could end up with either 2 dots or 1 dot at div 16, versus 5 at div 8.

If you want to see this more clearly, draw 7 dots in a line on a piece of paper (or in the mud!), and note that only the last five would be displayed. This is the div 8 case.

Now rub out every second dot, starting with dot number 2. Now you can see dots 1, 3, 5 and 7 and only 2 dots (5 and 7) would be displayed. Instead, rub out every second dot, starting with dot number one. Now you can see dots 2, 4 and 6 and only one (6) would be displayed. It's that simple."

Some further responses from Chris to other questions related to this issue are included below. We have chosen to not edit any of the original email text, so please excuse abbreviations and feel free to contact any of us if you'd like further explanation or discussion.

"Michael [Pennay] asked about [the *Miniopterus*] feeding buzzes. *Miniopterus* of all the species I have seen so far show a very distinctive feeding buzz where the buzz itself (recognised by the high repetition rate) is immediately much lower in frequency than the attack phase leading up to it. While most bats probably have two phases in the buzz, where the second phase (usually undetected in Anabat) is abruptly lower in frequency than the first phase, in *Miniopterus* it seems only the second phase is represented. You do have to be aware that not all buzzes are the same, and you can occasionally see extended buzzes from *Miniopterus* that look a bit more normal in frequency, but they don't look like typical feeding buzzes."

Terry to Chris: I was wondering whether the difference in Div 8 and 16 might affect the cycles display – e.g. get a better estimate, but check out what happens when you change Divratio from original to a) on Greg's file.

CC: "Ahhhhh - fascinating. I seem to have discovered negative time. That would be a bug!"

TR: So we can never look back over our files recorded at div 16 and expect to see clear examples of the mini feeding buzz.

CC: "Well I wouldn't go that far. It will certainly not be so easy to see the buzz as it would at div 8, but in many situations it will still be useful.

If you look again at Greg's file (a4010513.02) and view it at F7 compressed with Divratio changed to 16, it's easy to see that a buzz took place from the attack phase, which is more reliably detected anyway. You may find it useful to enhance the visibility of the buzz by going Tools, Options, Display and the setting the Pixels between calls (compressed) option to, say, 4. This spreads the buzz out, because each pulse, even if detected by only one dot, is still detected as a separate pulse and therefore there is a gap imposed between it and the next pulse.

I suspect that if Terry looks hard at his div 16 *M. s. bassanii* calls he will find instances where the presence of a buzz can be seen in a way which is distinctive of *Miniopterus*. You could also argue that if the bats had NOT been *Miniopterus*, you would have seen far more buzzes! Check Greg's file again with the divratio changed to 16 and zoom in to st= 648 and use F8, true-time. Now what you see is the poorly detected buzz spread over 50 ms. Although most pulses in the buzz are reduced to just one dot, the spacing between these dots clearly indicates the presence of multiple pulses, not just noise. You can see that by considering the difference in spacing between the two dots in the second buzz pulse versus the spacing between the other dots in the buzz. In the second buzz pulse, the dots are a mere ca 250 us apart, which makes sense, since 40 kHz divided by 16 = 2.5 kHz, but a dot is displayed for every transition, not just like-transitions, so you double that to 5 kHz, which is a spacing of 200 microseconds at 40 kHz. Therefore, the two dots in the second pulse are part of the same signal. Compare that to the spacing between the second and third buzz pulses, which is over 5 ms, so they cannot be part of the same signal. Hope that makes sense. The buzz is demonstrably made up of several individual pulse events, not just one burst of noise."

TR: So, if we change over to div8 would this compromise very high freq recordings e.g. *H. ater*, *Phoniscus*?

CC: "Depends on the equipment you use. The very old parallel port ZCAIMs were only capable of resolving transitions 50 microseconds apart, or 10 kHz. At div 8, this would correspond to just 80 kHz. But the Storage ZCAIM and SD1 are capable of much better than that. To give you an example, in Borneo with an SD1, using div 8, I detected the start of a downsweep from *Kerivoula hardwickii* at 250 kHz! Possibly the highest frequency ever detected from a bat. I attach a file showing that for your amusement. So it's not an issue.

The only real problem I have seen with div 8 is using the GML1 remote downloading system. Because this uses a slow cellular phone protocol, it can only deal with about 30 MBytes per day, so in noisy environments, using 16 could make the difference between being able to download all your data and not being able to keep up with the data load. But the real solution to that is to reduce the noise you are detecting, and hopefully soon, we will come up with a faster downloading system, anyway, so it won't matter."

In further twist, Greg subsequently found a *M. australis* call amongst his files recorded on Div 16 (Figure 3), which clearly does show the unusual feeding pulses!

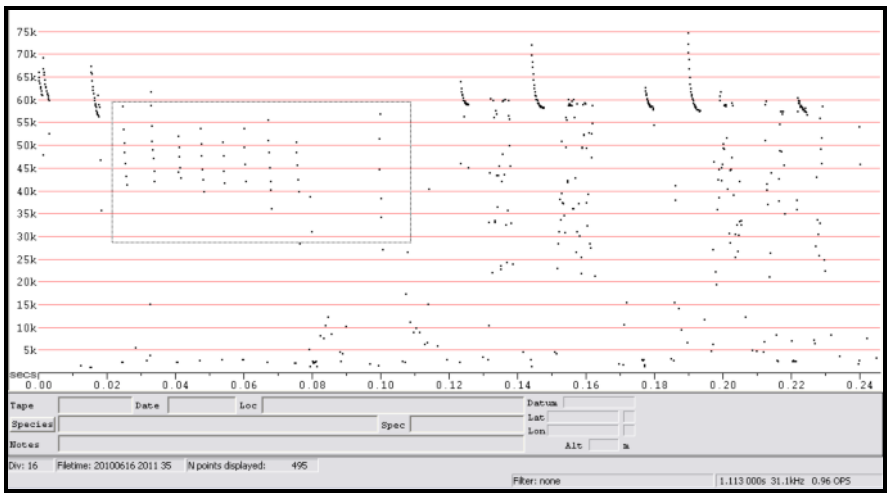
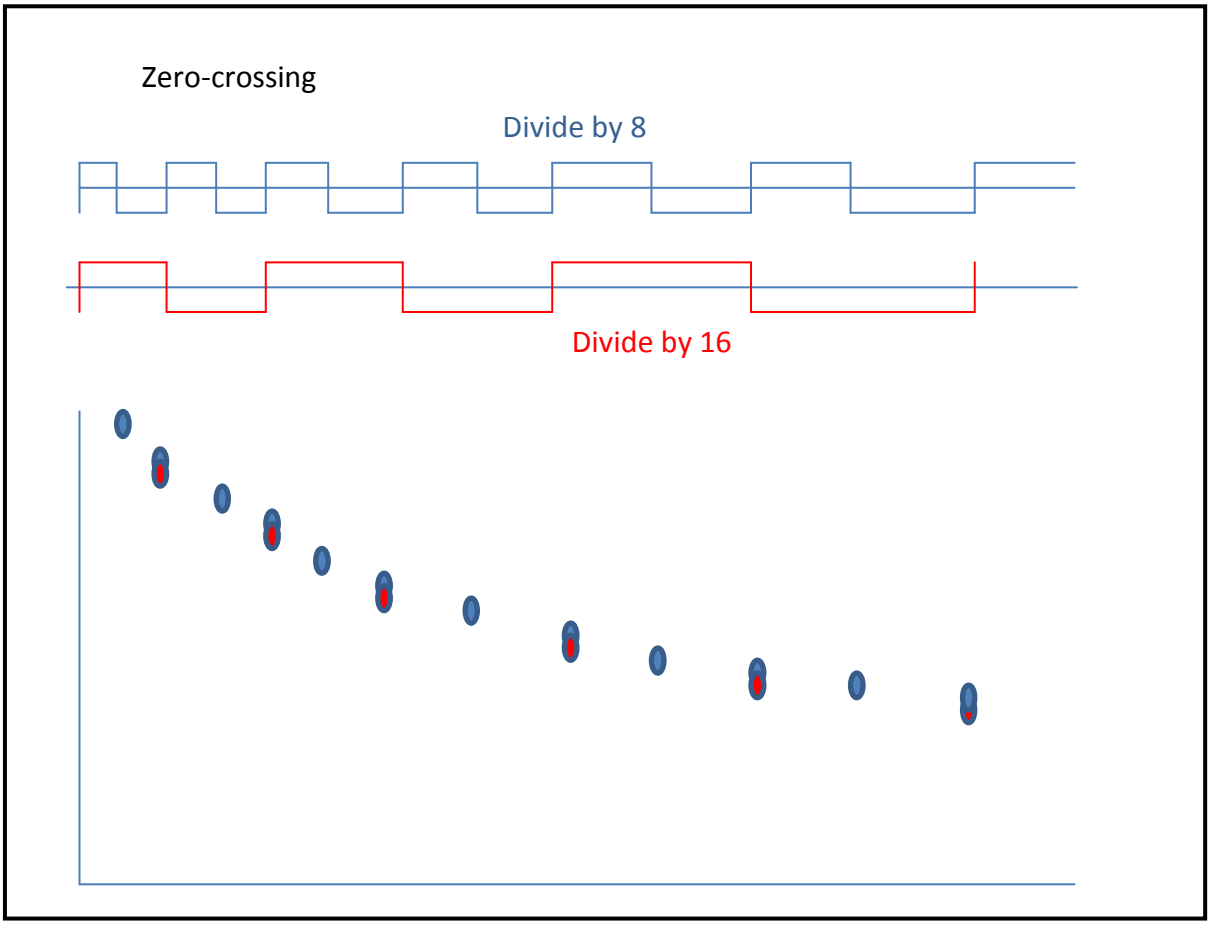
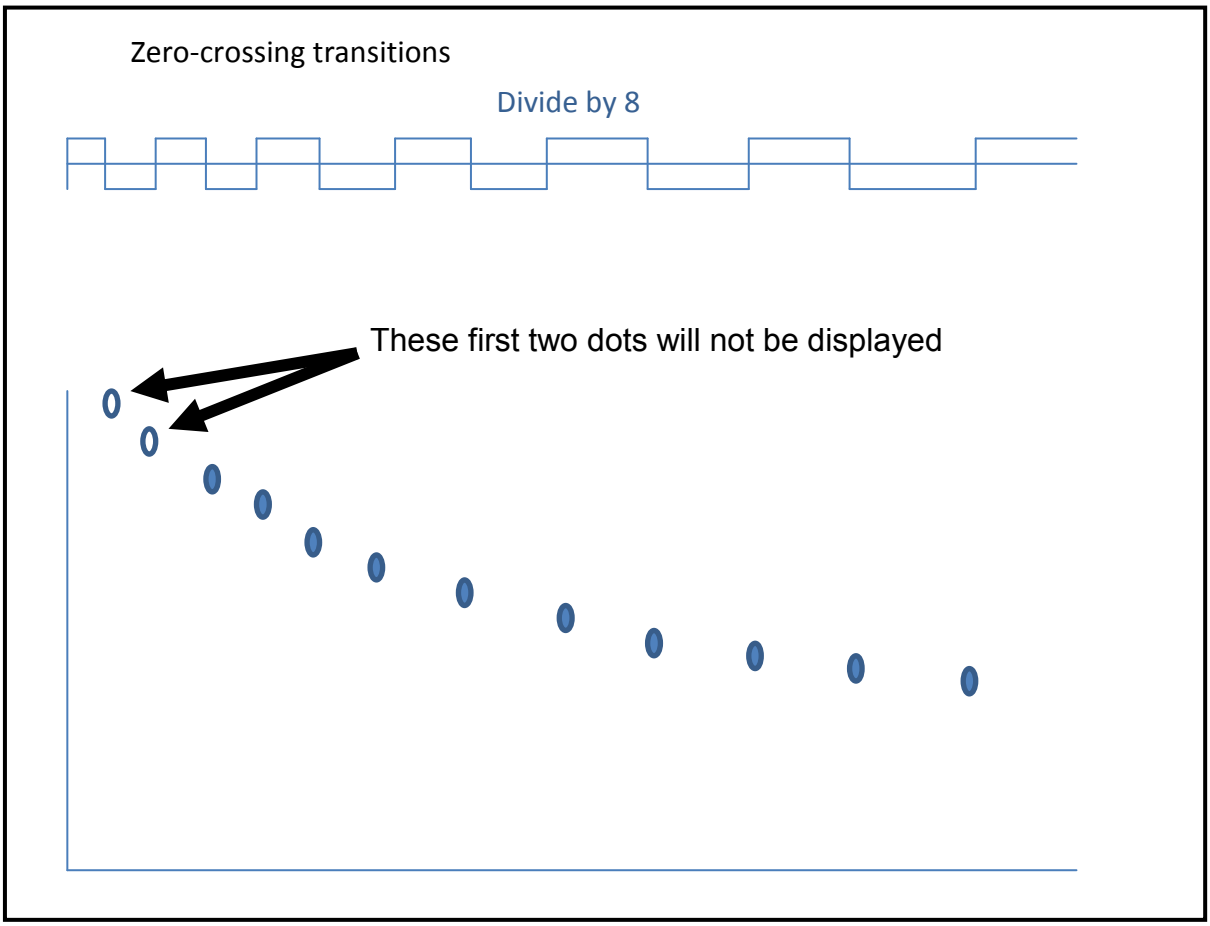
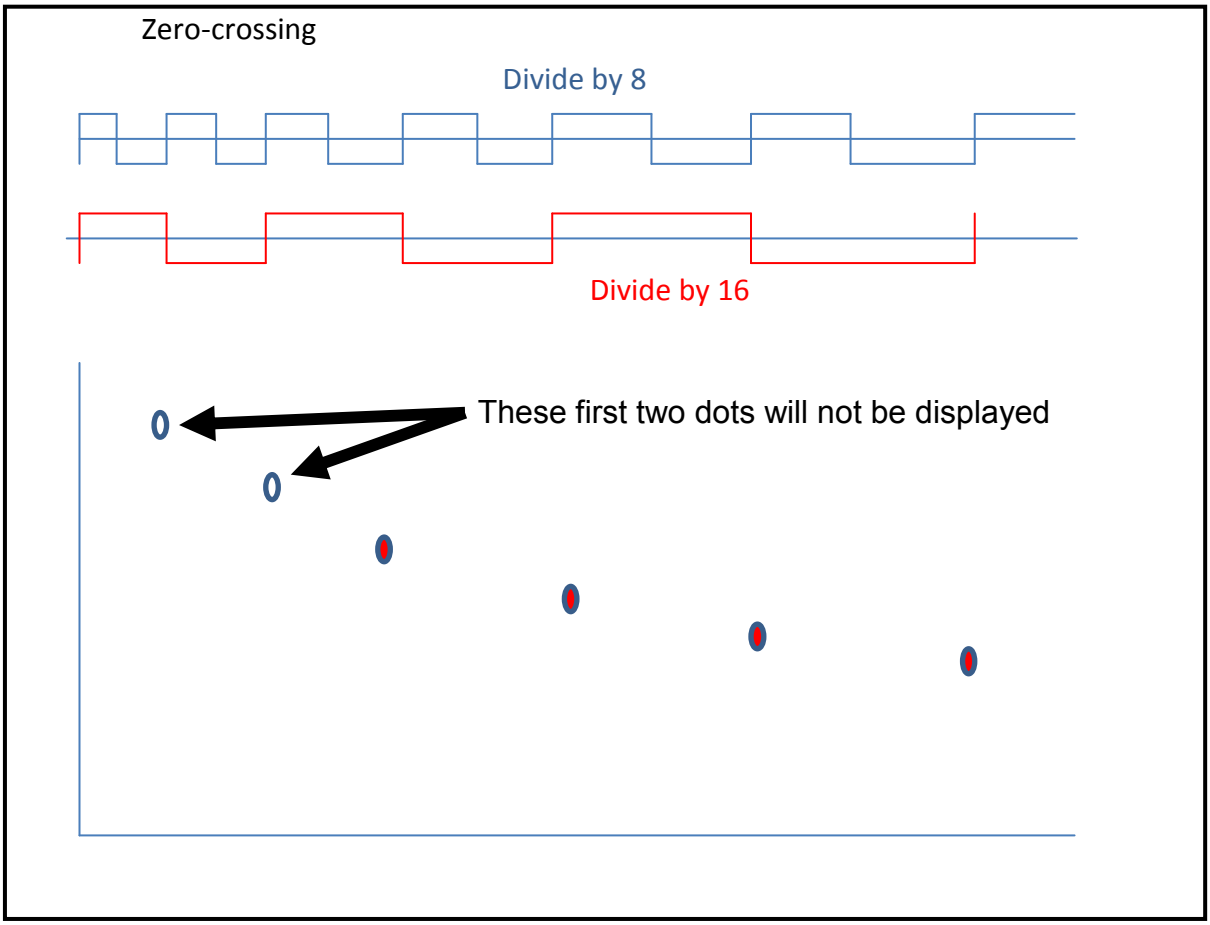


Fig. 3 (right): *Miniopterus australis* call recorded by Greg Ford at Div16, but showing the clear buzz pulses, displayed in F7.

Appendix 1 (following two pages): Images to help interpret Chris Corben's explanations in the preceding text. *[Ed: a wonderful portal into the genius thought processes that are Chris Corben…!)*


Zero-crossing
Divide by 8
Divide by 16


Zero-crossing transitions
Divide by 8
These first two dots will not be displayed


Zero-crossing
Divide by 8
Divide by 16
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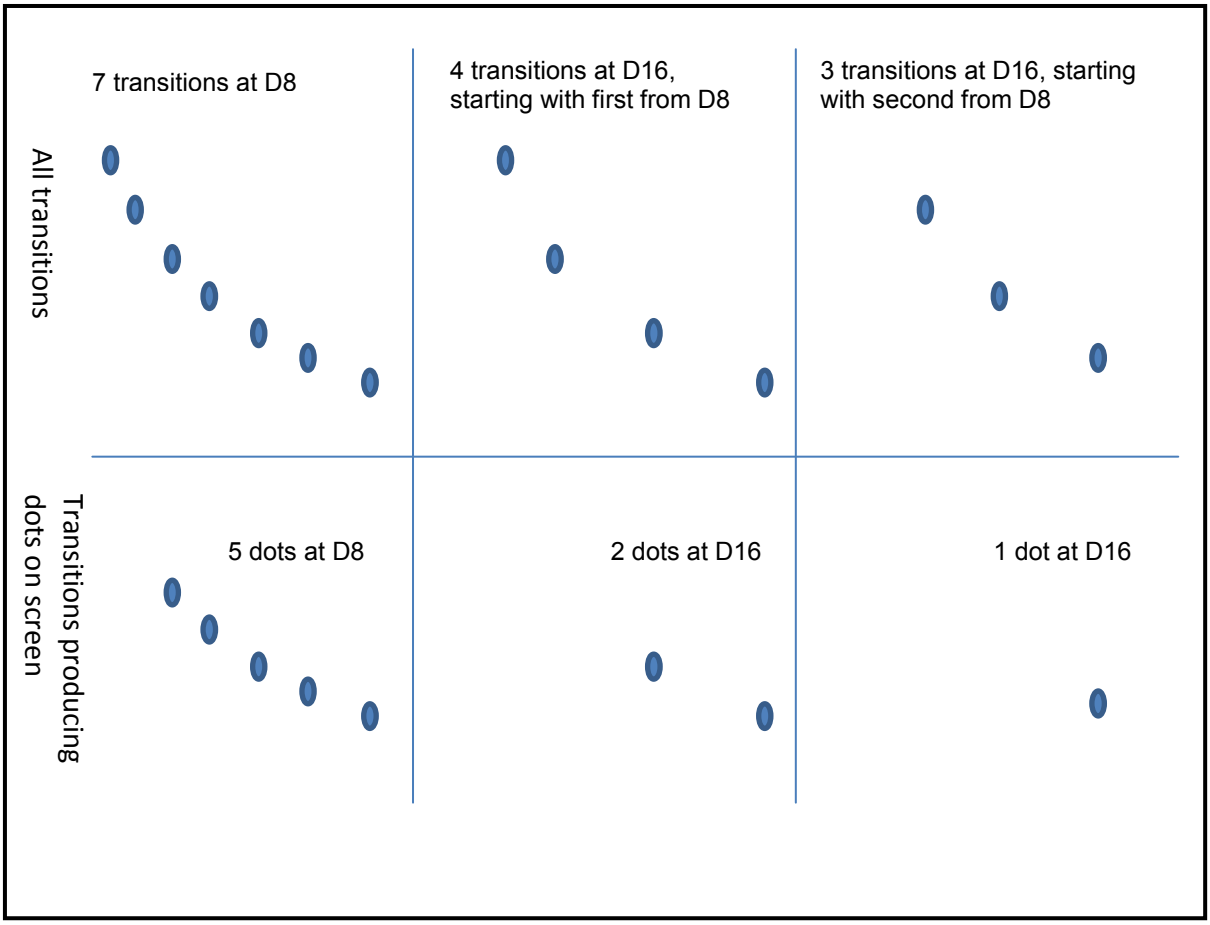

All transitions
Transitions producing dots on screen
7 transitions at D8
4 transitions at D16, starting with first from D8
3 transitions at D16, starting with second from D8
5 dots at D8
2 dots at D16
1 dot at D16

Witty photo caption competition

They're wrapped in black leath'ry patagium
With space on this tree at a premium –
The roost's a bare prong
That's just five fruit-bats long –
A pteropus small-scale condominium.

By Robert Bender.

Ed: Thank you Robert for this great limerick! I thought Nick Edards image at left deserved another print run – I think it's a great shot!

Hopefully it doesn't distract you all from composing a thought blurb for the images above, kindly supplied by Anna McConville, who clearly is not afraid of the trouble this may land her in with her supervisor! These photos were taken at Umbrawarra Gorge during the post-conference field trip during a successful python seeking mission.

Email suggestions to editor@ausbats.org.au or *s.campbell@zoology.unimelb.edu.au*

– News and Announcements –

New honorary life members

Prepared by Terry Reardon

The Australasian Bat Society has provision in its constitution to elect up to two Honorary Life Members at each AGM. Since its formation in April 1991, only three people have had Honorary Life Membership bestowed upon them – Les Hall, Elery Hamilton-Smith and F.R. 'Dick' Alison, RIP.

At the AGM during the conference at Darwin I had the pleasure to nominate two further candidates, Len Martin and Greg Richards, both of whom were duly elected unanimously.

Len Martin
Len was a co-founder of the ABS and its first President (1991-1996). Len was (and still) bemused that he was the ABS first President since he did not see himself as a 'bat person'. But through his leadership, borne of vibrant personality and intellectual acumen, he attracted a good committee around him and with them, steered the Society through its formative years into rapid maturity. Len's contribution to the Hendra and Australian Bat Lyssavirus crisis was tireless, professional and vehement, especially in the face a terrible public and government backlash against flying-foxes. I think the issue took a huge toll on Len.

I encourage members to go back to some of those first ABS *Newsletters* (available on the ABS website) and read Len's presidential reports and articles, they were always very witty and full of great information. It was great to see him at the Sydney conference – he was as ever, irreverent and entertaining.

I went in search of a photo of Len, and in the end had to solicit one directly from him....for those who haven't caught up with him in awhile, here is some of his email…and the picture (over page):

LM: "Strewth, bugger the Nobel – that's nowhere near as good as winning the Nimbin Performance Poetry World Cup and now THIS. Seriously I am deeply honoured. For the record, Kay (71) and I (76) are alive and well (unlike God) and living in the paradise of Nimbin, on a 600 acre multiple occupancy known as Nimbin Rocks Co-op, which actually has the biggest of the Nimbin Rocks on it. It also has a *Miniopterus* cave, named by my dear colleague Les Hall as *Martin's Crack*. Private tours can be arranged at a price. We are founding and active members of Nimbin Bushwalkers Club, and I continue to ride a push-bike into Nimbin and back as often as I can.

Recent activities relating to flying-foxes include:
- serving on NSW government's advisory panel that recommended ending permits to shoot FFs in orchards, a report that has been studiously ignored by said government;

- member of panel discussing flying-foxes and rainforest regeneration at Big Scrub Rainforest Landcare Group's 2009 *Rainforest Day* and also doing a "FF workshop" – basically a one man "all you ever wanted to know about FFs and never dared ask", accompanied by one lovely caged female *P. poliocephalus* - oh for the days when we were all free!

- shortly a paper will be published entitled, "Is the fruit you eat flying-fox friendly?", detailing the horrors of the electrocution grids once used to "protect" fruit in QLD & NSW.

My only FF pome, performed at the very first NPPWC, relates to that old bush myth that says FFs don't have an anus in the usual place cause the animals hang upside down and...

<u>To flying-fox-faecation or, what a load of</u>

From a Great Height
Oh best beloved, a pome for you
Alas it's on *Pteropus* poo
The Flying-fox code
When they poo and they pee
Is thumbs above bums
It's much cleaner you see, and
Dear old sport
I'm making this short, cause
Brevity is the soul of wit
and
Gives a denser load of ... so
When seized to make verse
I try to be terse
And emulate Nash
With a brief...
Pungent...
Slash!

All the best from your local neighbourhood eco-terrorist, that Bitter and Twisted Bastard The Old Bent Bat"

Greg Richards
Greg Richards in fact took over the Presidency from Len in 1997 and has been one of the most active contributors to the ABS through his roles on the executive and the extended executive. It's not widely appreciated the amount of email traffic that the Executive and extended Executive trade, especially at conference times and when issues such as the Christmas Island Pipistrelle arise. Greg has been a wise counsel during those times and been a great activist for bats and the Society. He has also been our international liason person. He has been a generous supporter of bat research, and has financially supported conference prizes almost since the first conference.

We thank both Len and Greg (image below) for their contributions to the ABS.

Wild Australia Guide: Bats

Congratulations to Les Hall who recently won a Whitely Award for the best pocket guide in 2010 for their new guide book on bats.

Future funding opportunity

Thanks to Steve Griffiths for sending through information on the **Margaret Middleton Fund for endangered Australian vertebrate animals.** Grants of up to $15,000 are available and the closing date each year is the 31st August.
More information can be found at:
http://www.science.org.au/awards/awards/conservation.html

Rabies guidelines

The World Health Organisation (WHO) has released revised Rabies guidelines, you can find them at:
http://www.who.int/wer/2010/wer8532.pdf
It is worthwhile looking through the guidelines for anyone working with bats or writing risk assessments / safe operating procedures for bat work etc. The majority of the guidelines are similar to previous practice, with only minor changes (i.e., post exposure treatment of three and not four shots).

Terry Reardon and best conservation paper winner, Maree Cali sharing a bat shake. Photo Chris Grant.

BAT CONSERVATION INTERNATIONAL
www.batcon.org

Bats in International Forestry Scholarships for 2011

The U.S. Forest Service International Programs' *Bats in International Forestry Scholarship Fund* supports up to 10 Bat Conservation International scholarships for research conducted in developing countries. Projects should be focused on the roles bats play in providing ecosystem services (such as pollination, seed dispersal, pest control or maintenance of biodiversity) and/or on habitat requirements that are critical to bat conservation. Students at any university worldwide are eligible to apply for Bats in International Forestry scholarships, but only research undertaken in developing countries will be considered. Other BCI scholarships are available for conservation-relevant research anywhere in the world.

All BCI scholarships are competitive, and research proposals will be evaluated by an international panel of reviewers. Applications that qualify will automatically be considered for Bats in International Forestry awards. Scholarships range from $2,500 to $5,000.

The deadline for applications is Dec. 15, 2010. For information or to apply for a BCI scholarship, visit BCI's website at: *www.batcon.org/scholarships*.

Previous BCI Bats in International Forestry Scholarships

Eric Moise Bakwo Fils, University of Yaounde
Fruit bats, seed dispersal and forest conservation in Cameroon.

Corneile Minnaar, University of Pretoria
The effect of artificial night lighting on the diet composition of insectivorous bats (*South Africa*)

Ralisata Mahefatiana, University of Antananarivo
Population and roosting ecology of the Old World Sucker-footed bat (*Madagascar*)

Laura Cisneros, *University of Connecticut*
Bat metacommunities in a Neotropical fragmented landscape: time-lag responses to dynamic changes in land cover (*Costa Rica*)

Kendra Phelps, Texas Tech University
Significance of karst formations to bat conservation in peninsular Malaysia (*Malaysia*)

Jorge Ayala, Universidad Nacional Autónoma de México
The effect of physiological constraints in the geographical distribution of nectar-feeding bats (*Mexico*)

HONOURS RESEARCH PROJECT

WHERE TO LIVE?

THE POTENTIAL OF BAT BOXES AS ROOSTS FOR JARRAH FOREST BATS IN SOUTH-WESTERN AUSTRALIA

In collaboration with Alcoa World Alumina Australia

Feeling a little bit batty? An exciting opportunity exists for a motivated honours student to study the potential of bat boxes as a management technique to ameliorate the impacts of strip mining on jarrah forest-dwelling insectivorous bats. As only a handful of studies have examined these bats, this project will be seminal in addressing an urgent need to understand responses of the south-western Australian bat fauna to restoration in a mined landscape.

The northern jarrah forest is home to nine species of insectivorous bats, all of whom are reliant on trees, mostly in form of hollows, for shelter and breeding. Alcoa is committed to a restoration objective of establishing a self-sustaining jarrah forest ecosystem. However, the formation of tree-hollows that are suitable for hollow-roosting bats requires over mature, senescent trees that take over a century to develop; within a bauxite mined landscape, the rate of loss of hollow-bearing trees will undoubtedly exceed replacement.

This project will work closely with a Murdoch University PhD student who is studying the impacts of restored bauxite minesites on jarrah forest bats. The research will be conducted within Alcoa's Huntly bauxite minesites near Dwellingup and will involve monitoring bat box use within the jarrah forest and comparing roost microclimate conditions. The opportunity exists to develop skills in trapping and handling bats, using radiotelemetry to locate roost sites and measuring roost preferences. An interest and willingness to work in the field is required, though prior experience is not necessary.

For further information, please contact:

Joanna Burgar, PhD Candidate, School of Biological Sciences, Murdoch University
Ph: 9360 6520; Email: J.Burgar@murdoch.edu.au
and/or
Dr Vicki Stokes, Research Scientist, Alcoa World Alumina Australia
Ph: 9530 2325 or 0427 857766; Email: vicki.stokes@alcoa.com.au

BAT CONSERVATION INTERNATIONAL
www.batcon.org

BCI Student Research Scholarships for 2011

Bats play essential but largely unappreciated roles in maintaining healthy ecosystems and human economies throughout the world. Many species are primary predators of night-flying insects, while others are critical pollinators and seed dispersers for countless plants. Yet bat populations are declining around the world, largely because they are so often misunderstood and so rarely studied. Since 1990, Bat Conservation International has addressed this lack of knowledge by supporting student research projects around the world through its Student Research Scholarships. We have awarded a total of $724,250 to help 291 students conduct research relevant to bat conservation in 59 countries.

Each year, BCI awards 15 to 20 scholarships of up to $5,000 each. Projects should be focused on the roles bats play in providing ecosystem services (pollination, seed dispersal, pest control, maintenance of biodiversity) and/or on habitat requirements that are critical to conservation. As many as 10 of the scholarships are supported by the U.S. Forest Service International Programs. These *Bats in International Forestry Scholarships* are specifically for research conducted in developing countries.

BCI scholarships are competitive and proposals will be evaluated by a distinguished international panel of peer reviewers. The deadline for applications is December 15, 2010. For more information or to apply, visit BCI's website at: *www.batcon.org/scholarships*.

Examples of Previous BCI Scholarships

Elizabeth Braun de Torrez, Boston University (*U.S.*) Foraging behavior of bats in pecan orchards: Implications for ecosystem services

Dawn Cory Toussaint, University of Pretoria (*South Africa*) Bats roosting in Baobab trees: Importance of thermally buffered microsites for water and energy balance in a hot, dry habitat.

Gabriel Reyes, Humboldt State University (*U.S.*) Behavioral function of social calls in migratory hoary bats.

Natalia Cortes-Delgado, Instituto de Ecología, A.C. (*Mexico*) Roost use in shade coffee plantations by *Sturnira ludovici* and *Artibeus intermedius*.

Amanda Adams, University of Western Ontario (*Canada*) Spatio-temporal variation in bat activity and community structure.

Alona Gukasova, St. Petersburg State University (*Ukraine*) New system of summer bat population monitoring in Ukraine.

TRACKING A MYSTERIOUS MICROBAT - Mangrove mud, swamp flats and city lights

Image: Matthew Jones from 2008 field season

VOLUNTEER OPPORTUNITY

PhD project: The ecology of the East Coast Freetail Bat (*Mormopterus norfolkensis*) in the Hunter Region, The University of Newcastle

My last volunteer flyer in 2008 was entitled 'TRYING TO CATCH AN ELUSIVE MICROBAT, Harp Trapping, Mist Netting, Trip Lining, Radio-tracking and fingers crossed, in the Hunter Region'. The six week stint proved to try even the most seasoned field member's patience as we worked tirelessly to try and capture this elusive little bat. Many thanks to the dedicated volunteers who assisted me at the Kearsley Rural Fire Station field camp. With the finish of the field work, a total of three *Mormopterus norfolkensis* had been captured, which was much less than required for the study. Maybe someone didn't cross their fingers as requested!

However, during the 2009/10 field season, the bat gods looked favourably upon us and we found 'Norfy Utopia', which unexpectedly was a stand of mangroves in the Hunter Estuary. This was a most exciting find, with over 200 bats captured in one night, a number never before captured at once. All the hard work has finally paid off … and so close to home!

This year, we will track bats again from Norfy Utopia and I am seeking volunteers to assist. I prefer volunteers that can help out for a block at a time (eg a week) so that we can get into a good rhythm. But those that can only help out for short periods (ie locals that can help for only nights or days only) will still be needed. I am aiming to have 3-4 field teams of 2 people for the night radio-tracking and the day work should only take 1-2 teams to allow people a chance to recover from night work.

DETAILS:

WHAT:
Radio-tracking *Mormopterus norfolkensis* near Newcastle, NSW

WHEN:
15 November – 24 December 2010 – you can volunteer for any part thereof. The project is dependent on timing radio-tracking to coincide with just after females have given birth (the maternity season) so the actual start date may be delayed by a couple of weeks. But we should have a good estimate a couple of weeks before we are due to start.

WHERE:
Kooragang Island in the Hunter Estuary is the main roost site, but we will also be tracking around 10km away.

All meals provided and accommodation can be provided if required (a cosy mattress on my lounge-room floor!). My house is a 10 minute drive to the beaches and Newcastle city centre and there should be some time during the day for those of you that don't need much sleep to have a look around.

CONTACT:

If you are interested, contact Anna McConville at anna.mcconville@uon.edu.au or on 0423801779 to register your interest and receive further information.

Discover Tasmania – the batty way

Are you a little bored with your local *Nyctophilus* sp? Are you a closet bat twitcher and need to see a *Nyctophilus sherinni*? Want to visit Tasmania but never had a good enough reason?

Well, wait no more – the time as come! Tasmania and her batty inhabitants await you. You are invited to come play in the Tassie forests this summer trapping and radio-tracking micro bats, with a focus on the often elusive Tasmanian long-eared bat to investigate roost selection in timber production forests. Between December 2010 and February 2011 (the maternity season), teams of volunteers and myself will be trapping and radio-tracking bats daily. Volunteers will assist in trapping, radio-tracking, collecting data on bat torpor and counting emerging bats from the roost. No experience necessary. Bat dance participation desirable but not essential. Transport to site, food and accommodation all provided – I'll even provide the head torch.

Interested?

Contact me – Lisa Cawthen, for more information.
lcawthen@utas.edu.au

Another species you may be lucky to encounter in Tasmania on one of Lisa's field trips, the Eastern Falsistrelle *Falsistrellus tasmaniensis*. Thanks to Lib Ruytenberg for the great picture.

– Book reviews –

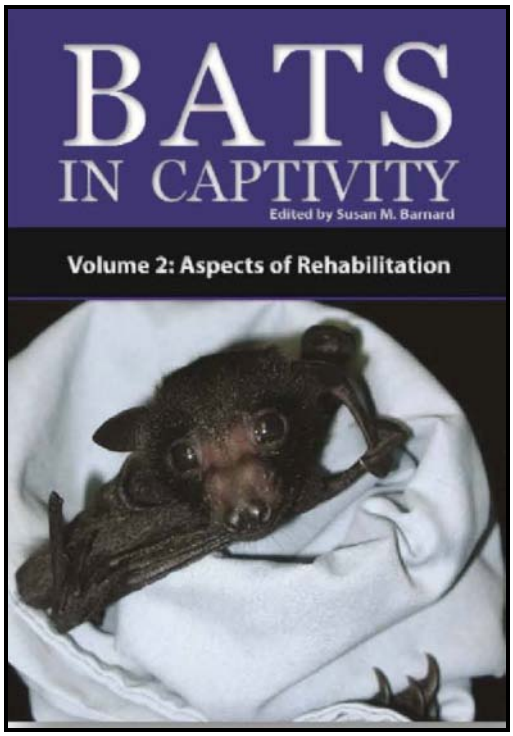
Bats in Captivity: Volume 2
Aspects of Rehabilitation

Susan Barnard, 2010

Logos Press

Reviewed by Jenny Maclean

Tolga Bat Hospital
jenny@tolgabathospital.org



This book is intended for anyone caring for bats, both micro and mega, in captivity. It comprises 460 pages, and 38 papers by 41 contributing authors. Australian authors include Brad Law on Old World Nectarivorous Bats, Les Hall and Tom Steginga on the Australian Ghost Bat, Nicola Markus on Releasing Flying-foxes, Jo Cowie on Hand Rearing young Ghost Bats, Clancy Hall from Currumbin Sanctuary on hand rearing Little Broad-nosed Bat, Danielle Stokeld Davenport from Melbourne Zoo on hand rearing Gould's Wattled Bat, and Helen Luckhoff on Hand Rearing Infant Australian Flying-foxes.

This is the second of 4 books planned. The first was Biological and Medical Aspects in 2009 (book review in ABS newsletter No. 33 Nov 2009), other titles to come are: Diet & Feeding, Environment & Housing (due out 2011) and Legislation and Public Education (due out 2012).

The sections in Volume Two are as follows: What are Bats and Why Save Them, Identifying Bats, Reproductive Patterns and Parental care, Social Organization and Communication, Aging Bats, Longevity in Bats, Capturing and Handling, Aspects of Rehabilitation, Marking Bats, Torpor and Hibernation, Lactation and Postnatal Growth, Stimulating Mother's Milk, and Hand Rearing Infant Bats.

Barnard has scoured the world to find excellent contributing authors, many of whom are household names for us. Nevertheless, for those I didn't know, I would have liked to see a short biography of the contributors in relation to their bat credentials. We are only given their work postal addresses.

This book contains a wealth of information, well illustrated by a generous use of photographs. It is very difficult to find other easily accessible sources of published information on the captive care of bats. The only two sources that I am aware of are Dave Pinson's Flying fox Manual from Australia, and from USA, Lollar and Schmidt-French's 'Captive Care and Medical Reference for the Rehabilitation of Insectivorous Bats'. Both of these publications also offer very good detailed information for hands-on care, and are written by dedicated carers.

I'd recommend that all those involved in captive care of bats have a copy of Barnard's books, but those working with flying foxes also have Pinson's Manual and likewise those working with microbats also have Lollar-French's book. Sue Barnards' book though is unique in that it offers information on both microbats and megabats.

I did have a few problems with the book though.

- I found the 'towel method' of capturing large flying-foxes in captivity described rather inadequately in the book, both text and photo.
- A photo of our large megabat flight cage at Tolga Bat Hospital is wrongly credited as being suitable for insectivorous species. In some respects it could be suitable, but it is far more suitable for flying-foxes.
- Some of Helen Luckhoff 's information on the rearing of Australian flying-foxes is a little dated. There is no mention of the widespread

use of cow's milk, nor Dave Pinson's Flying Fox Manual, which is really the 'holy book/DVD' for most Australian bat carers. The DVD, updated regularly, is specifically aimed at flying-fox carers and there is no mention of it anywhere in Barnard's book. Again a pity for those beginning to work with flying-foxes, or even if they have worked with them for a long time.

Barnard's book though is easy to navigate and read. I look forward to Volumes 3 - 4 as they will be welcome additions to this already excellent resource.

A review copy of Bats in Captivity, Vol. 2 was kindly made available to the ABS by Logos Press, info@logos-press.com, www.logos-press.com

The truth about bats
"Magic school bus science"

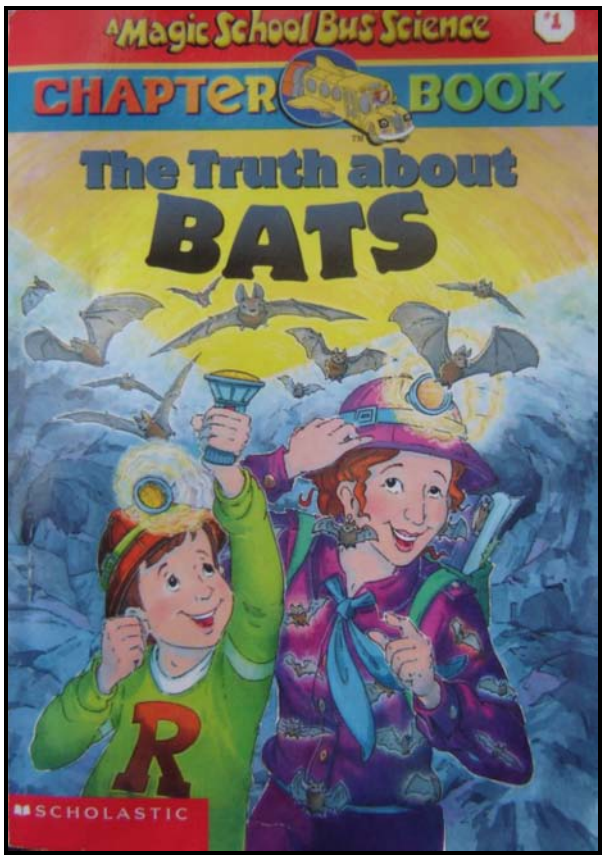
Joanna Cole, 1999
Scholastic Inc New York

Reviewed by Robert Bender

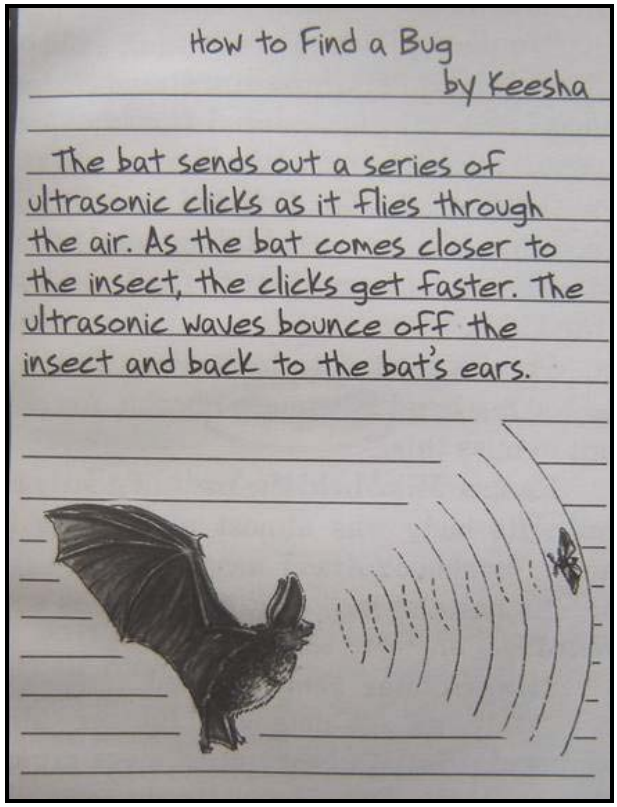
rbender@netlink.com.au

This little book is aimed at primary school children. It is one of a large series involving a magic school bus that can instantly convert into a jet plane, a helicopter or a log cabin, and takes a class of young children adventuring in the natural world with their science teacher Ms Frizzle, who knows everything. In this one, the Friz takes them to Yosemite in search of the rare Spotted Bat. Her bat-o-meter buzzes along the way and they drop out of the sky to investigate a cave where they inadvertently disturb a nursery colony of Gray Bats, and quickly retreat so as not to disrupt the colony. They eventually reach Yosemite where Ranger Mike sets up mist nets across a river and captures Spotted Bats with the help of a bag of moths released by The Friz.

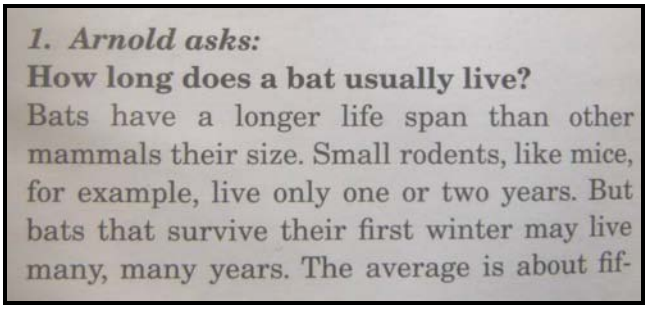
The various children are a mix of phobias (Phoebe), background knowledge (Carlos) and curiosity. The somewhat silly story line is broken by bits of "diary" from the children, extracts from their post-excursion assignments, as a way of stating some basic facts about bat biology and



life-ways. It is well illustrated by "snapshots" taken by storyteller Ralphie along the way, and pictures of bats echo-locating, flying, or exiting the bridge in Austin Texas, their last stop on the way home to enjoy the mass fly-out of millions of Mexican Freetails.



Near the end, after Friz explains the huge volume of crop-pest insects eaten by bats, anxious Phoebe is converted, by being allowed to stroke a little Spotted Bat, and ends up a fervent advocate for bat protection, cave-gating and convincing a nervous public that bats are beneficial.



1. Arnold asks:
How long does a bat usually live?
Bats have a longer life span than other mammals their size. Small rodents, like mice, for example, live only one or two years. But bats that survive their first winter may live many, many years. The average is about fif-

On their return to school the children have some eager questions, so there is a final section of FAQs and the last page suggests installation of bat houses to en-courage bats to roost around the school building.

It's very American, but a good discussion starter about many issues that still concern us all: public perceptions of bats, endangered species, the similarities between human and bat body design, bat trapping techniques, bat diet, bat calls, conservation and protection of bats. Scientific advisers were Jacqueline Belwood PhD, Ohio Biological Survey research associate, and Dennis Krusac, of the Endangered Species specialist with the US Dept of Agriculture, and the last page refers readers to Bat Conservation International's website. It was $3.99 in the USA a decade ago, 50c in the op shop where I found it.

– Recent Literature –

Compiled by Susan Campbell from Web of Science (late March 2010 – early October 2010).

[*Ed: "Murder in the Bat Cave"; Made me think there was trouble brewing in Terry and Chris' patented 'Bat Cave', but the real story is much more dire – see the burgeoning literature section on WNS]*

Roosting ecology

Fukui, D., K. Okazaki, et al. 2010. "The effect of roost environment on roost selection by non-reproductive and dispersing Asian parti-coloured bats *Vespertilio sinensis*." Mammal Study **35**(2): 99-109.

Kanuch, P., A. Fornuskova, et al. 2010. "Do two cryptic pipistrelle bat species differ in their autumn and winter roosting strategies within the range of sympatry?" Folia Zoologica **59**(2): 102-107.

Monadjem, A., T. Raabe, et al. 2010. "Roost use by two sympatric species of Scotophilus in a natural environment." South African Journal of Wildlife Research **40**(1): 73-76.

Campbell, S., G. Coulson, et al. 2010. "Divergent microclimates in artificial and natural roosts of the large-footed myotis (*Myotis macropus*)." Acta Chiropterologica **12**(1): 173-185.

Ruczynski, I., B. Nicholls, et al. 2010. "Selection of roosting habitats by *Nyctalus noctula* and *Nyctalus leisleri* in Bialowieza Forest-Adaptive response to forest management?" Forest Ecology and Management **259**(8): 1633-1641.

Scheunert, A., A. Zahn, et al. 2010. "Phenology and roosting habits of the Central European grey long-eared bat *Plecotus austriacus* (Fischer 1829)." European Journal of Wildlife Research **56**(3): 435-442.

Uhrin, M., P. Kanuch, et al. 2010. "Phenotypic plasticity in the greater mouse-eared bat in extremely different roost conditions." Acta Theriologica **55**(2): 153-164.

Wermundsen, T. and Y. Siivonen. 2010. "Seasonal variation in use of winter roosts by five bat species in south-east Finland." Central European Journal of Biology **5**(2): 262-273.

Foraging behaviour

Becker, N. I., C. Rothenwohrer, et al. 2010. "Dynamic feeding habits: efficiency of frugivory in a nectarivorous bat." Canadian Journal of Zoology-Revue Canadienne De Zoologie **88**(8): 764-773.

Carter, G. G., J. M. Ratcliffe, et al. 2010. "Flower Bats (*Glossophaga soricina*) and Fruit Bats (*Carollia perspicillata*) Rely on Spatial Cues over Shapes and Scents When Relocating Food." Plos One **5**(5).

Jackrel, S. L. and R. S. Matlack. 2010. "Influence of Surface Area, Water Level and Adjacent Vegetation on Bat Use of Artificial Water Sources." American Midland Naturalist **164**(1): 74-79.

Jonker, M. N., W. F. de Boer, et al. 2010. "Foraging and public information use in common pipistrelle bats (*Pipistrellus pipistrellus*): a field experiment." Acta Chiropterologica **12**(1): 197-203.

Langton, S. D., P. A. Briggs, et al. 2010. "Daubenton's bat distribution along rivers - developing and testing a predictive model." Aquatic Conservation-Marine and Freshwater Ecosystems **20**: S45-S54.

Luskin, M. S. 2010. "Flying Foxes Prefer to Forage in Farmland in a Tropical Dry Forest Landscape Mosaic in Fiji." Biotropica **42**(2): 246-250.

Muchhala, N. and J. D. Thomson. 2010. "Fur versus Feathers: Pollen Delivery by Bats and Hummingbirds and Consequences for Pollen Production." American Naturalist **175**(6): 717-726.

Munguia-Rosas, M. A., V. J. Sosa, et al. 2010. "Pollination system of the *Pilosocereus leucocephalus* columnar cactus (tribe Cereeae) in eastern Mexico." Plant Biology **12**(4): 578-586.

Rainho, A., A. M. Augusto, et al. 2010. "Influence of vegetation clutter on the capacity of ground foraging bats to capture prey." Journal of Applied Ecology **47**(4): 850-858.

Scott, S. J., G. McLaren, et al. 2010. "The impact of riparian habitat quality on the foraging and activity of pipistrelle bats (*Pipistrellus* spp.)." Journal of Zoology **280**(4): 371-378.

Stephenraj, D. and S. S. Isaac. 2010. "Nocturnal pollination of Parkia biglandulosa by nectar feeding bat, *Cynopterus sphinx*." Current Science **99**(1): 24-25.

Zahn, A., S. Bauer, et al. 2010. "Foraging habitats of *Myotis emarginatus* in Central Europe." European Journal of Wildlife Research **56**(3): 395-400.

Diet studies

Heer, K., L. Albrecht, et al. 2010. "Effects of ingestion by neotropical bats on germination parameters of native free-standing and strangler figs (Ficus sp., Moraceae)." Oecologia **163**(2): 425-435.

Lenhart, P. A., V. Mata-Silva, et al. 2010. "Foods of the pallid bat, *Antrozous pallidus* (Chiroptera: Vespertilinidae), in the Chihuanhuan desert of Western Texas." Southwestern Naturalist **55**(1): 110-115.

Mancina, C. A. and L. G. Herrera. 2010. "Disparate feeding strategies used by syntopic Antillean nectarivorous bats to obtain dietary protein." Journal of Mammalogy **91**(4): 960-966.

Mohd-Azlan, J., A. A. Tuen, et al. 2010. "Preliminary assessment of activity pattern and diet of the lesser dog faced fruit bat *Cynopterus brachyotis* in a Dipterocarp Forest, Sarawak, Borneo." Tropical Ecology **51**(2): 297-302.

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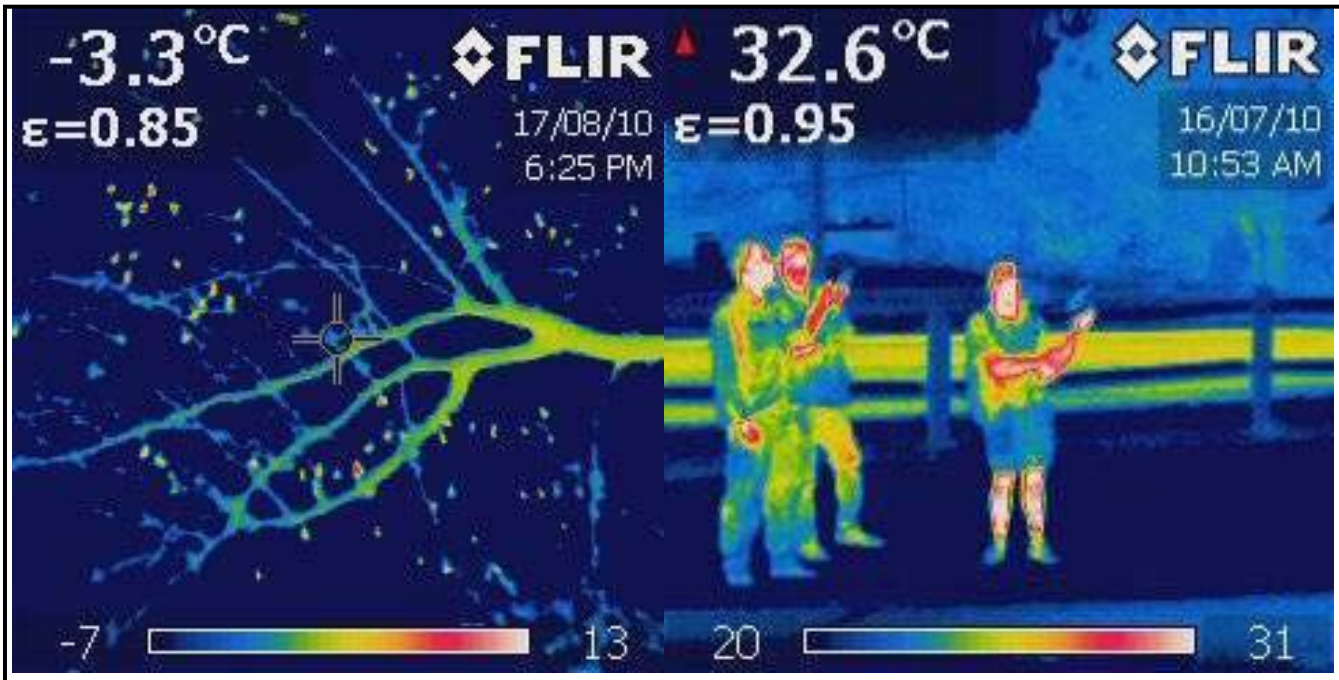

A thermal camera picture of a Grey-headed Flying-fox camp in winter (above left) in sub-zero temperatures looking like fairy lights in a deciduous tree, along with a thermal picture of Chris 'hot legs' Corben, Terry Reardon and Greg Ford Anabatting at Pine Creek (above right). Photo thanks to Michael Pennay.

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