The Australasian Bat Society Newsletter

Number 26 April 2006

ABS Website: http://abs.ausbats.org.au
ABS Listserver: http://listserv.csu.edu.au/mailman/listinfo/abs
ISSN 1448-5877

– 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: **31st March** for the April issue, and **31st 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. Manuscripts can also be sent on 3½" floppy disk, preferably in IBM format. **Please use the Microsoft Word template if you can (available from the editor).** 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 addresses of authors; 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 addresses of authors. 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.
- Research Papers and Notes will be refereed, and specialist opinion will be sought in some cases for other types of articles. Editorial amendments may be suggested, and articles will generally undergo some minor editing to conform to the *Newsletter*.
- Please contact the *Newsletter* Editor if you need help or advice.

President	**Secretary**	***Newsletter* Editor**
Rob Gration	Maree Kerr	Kyle Armstrong
Northern Melbourne Institute of TAFE	72 Lee Steere Crescent	Molhar Pty Ltd
PO Box 8, Epping, Victoria 3015	Kambah, ACT 2902	c/- 46A Cale Street, Como,
rgration@yahoo.com.au	Ph: 02 6296 4823	Western Australia 6152.
president@ausbats.org.au	Fax: 02 6230 0544	kyle.armstrong@graduate.uwa.edu.au
	Mobile: 0412 311 403	editor@ausbats.org.au
	cantcatchme@netspeed.com.au	
	secretary@ausbats.org.au	

The Australasian Bat Society Newsletter is ISSN 1448-5877.
Publishers contact address is PO Box 3229, Tamarama New South Wales 2026.

– Editorial –

This bumper issue should be a nice cure for those post-conference blues – if you can manage to lift it. Thanks to everyone who made it possible.

The editor is on the move again, coming back to Perth for however long. I will be continuing some genetic work on the bats *Rhinonicteris aurantia* and *Macroderma gigas* through a small company for a few months. Therefore, please note my new 'lifetime' email address for all new submissions and correspondence: kyle.armstrong@graduate.uwa.edu.au or else use: editor@ausbats.org.au

Issues 1–25 of this Newsletter and the entire contents of the journal 'Macroderma' are available for purchase on CD. Thanks again to Chris Tidemann for 'Macroderma', and to Greg Richards for printing the copies. Please contact Greg for your very own copy at: batmanoz@bigpond.com

In this issue, Terry Reardon and I put in a small note about updating the standard list of common names of Australian bats. This was partly in response to the compilation of the new edition of 'The Mammals of Australia'. We seek the response of member to this, so that we can derive a 'final list'. If you have a differing opinion about a name, please feel free to contact myself or Terry so that we can incorporate your view, though please justify your opinion.

Do not let the size of this 'tome' fool you into thinking that the next issue will be a cinch to fill – the *Newsletter* is eternally hungry for your article, and I know there are many ideas and good intentions out there. Send 'em in!

Kyle Armstrong
***Newsletter* Editor**


Spot the differences (taxonomists will love this)
Rhinolophus ferrumequinum and *R. cornutus* from the Japanese Izu Archipelago.

Front cover: Entanglement in barbed wire fences is a major issue involving many native wildlife species, but particularly for some such as flying-foxes. In this issue is a draft action plan by Carol Booth, which members are encouraged to give feedback on. Photo contributed by Carol.

– President's Report –

Welcome to another bumper addition of the Australasian Bat Society Newsletter.

It is with great honour, and some apprehension, that I have been elected to the position of President of the Australasian Bat Society. That the members of the society and my peers have the faith in my abilities to fill the void left by our out-going president is an honour indeed. My apprehension is due to the high benchmark set by Lindy and those before her. What I lack in experience, I hope to make up for with enthusiasm and by utilising the collective experience of the executive.

There was not only a changing of the guard with the President's position; we also have a number of new people on the executive and existing executive members in new roles. I would like to welcome Lindy to the 2nd Vice President's role vacated by me, Craig Grabham takes on the Treasurer's role and Susan Campbell is now the Assistant Editor. Maria Adams has vacated the Assistant Editor's role to concentrate on her PhD; we look forward to her involvement on the executive again once the PhD is completed. Due to work commitments, Natasha Schedvin has vacated the Treasurer's role. On behalf of ABS members, I would like to thank Natasha in ensuring our finances were in order and wish her all the best in her role as ecologist at the Australian Wildlife Conservancy Scotia sanctuary. Thank you to the executive members that are continuing in their existing positions and the non-executive members for their continuing input into the Society.

The New Zealand conference was an outstanding success with 85 delegates attending. The topics covered by the presenters were extremely varied and provided scope for interesting discussions of an evening. I would like to thank, and congratulate, Stuart Parsons and his team of helpers for their excellent co-ordination skills. Congratulations to all conference award winners in the various categories (see photos in the *Reports and Viewpoints* section).

A reminder to members to subscribe to the ABS listserver, it is an excellent forum for posting queries and receiving valuable information on equipment, survey techniques and conservation issues. I will soon be posting an interesting proposal for a ABS members to undertake fieldwork at the Australian Wildlife Conservancy's Kimberley sanctuary later this year. So you will need to be subscribed if you want to find out what it is all about.

Until the next newsletter, here's hoping that you catch the bat of your dreams.

Rob Gration
ABS President (newly elected)

– Australasian Bat Society: business and reports –

Minutes of the ABS Annual General Meeting held on 21 April 2006, at the 12th Australasian Bat Society Conference, Auckland, New Zealand.

1. Attendance and apologies

Apologies: Kyle Armstrong, Natasha Schedvin, Damian Milne, Alexander Herr, Tony Mitchell, Amy Williams.

Present: Gillian Bennett, Susan Campbell, Peggy Eby, Lisa Evans, Stan Flavel, David Gee, Jamie Gibbins, Craig Grabham, Chris Grant, Rob Gration, Sue Hand, Luke Hogan, Judith Hopper-Hallinan, Maree Kerr, Lindy Lumsden, Jenny Maclean, Dennis Matthews, Debbie Melville, Geraldine Moore, Colin O'Donnell, Nancy Pallin, Kerryn Parry-Jones, Michael Pennay, Terry Reardon, Greg Richards, Lynda Stevenson, Bruce Thomson, Trish Wimberley, Terry Wimberley, Carole West, Anne Williams, Narawan Williams, Ray Williams.

2. Ratification of Minutes of FAGM, Melbourne 2005

David Gee moved and Lindy Lumsden seconded that the minutes of the 2005 FAGM be accepted as a true record.

3. Reports from executive officers

President's Report – Lindy Lumsden

It is great to have our first Australasian conference outside of Australia and I would sincerely like to thank Stuart Parsons and his team for putting on such a great conference. I am sure the post-conference field trip, that some of us are lucky enough to be going on, will be equally fantastic and provide the Australians the opportunity to see New Zealand's unique and fascinating bats.

Recent months have been a busy time. So that we could use the ABS credit card facilities for this conference, the money needed to be collected by someone in Australia and so I offered to do the registrations and banking. This worked smoothly and made it easier for members to pay for the conference, and meant that Stuart had one less thing on his plate.

I have also just taken over as acting-Treasurer from Natasha Schedvin. Natasha has been our Treasurer for eight years, keeping track of all the finances and fulfilling our BAS requirements. I would like to sincerely thank Natasha for working quietly in the background maintaining this vital role for the society. However, in February she shifted to far western NSW and no longer had ready access to email and banking facilities. She therefore resigned as Treasurer and as I had not received any response to my requests for someone to take over this position, she handed the books over to me. Hopefully at this meeting I will be able to pass them on to a new Treasurer.

The newsletter has continued to thrive with Kyle doing a fantastic job from Japan. The last issue was a bumper 80 pages! Maria Adams was printing the newsletter in Wollongong, however, she was having difficulties with printers and so we have now shifted the printing and posting to Victoria. I have managed to find a cheap, good quality printer and so hopefully we will not have any more problems. I would like to thank Maria for her efforts in the Assistant Editor's role. Due to work and PhD finalisation commitments she is no longer able to continue in this position.

At last year's FAGM we discussed the idea of compiling details of Honours, Masters and PhD thesis that have been undertaken on bats, and making this list available on our website. A number of people have sent me details of their thesis or their student's thesis, but I am keen to receive many more. I will then compile the list and make it available so that others can know what projects have been undertaken.

Another thing I planned to do this last year was to see if it was possible for wildlife carers to obtain free rabies inoculations. I have determined the situation in Victoria, and although this has not been widely known, any wildlife carer that handles bats is eligible for **free** vaccinations. I have the name of the contact person in the Department of Human Services that organises this. All he needs is a brief letter from the carer's GP (on letterhead paper), stating eligibility for the free vaccine and he will then arrange supply directly to the GP's office. I have informed the wildlife carer organisations in Victoria of this information. I am yet to follow this up in other states, but hopefully the same situation occurs.

Next year in April we plan to hold a joint Royal Zoological Society of NSW – ABS two-day symposium on bats. Dan Lunney and Peggy Eby have started planning this and one of the sessions will focus on the care and rehabilitation of bats. Given that it will be centrally located in Sydney we hope that as many members as possible will be able to attend and contribute. We will hold the 2007 FAGM in conjunction with this symposium.

At last year's FAGM there was considerable discussion on the plight of the Christmas Island Pipistrelle. Much has happened in the last year. The ABS and Australian Mammal Society sent letters to the Minister for Environment and Heritage outlining the urgent need for action. These letters had a major impact on raising the profile of the species and funding was provided to investigate possible causes of the decline. Unfortunately, although we have learnt a lot, we still do not know the cause of the decline and further work is needed.

Members of the executive and general membership have been busy this year. Many members contributed to the bat species accounts for the new edition of 'Mammals of Australia', that is being substantially updated with the latest information. A number of members were also involved in August 2005 in the IUCN Global Mammal Assessment, where a range of people met and assessed the conservation status of all species of mammal in Australasia. The list, supporting data and distribution maps are currently being finalised and will be included in the 2007 IUCN Red List.

Finally, I would like to thank all the members of the executive, and extended executive, for their hard work over the last two years. I am stepping down as President but will still play an active role in the running of the society, but from behind the scenes. I would like to thank Rob, Greg and Maree for their efforts and input, Damian for maintaining the membership records with such efficiency, Kyle for his long distance editorial role, Herry for his tireless work on the website, Nancy for her work as Public Officer, Terry for his ideas, and in particular Peggy for her support and words of wisdom.

I would also like to thank all the membership for their on-going commitment to bats. It is great to have such a large and enthusiastic membership increasing the profile and the conservation of this amazing group of animals that we are all so passionate about.

1st Vice President's Report – Greg Richards

Greg thanked Lindy Lumsden for a fantastic job as President, and presented his report.

Archive: There have been no additions to the archive since the last FAGM or AGM. However we should still keep this facility available.

Bat Literature CDs: Issues 1-5 of the journal *Macroderma* (1985 – 1989) and issues 1-25 of the ABS newsletter (1993 – 2005) have been recorded onto CD. This activity has proven to be a successful initiative, with sales of 23 at the 12th ABS conference, already generating over $500 for the ABS.

An index will be generated and emailed to purchasers, and will also be included on other copies and the website.

2nd Vice President's Report – Rob Gration

Rob Gration presented his report. His main activities over the past year have been organising 2005 FAGM, managing enquiries to the ABS website, and production of the Bat Manual DVD.

Treasurer's Report – Lindy presented the report by Natasha Schedvin

TREASURERS REPORT TO THE SOCIETY
FOR THE FINANCIAL YEAR ENDING 31 DECEMBER 2005

	$	% (of income)
Income		
Membership subscription	$8,026.00	95.8%
Interest (Cash Management)	$208.98	2.5%
Interest (Cheque)	$100.02	1.2%
Interest (Gift Account)	$6.41	0.1%
Donations (ABS Gift Fund)	$38.00	0.5%
TOTAL INCOME	**$8,379.41**	**100.0%**
Expenditure		
Membership Management (renewals postage, etc)		
Newsletter (production & postage)	$161.95	
Insurance (public liability)	$3,234.22	
Executive (ie. webpage production & postbox rental)	$2,062.50	
Merchant Fees (Credit Card Facilities)	$140.70	
Bank fees (Cheque)	$265.19	
Bank fees (Cash Management)	$125.95	
Bank fees (Gift)	$37.00	
TOTAL EXPENDITURE	**$6,027.51**	
SURPLUS (DEFICIT)	**$2,351.90**	
GST Refunded from ATO	$1,913.34	
GST Paid to ATO	$133.00	
ABS Cash Management Trust (Investment)	$7,144.96	
ABS Cheque Account	$20,270.47	
ABS Gift Fund (Donations)	$1,030.06	
TOTAL ASSETS	**$28,445.49**	

Membership	
Cash inflow	$8,026.00
Costs	$161.95
Surplus	$7,864.05

Bank account costs	
Cash inflow	$315.41
Cash outflow	$428.14
Deficit	$112.73

Summary		
Membership	$7,864.05	99.5%
Donations	$38.00	0.5%
Newsletter	$3,234.22	-40.9%
Insurance	$2,062.50	-26.1%
Bank accounts	$112.73	-1.4%
Executive	$140.70	-1.8%
Net result	**$2,351.90**	29.8%

Surplus comprises	
Excess of subs	$2,351.90

Natasha Schedvin
Treasurer

Peggy Eby moved and Judith Hopper-Hallinan seconded that the Treasurer's report was accepted.

Secretary's Report – Maree Kerr

No report was submitted as the President's report covered ABS activities over the last year. A number of email meetings have been conducted since the FAGM last year discussing a number of issues that are covered in other reports. At the last FAGM Maree reported on the ABS submission regarding planning issues in the Daintree but the ABS has not yet received any advice on the result of this. Other advocacy issues, including the Christmas Island Pipistrelle are covered in the President's report.

Membership Officer's Report – Damian Milne (presented by Lindy Lumsden)

Overall membership increased slightly again in 2005 with a total of 282 members. This is up eight on the previous year (20 new members and 12 members either resigned or their membership expired) and only one short of the highest ever membership back in 2002. However a worrying trend is the increase in the number of unfinancial members last year. A total of 66 members had not paid their membership for up to two years in 2005 compared to 38 the previous year. This is in spite at least three formal reminder notices being sent out by mail and/or email.

Membership renewal notices were posted to all members in early February this year and so far I think the response has been reasonable with around 140 renewals (which leaves around 120 still to go).

	31 Dec 2003	**31 Dec 2004**	**31 Dec 2005**
Financial members	196	229	209
Exchange / life members	7	7	7
Subtotal	203	236	216
Members unfinancial for 1 year	47	25	51
Members unfinancial for 2 years	17	13	15
Total members (based on 2 yr unfin.)	267	274	282
% of members financial	76.0%	73.9%	76.7%
Total members (based on 1 yr unfin.)	250	261	267
% of members financial	81.2%	79.5%	70.9%

On other issues, at the last executive meeting, it was decided that in order to increase the readership and accessibility of the ABS, we should send complimentary copies of the ABS newsletter to key libraries and institutions around Australia. In addition, that we should contact several other major Universities and Departments and invite them to subscribe to the ABS. Unfortunately, of all those that I invited to subscribe (approx 30 different institutions), none accepted. However, of the 18 major institutions that the executive decided we should contact to offer complimentary copies, 16 were contacted, 9 accepted our offer and one is cataloguing the newsletter as an embedded hypertext link to the ABS newsletter archive. A complete list of libraries and institutions now receiving the ABS newsletter is shown below.

Institutions receiving ABS newsletter

National	National Library of Australia *
NSW	State Library of NSW Department of Environment and Conservation (EPA)
Vic	State Library of Victoria Arthur Rylah Institute, Dept Sustainability and Environment ***** Museum Victoria
Qld	State Library of Queensland Qld EPA
SA	South Australia Museum *****
WA	Western Australian Museum State Library of WA
NT	Natural Resources and Environment Library

* had already been receiving complimentary newsletters

Editor's Report – Kyle Armstrong

No formal report was presented but there was some discussion on the format and name of the newsletter which is reported later.

Website report – Alexander Herr

No formal report was presented. However, the request made at last year's FAGM for assistance with the website was asked again. Volunteers from ABS membership are asked to take over a page on the ABS website and keep it updated on a monthly basis. The Links page particularly needs regular updating. Michael Pennay offered to assist. Maree Kerr volunteered to look after an education page.

4. Election of office bearers

Nancy Pallin chaired the meeting for election of the ABS committee

President
One nomination was received for President.
Nominee: Rob Gration
Nominated by Greg Richards; Seconded by Maree Kerr
Rob Gration was duly elected as President until 2008

1st VP
One nomination was received for First Vice President.
Nominee: Greg C Richards
Nominated by Terry Reardon; Seconded by Susan Campbell
Greg Richards was duly elected as 1st Vice-President until 2008

2nd VP
One nomination was received for Second Vice-President.
Nominee: Lindy Lumsden
Nominated by Craig Grabham; Seconded by Nancy Pallin
Lindy Lumsden was duly elected as 2nd Vice-President until 2008

Secretary
One nomination was received for Secretary
Nominee: Maree Kerr
Nominated by Greg Richards; Seconded by Rob Gration
Maree Kerr was duly elected as Secretary until 2008

Treasurer
One nomination was received for Treasurer.
Nominee: Craig Grabham
Nominated by Bruce Thomson; Seconded by Rob Gration
Craig Grabham was duly elected as Treasurer until 2008

Membership Officer
One nomination was received for Membership Officer.
Nominee: Damian Milne
Nominated by Nancy Pallin; Seconded by Terry Reardon
Damian Milne was duly elected as Membership Officer until 2008

Editor
One nomination was received for Editor.
Nominee: Kyle Armstrong
Nominated by Terry Reardon; Seconded by Susan Campbell
Kyle Armstrong was duly elected as Editor.
Susan Campbell agreed to act as Assistant Editor.

Public Officer
This is not an elected position. Nancy Pallin agreed to continue as Public Officer.

Peggy Eby moved a vote of thanks to the immediate past executive.

5. Other business

Newsletter

Following Damian's report, there was some discussion regarding the number of institutions which declined to subscribe to the newsletter. It was suggested that the fact it was called a newsletter might contribute to the un-willingness of institutions to subscribe. The last edition of the newsletter ran to 80 pages so it is considerably more than just a society newsletter. Lindy Lumsden explained the reasons that the ABS does not want to make the newsletter a refereed mini-scientific journal, as it performs a vital role in communication of ideas, observations etc between members of ABS, which it would not be able to do as a scientific journal.

David Gee suggested changing the name from "The ABS Newsletter", and Colin O'Donnell suggested the name "Australasian Bats".

A vote was held and it was unanimously agreed to change the name.

The change of name will mean changing the ISSN. It was agreed that Lindy would ask Kyle Armstrong to check on procedures for this.

Bat survey standards, Dissemination of Anabat reporting standards and Windfarm guidelines

Background:
These issues were discussed at the FAGM in April 05 and the following motions were passed.

1. Wind-farm Monitoring Motion: That the ABS pay a consultant to write a set of standards for pre and post monitoring of wind farm developments to be circulated to ABS for approval. ABS would then distribute these to government, municipal councils and other land planning agencies and to wind-farm developers. And that the standards be reviewed as appropriate to ensure that best practice is adhered to and standards are kept current and up-to-date to best information available. The upper limit of costs to be determined by the ABS executive.

Chris Grant was to act on this.

2. Survey Standards: A proposal for Anabat survey standards was passed at the FAGM 2004. Terry Reardon wrote a draft which was posted in the newsletter but it has not been implemented or circulated to land planning agencies as yet. The Anabat reporting standards have been incorporated into NSW legislation. The reporting standards need to get to the people responsible for issuing permits and licences. The agencies which review EIS / EIA in each state and territory are our target audience. This includes State and Territory planning authorities, relevant Departments of Environment and consultants. The ABS needs a mechanism to get these standards out.

It was decided that Chris Grant should add reporting standards to his brief on windfarms.

These actions are still outstanding, and the executive asked the members present if the ABS should continue with these activities. It was agreed that the ABS should:

- continue to develop a project brief for a consultant on wind-farm guidelines,
- that the existing Anabat standards should be disseminated, and
- a workshop be held to determine minimum survey guidelines

After discussion of various proposals, a sub-committee was formed to progress these actions. The following volunteered to form the sub-committee: Stan Flavel, David Gee, Maree Kerr, Michael Pennay and Greg Richards.

Flying foxes Issues

Melbourne: Following a meeting with Yarra Valley orchardists, Dr Denis Napthine, the Victorian shadow Minister for Agriculture has pledged to cull Melbourne's colony of listed Grey-headed Flying-foxes if the Liberals win power in the November state election. He proposes a 'progressive cull' by shooting, gassing and lethal injections. It was agreed that the ABS write a letter to the Victorian Liberal Party opposing this policy.

Maclean: It was reported to the meeting that the flying-foxes have moved to a nearby village, following a series of disturbance to the Maclean colony site in attempts to move the colony. The new site is just as controversial as Maclean, and the National Party wishes to move the colony again. The ABS has a policy statement against disturbance to camp-sites. It was agreed that the ABS would write a letter to the National Party opposing planned disturbance.

Animal ethics

Rob Gration spoke of concerns with the Victorian DPI Animal Ethics committee's requirements before granting approval for standard operating procedures for bat trapping by an experienced Australasian bat society member and for general fauna surveys to be conducted by the Victorian Field Naturalists Club. It was agreed that ABS members who have applied to Animal Ethics committees should pool resources to help other organisations with applications. The ABS endorses an Australian ethical standard. Accreditation is expected soon in NSW and Europe has agreed on standards for ethical treatment of bats. Rob Gration will investigate the evidence required when applying to Animal Ethics committees for bat handling and procedures, and will also contact Dan Lunney for a report on progress from a review into ethics from some years ago.

6. Next Meeting

FAGM at the Joint RZS / ABS (and possibly AMS) symposium in April 2007

Next AGM / conference: Darwin was suggested as a possible venue. ABS executive will explore this proposal and report to the members.

Abstracts from the 12th Australasian Bat Society Conference, Auckland, 19 – 21 April, 2006

Placing *Mystacina* in a palaeontological context – first Tertiary bats from New Zealand reveal new implications for the origins of the Australasian bat fauna

Suzanne Hand[1], Trevor Worthy[2], Michael Archer[3], and AlanTennyson[4]
[1]School of Biological, Environmental and Earth Sciences, University of New South Wales, Sydney, Australia 2052; [2]Department of Earth and Environmental Sciences, University of Adelaide, Adelaide, Australia 5005; [3]Faculty of Science, University of New South Wales, Sydney, Australia; [4]Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand.

New Zealand has a small but highly interesting bat fauna. Apart from a member of the southwest pacific vespertilionid genus *Chalinolobus* New Zealand is renowned for the presently endemic Mystacinidae. We present a brief summary of the distinguishing features of the two *Mystacina* species and overview of the changing ideas on the familial relationships of family. The Quaternary distributions of both *Mystacina* species are shown. Until now the oldest bat fossils from New Zealand are 22,000-18,000-year-old remains of species of *Mystacina* from Kids and Hermit's caves, near Charleston, South Island. Recent Tertiary fossil mystacinid discoveries in Australia are summarized showing direct linkages with the New Zealand bat fauna in the mid-Tertiary. In this context we report the discovery of New Zealand's first Tertiary bat fossils in the Early Miocene (16-19 million-year-old) sediments of the Manuherikia Group near St Bathans in Central Otago, South Island. Two molars, the proximal ends of three radii, two proximal humeri, one distal humerus and a fifth metacarpal represent at least four new bat taxa including a mystacinid, a vespertilionoid (but not of the indigenous *Chalinolobus* lineage) and an archaic bat most closely resembling bats that died out elsewhere >45 Ma. While yet limited, this fauna has affinities with Eocene (55 Ma) and Oligo-Miocene (25-12 Ma) Australian faunas, as well as modern South American bat faunas. The same sediments, dated by the pollen and macroflora they preserve, have produced many birds, tuatara, lizards, crocodiles and fish, as well as fragments of a femur and dentaries of a mouse-sized, non-volant archaic mammal. The chiropteran remains provide new opportunities for testing competing biogeographic hypotheses concerning the origins of the Australasian bat fauna. They also indicate that there have been substantial changes to New Zealand's bat community since the late Early Miocene, with trans-Tasman dispersal and a cooling climate probably contributing to this turnover.

Re-evaluating Inter-specific mystacinid relationships: Why the kauri forest lesser short-tailed bat is a different species to the beech forest lesser short-tailed bat and why the greater short-tailed bat is not

Andrew Winnington
Wellington School of Medicine, University of Otago.

When compared to populations of beech forest Lesser Short-tailed Bats *Mystacina tuberculata* found throughout mainland New Zealand, the Northland kauri forest Lesser Short-tailed Bat *M. t. auporica* is significantly smaller, possesses morphologically distinctive features, exhibits significantly different vocalisations, is genetically unique, and lives in a totally different forest habitat. In contrast, the Greater Short-tailed Bat *M. robusta* does not differ significantly from mainland beech forest short-tailed bats and, when scientifically scrutinised, the epistemology of the taxonomic designation appears unsound. Elevating the kauri forest subspecies of short-tailed bat to the specific level is not only scientifically valid and taxonomically credible but, most importantly, it may provide impetus for the development of a Kauri Forest National Park in Northland, New Zealand.

Systematics of *Mormopterus* (Chiroptera: Molossidae)

Terry Reardon
Earth and Environmental Sciences, University of Adelaide/South Australian Museum.

Around half of the 20 microbat genera in Australia still require resolution of taxonomic problems at the species-level. The free-tailed bat genus Mormopterus in particular has had a long history of taxonomic instability. By 1988 four species were thought to comprise Australian and New Guinean Mormopterus. The allozyme study of Adams et al. (1988) supported by unpublished morphological data of McKenzie (CALM WA) revealed several new cryptic species. An informal taxonomy developed from these studies that recognised nine 'species' in Australia. In this talk I will present the background and current results from my systematics revision of Mormopterus. Preliminary analysis based on allozyme electrophoresis, mitochondrial DNA sequencing and morphology, show that up to thirteen taxa may occur in Australia and three in New Guinea. In addition to determining species boundaries, there are several nomenclatural issues to resolve, stemming from the poor provenance of key type specimens. A novel aspect of this project will be the intention to genotype type specimens to unequivocally attach the correct name to extant species. The preliminary results also suggest that these species may represent more than one genus. Thus the phylogenetic relationships amongst Australo-New Guinean, African (including Madagascar and Mascarene Islands) and South American Mormopterus, as well as other genera within the Tadaridinae will be studied. The overall aim of the project is to test hypotheses on the origins of Australian molossids.

Sexual dimorphism in the skulls of the grey-headed flying-fox

Anja Divljan[1], Kerryn Parry-Jones[2], and Glenda M. Wardle
[1]Institute of Wildlife Research, School of Biological Sciences, University of Sydney, New South Wales, Australia 2006; [2]University of Sydney, RMB 30 Wambina Rd, Matcham, New South Wales, Australia 2250.

Sexual dimorphisms, such as plumage colour in birds, are useful for assigning individuals to genders in population studies, but the features may not be retained on dead animals. Here we were interested in finding a method to determine the gender of partial skeletal remains as part of a study on mortality risks in the Grey-headed Flying-foxes (*Pteropus poliocephalus*). Sexual dimorphism was observed in the skull morphology of the adult *P. poliocephalus*. Mature male skulls have a prominent sagittal crest, while the skulls of females are relatively more flattened and smoother. This clear dimorphism enabled the sex of any mature individual to be determined with 100% accuracy. Here we present the comparative photographs of the dimorphic skulls. Additionally, the usefulness of this diagnostic character is investigated and briefly compared to other *Pteropus* species. We also found the sagittal crests of juvenile and sub-adult *P. poliocephalus* males to be underdeveloped due to incomplete fusion of the cranial sutures. We propose that in such instances other cranial variables (such as zygomatic width) are of moderate success in determining the sex of the flying-fox, with most cranial variables being, on average, larger in males. Disarticulated skeletons are commonly recovered in colonies after heat stroke deaths and we have previously been able to age these individuals from cementum rings in their teeth. The newly identified skull dimorphism will enable the gender to also be determined for these individuals to yield useful life history data for understanding the population dynamics of this vulnerable species.

Foraging ecology of *Tadarida australis* in urban Brisbane

Monika Rhodes and Carla Catterall
Australian School of Environmental Studies, Griffith University, Nathan Queensland, Australia 4111.

The persistence of native wildlife in cities will depend on the extent to which their resource requirements can be met within the urban landscape. Knowledge of these requirements will enable urban designs that support more native fauna. Insectivorous bats use different habitat for diurnal roosting and nocturnal feeding, however, feeding ecology is poorly known for most species. The white-striped freetail bat, *Tadarida australis*, is a fast-flying insectivorous bat, which feeds at high altitudes on airborne insects. Within Brisbane, research into radio-tagged bats has shown that *T. australis* roosts in trees within the suburban matrix, but these are limited to old and dead eucalypts. Also, these bats make regular visits to a communal roost tree, although mostly roost in other trees. In this talk, we assess the bats' use of the urban landscape for foraging, using position fixes from radio-telemetry to quantify the foraging movements of 13 individuals during two summers. Here we answer the following questions. Do the bats forage preferentially over any forms of land cover (e.g., forested, grassy, open woodland, riparian, open water, residential, industrial areas)? What are individuals' realised movement rates and patterns, within and between nights? Do they associate together while foraging? What is the relationship between roost trees and foraging areas? We then consider whether conservation of feeding habitat is an important issue for this species.

Does microbat activity differ between sites which have similar vegetation characteristics?

Patrick Prevett
University of Ballarat, School of Science and Engineering, Centre for Environmental Management.

In this study an attempt was made to assess how much variation in bat activity existed in replicated sites within a large forest tract. This was a preliminary exercise to assessing differences between treatments. Two similar sites about 1 km apart were chosen in the Wombat State Forest in the Midlands region of Victoria. A grid of nine sampling points was set up at each site and 8 Anabat CFC ZCAIM bat detectors were available for simultaneous data collection. On each grid four of the detectors were deployed, one at each of four randomly selected points from the nine points available on the grid. Data was collected simultaneously from dusk to dawn for three consecutive nights in both April and May 2005. Selection of four sampling points for the detectors was randomised on each grid in each month and the detectors used at a site were also randomised between points so that no systematic error was introduced due to use of the same machine on the same site. All detectors were calibrated for sensitivity using a chirp board and microphones pointed upwards at similar angles so that buffering of ultrasonic calls by adjacent trees was reduced. Analyses of data collected in this ongoing experiment suggest that these replicated sites with similar vegetation characteristics vary in bat activity. It will be useful to measure the extent of this variation at different temporal scales (ie during the night and annually), and both within species and between species. An attempt will be made to identify and partition the factors that cause these differences in activity both within and between sites.

Trophic structure and spatial resource partitioning in an early Miocene bat community in northern Australia

S.J. Hand[1], M. Archer[1,2] and H. Godthelp[1]
[1]School of Biological, Earth and Environmental Sciences, University of New South Wales, New South Wales 2052, Australia; [2]Faculty of Science, University of New South Wales, New South Wales Australia.

Eight hipposiderid species and one megadermatid have been described from Bitesantennary Site, an early Miocene cave deposit in the Riversleigh World Heritage fossil property, Queensland. Within the Bitesantennary community there appears to be a core of five or six hipposiderid species that are similar to each other in size, skull and dental morphology, taxonomy and probably diet. Also represented are two much larger, more trophically and taxonomically divergent hipposiderids, and a carnivorous megadermatid. Other members of this early Miocene bat community appear to have included a molossid, two mystacinids, a vespertilionid and three additional hipposiderids. These taxa have been described from early Miocene Riversleigh sites interpreted to be lacustrine, fissure fill or mixed cave deposits that are located within a 2 km radius of Bitesantennary Site. They represent additional, divergent ecomorphologies not otherwise represented among the Bitesantennary bats. Compared with modern bat faunas, the early Miocene Riversleigh bat community differs strikingly in its high hipposiderid diversity but appears to differ less in its overall trophic structure. Striking specializations in skull and palatal morphology in Australian Miocene hipposiderids are indicative of further spatial resource partitioning in a hipposiderid-rich bat community.

One sex in the city? Early indications of an extreme sex bias in the use of city habitats by bats in Hamilton New Zealand and the ecology of male long-tailed bats (*Chalinolobus tuberculatus*) at the urban-rural interface

Andrea Dekrout and Stuart Parsons
School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland, New Zealand.

The endemic New Zealand Long-tailed bat (*Chalinolobus tuberculatus*) is considered to be in population decline. This decline has been linked to anthropogenic land developments such as urbanization which are reducing wildlife habitats. However, a number of species, including *C. tuberculatus*, are able to exploit modified areas. It has been suggested that encouraging bats to use urban areas can significantly contribute to the conservation of threatened species and extend their geographic range. Information on the ecological needs of urban species, such as *C. tuberculatus*, is need for urban planers to integrate wildlife management needs into land development such that wildlife may be conserved across a wide range. Currently the distribution and ecology of an urban population of *C. tuberculatus* in the city of Hamilton, New Zealand is being investigated. This study has verified the presence of *C. tuberculatus* in Hamilton. Ultrasound survey methods for investigation of their range and distribution within Hamilton and at the urban-rural interface will be described and results will be presented. Further, some urban bats have been captured and the sex, reproductive status, morphometrics and weight of these bats were recorded. Despite considerable trap effort only male bats have been captured within the city. Some of these male bats were selected to be marked with small (0.5 g) radio-transmitters and the ranges, habitat use and time budgets of the bats were recorded. The ranges and nightly time budgets of Hamilton's male *C. tuberculatus* will be presented and potential reasons for the extreme sex bias towards captured males will be discussed.

Roosting and foraging ecology of the bristle-nosed bat *Mormopterus* 'species 6'

Michael Pennay
New South Wales Department of Environment and Conservation, PO Box 733 Queanbeyan NSW Australia 2620.

The bristle-nosed bat is one of Australia's least known microchiropterans. Currently known from only 22 specimens captured at scattered locations in the arid and semi arid regions of central Australia, Queensland and north western New South Wales, almost nothing is known of its ecology. In November 2005, I trapped 10 bristle-nosed bats at Gundabooka National Park in north west NSW, using radio transmitters I attempted to track the bats to locate roosts and monitor the foraging behaviour of the species. I also recorded general behavioural and morphological observations including diet, flight patterns, airframe design and echolocation call. A total of three diurnal roosts were located including one maternity roost, the bats were found to roost communally, sometimes with other species. Roosts were all located in eucalypt tree hollows with tiny entrances amongst the fringing vegetation of a large dry creekline. The roosts were up to 4.7 km from point of capture and almost all tagged bat activity was observed within the open creek channel, not the surrounding mulga shrublands. The species displayed a distinctive flight pattern. With relatively long narrow wings, its airframe characteristics are indicative of a species evolved for straight high-speed flight in open air similar to other Australian molossids, however, both visual observations and the echolocation call indicate the species utilises a more agile foraging strategy.

Spatial and temporal patterns of resource use by spectacled flying foxes (*Pteropus conspicillatus*)

Jen Parsons[1,3], Chris Johnson[1], Simon Robson[1], Louise Shilton[2,3] and David Westcott[2,3]
[1]School of Tropical Biology, James Cook University, Townsville, Queensland, Australia; [2]Tropical Forest Research Centre, CSIRO Sustainable Ecosystems, Atherton, Queensland, Australia; [3]Rainforest Cooperative Research Centre, Cairns, Queensland, Australia.

The diet of four *Pteropus conspicillatus* camps in different habitat types were examined using faecal analysis. Each camp displayed a unique dietary signature that was not able to be predicted by the surrounding habitat. Although diet was unique at each camp, a similar variation in dietary resource use was shown over the period/months of study. This is likely to be associated with the different fruiting and flowering phenologies of tropical angiosperms. *P. conspicillatus* showed a high reliance on fruits from the genera *Ficus* as well as floral resources from the family Myrtaceae. This dietary reliance in conjunction with the broad spectrum of dietary resources utilised from many habitat types is typical of tropical pteropodids, leading to the conclusion that *P. conspicillatus* uses food resources similarly to other flying-foxes. The use of food resources from habitats other than rainforest was substantial and indicates that the species is much more a dietary generalist than previously thought. Macroscopic bryophytes and various micro-organisms were also found in *P. conspicillatus* faeces, providing the first evidence for the dispersal of bryophytes and other organisms by a pteropodid. The two aspects of this study have broadened our knowledge on the ecology of *P. conspicillatus* and raise new questions about interactions between flying foxes and other organisms.

Bats and Bugs in Boxes: Do parasites influence bat roosting behaviour?

Lisa Evans[1], Ian Beveridge[1], Lindy Lumsden[2], Graeme Coulson[3]
[1]The Faculty of Veterinary Science, The University of Melbourne, 250 Princes Hwy, Werribee, Victoria 3030, Australia; [2]Arthur Rylah Institute for Environmental Research, Department of Sustainability and the Environment, PO Box 137, Heidelberg, Victoria 3084, Australia; [3]Department of Zoology, The University of Melbourne, Victoria 3010, Australia.

Forest-dwelling microbats typically have a number of roosting sites which they will move between frequently, even daily. It has been suggested that a possible benefit of this behaviour is a reduction in ectoparasite load. Some bat parasites, such as ticks (Argasidae) and bat flies (Nycteribiidae), live part of their life-cycle in the roost. The life histories of each parasite are quite different, but for both groups it is theoretically possible that by vacating roosts the bats could disrupt the life-cycle and slow parasite reproduction thereby reducing their parasite load. However, currently there is no experimental evidence available to test this hypothesis. We are investigating the effect of ectoparasites on the roosting behaviour of a population of Gould's wattled bat (*Chalinolobus gouldii*) and the white-striped freetail bat (*Tadarida australis*) using bat boxes in an urban reserve in Melbourne, Victoria. Each species carries a distinct complement of parasites, and this is likely to affect their response to parasite loads and any subsequent influence on roosting behaviour. Specifically, *T. australis* does not appear to be host to ticks or bat flies and yet it roosts in close contact with *C. gouldii*, a host for both these parasites. Here we present some preliminary data on patterns of nest box use for each species and corresponding parasite loads in the nest boxes and on the bats.

Intraspecific variation in feeding ecology: findings for a specialist forager, the large-footed myotis, *Myotis macropus*

Susan Campbell[1], Lindy Lumsden[2] and Graeme Coulson[1]
[1]Department of Zoology, The University of Melbourne, Parkville, Vic 3010, Australia; [2]Arthur Rylah Institute, 123 Brown St, Heidelberg, Vic 3084, Australia.

The concept of 'species-typical' behaviour has recently been challenged by research on multiple populations of single species. Intra-specific variation in behavioural traits may reflect adaptations to local conditions and/or differing energy demands of individuals. This variation is an important consideration for species' conservation management. Despite the potential for high gene-flow over relatively large geographic areas, there are several examples of intra-specific behavioural variation within the microchiroptera, particularly in their feeding ecology. Our study aimed to determine the extent of this variation both between (one inland lake, two inland river and two coastal populations in Victoria, Australia), and within, populations of the large-footed myotis, *Myotis macropus*. Habitat use and foraging patterns were recorded for 134 light-tagged individuals, and the diet of 148 bats was determined via faecal analysis. The proportion of observed time bats spent foraging over water did not differ between sites (μ ± se: 87.7 ± 1.8 %), nor did the rate of contact with the water surface (21.0 ± 2.0 sec / touch) or the average median height bats foraged above water (45.0 ± 9.0 cm). In contrast, the average percentage volume of major prey categories in faecal remains varied among sites, with more Trichoptera and Coleoptera consumed at inland sites and more Lepidoptera taken in coastal areas. Within populations, there was no difference in the foraging behaviour between adults and juveniles. However, pregnant and lactating females foraged closer, and contacted the water surface more often, than post-lactating females. Reproductively-active females also preyed significantly more upon Lepidoptera compared to post-lactating females, and juveniles fed primarily on Trichoptera.

Comparison of pine plantations and native remnant vegetation as habitat for insectivorous bats in south-eastern South Australia

Bronwyn K. Stratman[1,2], Andrew F. Bennett[1] and Linda F. Lumsden[3]
[1]School of Ecology and Environment, Deakin University, Burwood, Vic 3125 Australia; [2]current address: Department for Environment and Heritage, PO Box 1046, Mount Gambier, SA 5290 Australia; [3]Arthur Rylah Institute, Dept Sustainability and Environment, 123 Brown St, Heidelberg, Vic 3084 Australia.

Since the 1960's, a number of studies have compared the faunal assemblages of native forest and *Pinus radiata* pine plantations, but there have been no systematic studies of insectivorous bats (Microchiroptera) in softwood plantations in Australia. This study investigated the occurrence and relative abundance of bats in a pine plantation matrix in south-eastern South Australia, and compared community structure and habitat use by bats between pine plantations, remnant native eucalypt forest and isolated swamps. Bats were surveyed using harp traps and ultrasonic Anabat bat detectors at 60 sites representing five categories: pine plantations (on and off-track), native forest (on and off-track) and isolated swamp habitats. The availability of insect prey was assessed using light traps at each site. Twelve species were recorded, including the first record for the area of *Mormopterus* sp2. Overall bat activity, as recorded by detectors, differed significantly between habitat types and categories (on and off-track); with the greatest number of passes recorded in native forest and along forest tracks. Based on trapping data, native forests supported a significantly different community composition to that of pine plantations and swamp habitats, while for detector data all habitat types and categories had different community compositions. Activity levels in pine plantations suggested that assemblages were dominated by *Nyctophilus* spp., *Falsistrellus tasmaniensis* and *Vespadelus darlingtoni*, whilst for native forests the dominant taxa were *Vespadelus vulturnus*, *F. tasmaniensis*, *Nyctophilus* spp. and *Vespadelus regulus*. Although bats are unlikely to utilise pine plantations for roosting, these areas can provide additional foraging habitat and commuting routes for bats throughout the landscape mosaic. Whilst pine plantations can provide partial habitat requirements for bats, this study highlighted the significance of native forest remnants and isolated swamps for the conservation of bat communities within the pine plantation matrix.

Social behaviour and activity patterns of chocolate wattled bats, *Chalinolobus morio*, roosting in a building at the Bunya Mountains, SE Queensland

Bruce Thomson
School of Biomedical Sciences, The University of Queensland, Brisbane, Queensland, Australia 4072.

The social structure of colonial bats is known to strongly influence resource use, the nature of breeding systems, gene flow and the spatial patterning of populations. In this regard, a major study is underway to examine the social ecology of the Australian vespertilionid bat, *Chalinolobus morio*. Seasonally, a large breeding population (1000+) occupies a disused building in the Bunya Mountains of south east

Queensland and about 12 discrete roosting groups have been identified. The association patterns and relatedness of individuals within the groups of this ‘colony’ are being investigated from 400 PIT tagged bats and mtDNA analysis. Presented here are results of the first part of this study, that reports on the daytime roosting interactions between individuals occupying the building and observed by an in situ infrared digital video camera and recorder. Scan and focal animal sampling revealed that both sexes spent approximately half of their diel roosting hours at rest and the other half engaged in various forms of activity, of which grooming was the most prevalent. Overall activity patterns were negatively correlated with temperature, a response thought to reduce additional metabolic heat load during periods of high temperature. Allogrooming was observed in both sex classes and although not unexpected (since observations of bat roosting behaviour are rare), is described here for the first time in an Australian species. Allogrooming in males appears to be thus far unique, and has never been reported before. All allogrooming bouts were reciprocated simultaneously.

Habitat characteristics of flying fox camps in south-east Queensland

B.J. Roberts, C.P. Catterall, J. Kanowski, and L. Hall

Flying foxes (family Pteropodidae) are large-bodied fruit and nectar eating bats, which roost colonially during the day in large “camps”. In south-east Queensland, there is conflict between humans and flying foxes, as many camps have been established in urban and peri-urban areas. However, few studies have quantified the habitat characteristics of camps of Australian flying foxes and their roost site preferences are poorly understood. This study examined the habitat characteristics of flying fox camps at the landscape and local scales in south-east Queensland. Within this region, 40 camps were known to be used by grey-headed (*Pteropus poliocephalus*) and/or black flying foxes (*P. alecto*) during 2004-05. Flying fox camps within south-east Queensland tend to be either regularly or irregularly used. In general, the regularly-used camps were occupied more frequently and had larger populations of flying foxes. Camps were mostly located in coastal lowland areas (≤ 60 m), within close proximity to a drainage line (≤ 200 m) and in a patch of vegetation at least one ha in size. Flying foxes also preferred to position camps in places surrounded by urban land. The roost sites usually contained both scattered tall trees and a dense understorey, unless sites were in areas inundated by surface water (e.g., swamps or mangroves). A variety of different tree types were used by roosting flying foxes. There was little selection for tree type other than an apparent avoidance of introduced species and a preference for eucalyptus trees, and this was probably a by-product of a preference for tall trees (many introduced trees occurred as young individuals, and the eucalypts were emergent tall trees). Greater knowledge of the reasons why flying foxes choose a particular patch of vegetation as a roost would assist the management and conservation of flying foxes and their habitats, especially in areas where campsites are within close proximity to residential areas, or future residential sites.

Are bat boxes providing appropriate roosting habitat in urban Brisbane?

Monika Rhodes[1] and Darryl Jones[2]
[1]Australian School of Environmental Studies, Griffith University, Nathan Qld 4111; [2]Australian School of Environmental Studies, Griffith University, Nathan Qld 4111.

Nest boxes have been used as an important wildlife management tool in situations where hollow availability can limit population levels. In suburbia where old tree stands are limited, nest boxes may be the only source of hollows for wildlife populations and therefore could provide habitat, which is essential for these species to persist in the area. In Europe and in the United States of America, bat boxes have been shown to provide suitable roosts for many bat species, where roost sites became scarce. In Australia, however, the systematic use of bat boxes is at an early stage and literature and information about bat box usage is virtually non-existent. Most literature on nest boxes are of descriptive nature and focuses on the occupancy of boxes rather on natural hollow availability and landscape factors which might contribute to the occupancy rate of boxes. Also lacking in Australia is a direct comparison of different bat box designs and if they might attract different bat species. Very little emphasis is given regarding standardising the study set-up and box design. Here we present a pilot study of 70 bat boxes in urban Brisbane. We investigated the overall acceptance of artificial roosts by bats in suburbia, compared box acceptance and success with differing land tenure and landscape factors, distance of bat boxes to forest reserves, compared box clusters versus single distributed ones and whether bat species differing in sizes used different bat box types. We also hope to start/facilitate??? a critical discussion on the pros and cons of providing artificial roosting habitat for insectivorous bats in Australia.

Habitat use and conservation requirements of the spectacled flying-fox (*Pteropus conspicillatus*)

Louise Shilton[1,3], Peter Latch[2,3], Adam McKeown[1,3], David Westcott[1,3]
[1]CSIRO Sustainable Ecosystems, Atherton; [2]QPWS, Atherton; [3]Rainforest CRC, Cairns, Queensland, Australia.

Conservation management of the spectacled flying-fox, *Pteropus conspicillatus*, is a pressing and contentious issue facing natural resource management in the Wet Tropics bioregion of northern Queensland. Recognised as an important component of World Heritage values, and listed as Vulnerable under the EPBC Act 1999, this species also causes economic losses to primary production through consumption and damage of commercial fruit crops. Appropriate and effective management of *P. conspicillatus* requires sound knowledge of: i) population size; ii) camp sites; iii) foraging range; iv) habitat use; and v) seasonal behaviour. Population dynamics and camp site use are presented separately. Here we provide an overview of *P. conspicillatus* habitat use and foraging range data obtained from 18 radio- and 9 satellite-tracked animals; the first time either tracking device has been used on wild-caught *P. conspicillatus*. Generally, our knowledge of *P. conspicillatus* foraging habitat has been restricted to rainforest fragments and urban or suburban areas. Our use of satellite telemetry has revealed long-range movements of animals both north and south of the place of capture, but few foraging bouts in continuous rainforest. Overall, our combined tracking data reveals that contrary to the widespread belief that *P. conspicillatus* is a rainforest specialist, this species utilizes dry sclerophyll habitat throughout the year, to a similar extent as *P. alecto* and *P. poliocephalus*. Our foraging data supports dietary information (presented here by Jen Parsons et al.), which reveals frequent ingestion of myrtaceous pollen. These findings have important implications for conserving *P. conspicillatus* through managing appropriate habitat.

New Developments in the use of Anabat

Chris Corben

Anabat is an acoustic bat-detection system widely used for passively monitoring bat activity. Recent and future developments include wireless networks, synchronised arrays for plotting bat positions in three dimensions, and highly portable PDA based systems for active monitoring. Currently, solar-powered, passive monitoring stations, can be deployed for weeks without maintenance. Weather protection is essential, and is achieved by reflecting signals into a sheltered microphone. In the USA, such units have been deployed throughout the year, revealing unsuspected levels of winter activity. Passive units will soon be linked in wireless networks, permitting daily downloads to a central location or the internet. This will reduce running costs by removing the need for manual downloading. A synchronised array of detectors uses signal times-of-arrival to determine the position of a bat each time it calls. This system has already been used to measure call intensities of wild bats. Other uses include plotting the trajectories of bats near wind turbines, and determination of flight direction at a cave entrance. Active monitoring using a PDA based system has proven extremely effective. A bat detector and PDA, providing real-time Anabat displays, can be held in one hand. This system has practical advantages over heterodyne and time-expansion systems, providing useful output from even a single bat call. In field comparisons, any deficit in sensitivity was more than compensated for by a realtime, broadband, visual display, and freedom from the need for specialised hearing skills.

Factors influencing survival and long-term population viability of New Zealand long-tailed bats (*Chalinolobus tuberculatus*): Implications for conservation

Moira A. Pryde[1], Colin F.J. O'Donnell[1] and Richard J. Barker[2]
[1]Southern Regional Science Centre, Department of Conservation, PO Box 13049, Christchurch, New Zealand; [2]Department of Mathematics and Statistics, University of Otago, PO Box 56, Dunedin, New Zealand.

A population viability analysis is important for the management of endangered populations and requires the estimation of survival parameters. The long-tailed bat (*Chalinolobus tuberculatus*) is one of only two native terrestrial mammals currently found in New Zealand and is classed as vulnerable. Its viability in temperate beech (*Nothofagus*) forest, Eglinton Valley, Fiordland, New Zealand, was estimated using mark-recapture data collected between 1993 and 2003 using the Program MARK. Survival was estimated based on a total of 5286 captures representing 1026 individuals. Overall annual survival varied between 0.34 and 0.83 but varied significantly among three sub-populations and with sex and age. Females generally had a higher survival rate compared to males; and adults had higher survival relative to juveniles. Survival of all bats was lower in years when the number of introduced mammalian predators was high and when the winter temperature was warmer than average. High numbers of introduced predators occurred during three of the 10 years in the study. Climate change may mean that the conditions that promote high predator numbers may occur more frequently. A preliminary population viability analysis using a projection matrix on the overall adult female population showed an average 5% decline per year ($\lambda = 0.95$). Increased predator control targeting a range of predators is required in years when their numbers are high in order to halt the decline of this population of long-tailed bats. Population estimates using minimum number alive estimates supported the population estimates derived from program MARK and a population viability analysis using matrices.

Monitoring the entrance of the Riverton cave

Jamie Gibbins

Study aims: 1) Ascertain the arrival and departure dates of the Riverton Bent Wing Bats to this maternity site each year considering the cave can not be inspected every day, and 2) Confirm that there is continuous mass exiting over one hour each evening as concluded by limited observations. A photo electric beam was fitted to the cave entrance and connected to a data logger to monitor the movements of the bats. The data shows a large spike just on dusk and another spike towards dawn each day. There are also counts throughout the night. There are reducing spikes over a number of days until only small counts remain. The collected data appears to confirm the evening mass exits as well as showing the thinning of the bats over a number of days until only the resident horseshoe remain. It also provides information on the nightly movements and morning returns. This is an easy, unmanned, low cost method of monitoring bat movements in a small cave system.

Pitt-tagging trials in Lesser Short-tailed bats

Jane Sedgeley and Colin O'Donnell
Research Development and Improvement Division, Department of Conservation, PO Box 13049, Christchurch, New Zealand.

Various studies have shown that bands cause unacceptable injuries to lesser short-tailed bats (*Mystacina tuberculata*). Therefore, there is currently no appropriate technique for long-term marking of this species, and consequently no robust method for monitoring populations. Passive integrated transponder tags (PIT-tags) have been previously trialled in New Zealand on free-living lesser short-tailed bats. The trial was largely unsuccessful; there were incidences of double puncture wounds, serious bleeding and expelled tags were found at the base of roost trees. In August 2005, Jane went to Germany to work with Gerald Kerth, PIT-tagging Bechstein's bats (*Myotis bechsteinii*) and brown long-eared bats (*Plecotus auritus*). As a result of observing the techniques used by Gerald she recommended PIT-tagging should be trialled again in New Zealand. We undertook a pilot study in

January 2006 and decided to hold lesser short-tailed bats in captivity because this allowed us to assess any short-term negative effects of the tags and we would be able to observe if any tags were expelled after a few days. Firstly, we PIT-tagged six bats using the Trovan system. Lesser short-tailed bats proved to be difficult to work with, and several bats received double puncture wounds; that is the needle for inserting the transponder made a second hole which the tag was then expelled through. The second hole was usually unacceptably large. After tagging the bats were held for three days inside a free-flight enclosure. Three adult males, two tagged and one untagged, died in captivity. Post mortem results showed deaths were not directly caused by tagging and we felt the deaths may have been associated with stress caused by holding adult males in close proximity. Consequently we tagged a further five bats but kept them for only one night in individual holding boxes. All were released successfully. In March 2006 we captured a total of 30 bats (73% female, 27% male). Twenty-one bats were tagged using Trovan and Allflex tagging systems, and four types of applicators were assessed. The Henke-jet metal gun used with Allflex tags was most successful having a very smooth action, which resulted in almost no double puncture wounds. At the time of writing the 30 bats have been in captivity in the free-flight enclosure for one week. The tag entry wounds are healing well, and no tags have been expelled. We also recaptured three wild bats from our January study. All three bats were healthy, the tags were in place and there were no signs of the entry wounds.

The use of Day-Glo Red for identification of roost sites by *Rhinolophus megaphyllus* in Far North Queensland

David Gee[1] and John Nelson[2]
[1]Wildtraces, P.O. Box 189 Gol Gol NSW 2738; [2]Monash University, Melbourne.

The placement of bands for marking *R. megaphyllus* has in the past been not permitted due to excessive injury resulting from the bands. So it is difficult to monitor movements of this species from one cave to another. In this paper we investigate the use of a commercial non-toxic dye called Day-Glo Red to connect two known roosting sites of *R. megaphyllus*. The persistence of Day-Glo Red in a mine situation has also been investigated.

Acoustic identification of bats: new machine learning methods applied to the echolocation calls of British bats

Robert Redgewell[1], Joseph M. Szewczak[2] and Stuart Parsons[1]
[1]School of Biological Science, University of Auckland, Private Bag 92019, Auckland, New Zealand; [2]Department of Biological Sciences, Humboldt State University, 1 Harpst Street, Arcata, CA 95521, United States of America.

Most Microchiropteran bats are small and nocturnal making them difficult to study. Furthermore, capture techniques are time consuming, can injure bats, and produce biased results for estimates of species presence and abundance. Fortunately, most Microchiropterans utilise ultrasonic echolocation calls for navigation, orientation, and prey capture during which they constantly leak information about themselves into the environment in the form of echolocation calls. Analysis of these echolocation calls offers a non-invasive means to identify Microchiropteran species. Currently, many researchers utilise subjective techniques to analyze these calls for identification. However, this can be unreliable, and result in different classification of a single echolocation call by different researchers. Additionally, classification of large libraries of calls can be extremely time consuming, and the accuracy of subjective identification is not quantifiable. Many studies have attempted to use multivariate analysis for classification of call parameters to classify calls more reliably. However, the classification rates of some species in these studies have been relatively low. These deficiencies have motivated the exploration of new methods to reduce subjectivity among researchers, and provide increased accuracy of Microchiropteran identification. This talk introduces the results obtained from an entire acoustic identification system developed for 14 species of British Microchiropterans. The system includes the use of some new call parameters, and new methods for call isolation measurement which reduces subjectivity among researchers and improves identification accuracy.

Radio tracking a fast-flying micro chiropteran, *Miniopterus schreibersii bassanii*

Chris Grant
Deakin University.

The foraging ecology of microchiropteran bats can be difficult to study, yet in order to understand the impact of land use change on bats, it is critical to know where bats are foraging. The southern bent-wing bat, *Miniopterus schreibersii bassanii*, is a strong flier that can travel over 60 km in a single night. Radio tracking such a bat while it is foraging would be impossible from the ground, but not with a light aircraft. This paper describes our use of night time aerial radio tracking to investigate the foraging behaviour of the southern bent-wing bat around a maternity colony at Bat Cave, Naracoorte, South Australia.

Thermal physiology of pregnant and lactating female and male long-eared bats, *Nyctophilus geoffroyi* and *N. gouldi*

Christopher Turbill and Fritz Geiser
Centre for Behavioural and Physiological Ecology, Zoology, University of New England, New South Wales 2351, Australia.

During roosting in summer, reproductive female bats appear to use torpor less frequently and at higher body temperatures (Tb) than male bats, ostensibly to maximise offspring growth. To test whether field observations result from differences in thermal physiology or behavioural thermoregulation during roosting, we measured the thermoregulatory response and energetics of captive pregnant and lactating female and male long-eared bats (Nyctophilus geoffroyi 8.9 g and N. gouldi 11.5 g) during overnight exposure to a constant ambient temperature (Ta) of 15 °C. Bats were captured 1 to 1.5 h after sunset and measurements began at 21:22 ± 0:36 h. All N. geoffroyi entered torpor commencing at 23:47 ± 1:01 h. For N. gouldi, 10/10 males, 9/10 pregnant females and 7/8 lactating females entered torpor commencing at 01:10 ± 1:40 h. Minimum Tb of torpid bats was 15.6 ± 1.1 °C and torpid metabolic rate (TMR) was reduced to 0.05 ± 0.02 ml O2 g-1 h-1. Sex or reproductive condition of either species did not affect timing of entry into torpor (F = 1.5, d.f. = 2, 19, P = 0.24), minimum TMR (F = 0.21, d.f. = 4, 40, P = 0.93) or minimum Tb (F = 0.76, d.f. = 5, 41, P = 0.58). Moreover, sex or reproductive condition did not affect the allometric relationship between minimum RMR and body mass (F = 1.1, d.f. = 4, 37, P = 0.37). Our study shows that under identical thermal conditions, thermal physiology of pregnant and lactating female and male bats are indistinguishable. This suggests that the observed reluctance by reproductive females to enter torpor in the field is predominantly because of ecological rather than physiological differences, which reflect the fact that females roost gregariously whereas male bats typically roost solitarily.

Development of assisted breeding technology in the flying-fox

Debbie Melville[1], Elizabeth Crichton[2] and Steve Johnston[1]
[1]*School of Animal Studies, University of Queensland, Gatton;* [2]*XY Sperm Inc, USA.*

While over 40% of the world's flying fox (*Pteropus*) species are considered threatened and in urgent need of conservation, there has been little attempt to utilise assisted breeding technology as a conservation strategy. This project aimed to increase knowledge of male *Pteropus* reproduction for the development of artificial insemination (AI) in which the ability to preserve spermatozoa is a key component. Previous studies have shown *Pteropus* spermatozoa possess an unusually large acrosome that loses integrity during dilution and preparation for cryopreservation. We report on the results of three (3) experiments that examined acrosomal response to diluent pH, osmolality and temperature change. Although the *Pteropus* electro-ejaculate has an initial pH of 8.2, study (1) revealed there was no apparent adverse effect on >acrosomal integrity(p>0.05) if sperm were collected and incubated in media ranging from pH7.2 - 8.8. Study (2) showed that acrosomal integrity declined sharply in both hypo-osmotic (103 and 161 mOsm/kg water; p<0.05) and hyper-osmotic environments (>879 mOsm/kg water; p<0.05), indicating that the changes in osmotic pressure associated with cryopreservation may be responsible for acrosomal damage. Cryomicroscopy (study 3) revealed that spermatozoa diluted in a Tris-citrate-glucose buffer containing egg yolk (7.5%) as a source of lipid were more susceptible to acrosomal damage than those diluted without egg yolk ($p<0.05$). Continued development of sperm cryopreservation protocols is required if AI is going to play a role in the conservation of this genus.

Population dynamics of the spectacled flying-fox (*Pteropus conspicillatus*)

Louise Shilton[1,3], Peter Latch[2,3], Adam McKeown[1,3], David Westcott[1,3]
[1]CSIRO Sustainable Ecosystems, Atherton; [2]QPWS, Atherton; [3]Rainforest CRC, Cairns, Queensland, Australia.

Pteropus conspicillatus has the smallest known distribution of four flying-fox species in mainland Australia, occurring only in northern Queensland. It is also believed to have the smallest population of Australian *Pteropus*. Although apparently suffering a significant decline in the Wet Tropics bioregion of North-eastern Queensland 1999-2000 (80,000), the estimated total number has consistently been c. 200,000 since 2001. Fly-out counts used to estimate *P. conspicillatus* population size since 1998 are sufficiently accurate to indicate numbers of flying foxes at individual camps. However, many *P. conspicillatus* camps are seasonal, so the proportion of the *P. conspicillatus* population counted during each annual census has not been known. This project is the first to attempt monthly counts at *P. conspicillatus* camps across the Wet Tropics. Monthly monitoring began in May 2004 and is currently ongoing. Here we present our preliminary results, combining monthly camp survey data with inter-camp movement data from radio- and satellite-tracked individuals. Our data reveals: i) simultaneous changes in *P. conspicillatus* camp size and camp switching by individuals; ii) widespread use of multiple camps by individuals; iii) highly dynamic camp composition, camp site occupancy, and temporary abandonment of camp sites; iv) five-fold change in overall numbers of *P. conspicillatus* across the same known camp sites during the course of the year; vi) the whereabouts of a large proportion of *P. conspicillatus* is unknown at certain times of the year, particularly during the winter. Our findings are consistent with the known behaviour of *P. alecto* and *P. poliocephalus* in Australia.

A road less traveled - one couple's journey

Terry Wimberly and Trish Wimberly

Trish and I, after a number of years of being involved in Wildcare Australia as Carers for most native fauna, decided that our best contribution to conservation, along with our real passion, was bats. Having chosen to focus on bats we applied the three principals we apply to most things: 1. Have a plan; 2. Put ourselves in a place where good things can happen; 3. Have fun following our passion. The Plan: To learn, interact and become one with bat conservation, rehabilitation and research communities. The Places (a partial list): a) Bat World – Austin Texas and Mineral Wells Texas, USA; b) Acoustic Monitoring Workshop by BCI – Portal, Arizona (18 species, 1,068 captures); c) BCI Founders Circle Trip – The Amazon, Brazil (28 species, 780+ captures); d) Research Assisting – Uvalde, Texas, USA
e) Bracken Cave – Texas, USA (BCI); f) BCI Founders Circle Trip – Madagascar (15 species, 250+ captures); g) Working with the Dept of Agriculture – South Africa (12 species, 136+ captures). The presentation would include photos and details of bats captured, potentially new species and interesting outcomes. This section would also include many of the other bat conservation works that we have attended. The Fun, The Passion: We are continually inspired by those in all aspects of conservation rehab and education. Especially inspiring on our journey thus far and a big thank you to: Dr Merlin Tuttle – BCI Founder and Legend, Dr John Hangar – Australia Zoo, Dr Geoff McGee – Griffith University, Amanda Lollar and Barbara French – They are The Book, Dr Steve Goodman – Field Museum and Legend, Fiona Reid – Illustrator and Treasure, Dr Gary McCracken – University of Tennessee, Janet Tyburec and Joe Szewczak – Simply Amazing. Included also in the paper would be the detail of all the bat species captured, particularly focusing on the echo location classes in Portal Arizona, the Amazon BCI Founders Circle Trip and the Madagascar trip, again by BCI. All of this work has taken place in the last two years, since the last Australasian Bat Society gathering in Toowoomba.

Batting in the UK and Southern Ireland 2005: a post ashes experience. (Attendance at the 10th European Bat Research Conference at Galway in the Republic of Southern Ireland and the 6th European Bat Detector Workshop in Killarney National Park in Ireland's southwest)

Patrick Prevett
University of Ballarat, School of Science and Engineering, Centre for Environmental Management.

Attendance at overseas meetings provides opportunities to learn new techniques and gain a broader understanding of microbat issues through networking. These opportunities are particularly relevant in the case of microbats since microbats have a world wide distribution as do the researchers who work on them. (The opportunity also existed to find out whether guinness really does taste better in Ireland and whether aussie bats really were as bad as the English press made them out to be). Among a wide rage of talks and workshops, there were demonstrations of microbat survey assisted with autobat, study of social calls and bat songs, clustering and advertisement in relation to mating behaviour and management issues related to threatened species and bats in buildings. At the landscape level researchers reported on assessment of the impact of wind farms on bats and the use of vegetation corridors by bats. It was explained how car based surveys are used in Southern Ireland to help in the development of distribution maps for microbats. The presentation will provide further detail on some of these techniques and findings.

Koala's take my shade

Jenny Jones
71 Thomas St, Unley, Adelaide, South Australia 5061.

I will present a talk on my work and experiences as a conservation / environmental educator and author of natural history books and teacher resource material (e.g. Bat Pack, Discovering New Zealand's Native Bats.1996). I recognize a need for young people of all ages to have knowledge and an understanding of their natural world and the current environmental issues to actively prepare them for their future. As the science research becomes more sophisticated and new ground breaking discoveries are made I am further encouraged and motivated to believe that there will be a more important education role for the children's educator. Using bats and their natural history as a case study I will explain how I use the scientific papers which are of course written for an academic audience and "translate" them into "Kid speak" in the development of my resources for programmes and writing.

The ecology and conservation of New Zealand bats

Colin F. J. O'Donnell
Southern Regional Science Centre, Department of Conservation, PO Box 13049, Christchurch, New Zealand.

Bats, along with the seals, are the only native land-breeding mammals in New Zealand. The bat fauna is small and depauperate with only three species, but all are endemic and have been isolated in New Zealand for millennia. Two species belong to the Family Mystacinidae (short-tailed bats, genus *Mystacina*), which have evolved in isolation for so long that they possess characters not found in bats anywhere else in the world. The ancestors of the third species, the long-tailed bat *Chalinolobus tuberculatus*, are believed to have reached New Zealand from Australia by chance dispersal across the Tasman during the Pleistocene, as have those of many of New Zealand's birds. Since there are over 90 species of bats in Australia it is surprising that not more of them have been blown to New Zealand in the past. Ancient faunal lineages have tended towards flightlessness in the absence of indigenous mammalian predators and *Mystacina* has a number of unique characteristics to aid its foraging on and beneath litter on the forest floor. In Australasia, number of bat taxa decline with increasing latitude, from 41 taxa at 10-15°S to only 3 taxa at 45-50°S in New Zealand. However, frequency of tree-cavity roosting increases as mean annual temperature decreases and latitude increases. Thus the ecology of New Zealand bats focuses of adaptations to cold temperate rainforests. The bats select the oldest and largest trees for maternity roosting and avoided roosting under bark and in caves and buildings, despite the abundance of these sites. Groups of bats are highly structured. They roost in small well-insulated cavities that accrue significant energy conservation benefits compared with other potential roosts. All populations exhibit extreme roost site lability on a daily basis, but strong long-term philopatry among pools of > 100 roosts. The Department of Conservation has an active recovery programme for the New Zealand bats. The greater short-tailed bat is considered extinct whereas lesser short-tailed bats and long-tailed bats are classed as endangered. The range and numbers of bats have declined significantly and in many areas declines are continuing. A wide range of threats to the continued viability of bat populations have been identified including predation and competition from exotic mammals, habitat degradation and loss, and disturbance. The recovery programme aims to ensure the survival of all extant bat species and subspecies throughout their present ranges, and where feasible, to establish new populations within their historical range. After a 10-year period of research aimed at determining the factors causing the decline of these bats, active conservation management measures are now being implemented. These include: using legal mechanisms for protection; general advocacy and education; developing community-based conservation initiatives; control of exotic pests, particularly introduced predators, at key sites; active protection of roosts sites, protection of aquatic and terrestrial foraging habitats and a raft of habitat restoration techniques; and translocations to predator free habitats.

How hard it is to conserve habitat - Blue Gum High Forest, bats and all

Nancy Pallin
Ku-ring-gai Bat Conservation Society Inc.

From colonial times British Governors granted land to individuals to promote development. This paper outlines the efforts needed in the 21st century to bring back into public ownership small parcels of land of high conservation value within the Sydney metropolitan region. From writing submissions in 2000 to purchase by state government, 0.5 ha of bushland will be legally added to the 14.6 ha of Ku-ring-gai Flying-fox Reserve. The huge community effort required to bring the last 1 hectare of undeveloped Blue Gum High Forest (BGHF) critically endangered ecological community into public ownership will be outlined. Ingredients include networking between community groups, powerpoint presentation for 17 talks, 26 walks, estimated attendance 1500, media coverage, speeches at Council meetings, thousands of emails and phone calls (personal expenses), photographs, design & printing of brochures, letterbox delivery of brochures and door knocking, letters to politicians, grant applications, walks with politicians, raising public donations. Access to email and Google Earth have increased the effectiveness of community activism. This 17 hectare BGHF remnant is the largest, most viable and biologically diverse of this ecological community. Of ten native mammals species, six are bats including the grey-headed flying-fox. The 80 bird species, residents and migrants, identified in this forest indicate its healthy condition and connectivity, even in an urban context. This small forest has natural and cultural heritage values at the local, state and national scales.

The rapid decline and imminent extinction of the Christmas Island Pipistrelle *Pipistrellus murrayi*

Lindy Lumsden[1], Martin Schulz[1], David James[2], Raquel Ashton[3] and David Middleton[3]
[1]Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, 123 Brown Street, Heidelberg, Vic 3084, Australia. [2]Parks Australia North, PO Box 867, Christmas Island (Indian Ocean), WA 6798, Australia. 3Healesville Sanctuary, Zoos Victoria, Healesville, Vic 3777, Australia.

The Christmas Island Pipistrelle *Pipistrellus murrayi* is endemic to Christmas Island in the Indian Ocean. Its distribution and abundance has declined dramatically in recent years. Surveys undertaken in the mid-1980s found it to be widespread and common. By the mid-1990s there had been a marked reduction in abundance and a westward range contraction. This decline has continued at an alarming rate and the species is now confined to the far west of the island, no longer occurring across more than 80% of its former range. Based on repeated detector surveys at fixed sites there has been a decline in abundance of approximately 90% since 1994. This suggests that, if the current rate of decline continues, this species will be extinct by 2008. The cause of this rapid decline is currently unknown. A number of introduced species may prey on or disturb bats while within their roosts, e.g. Common Wolf Snake *Lycodon aulicus capucinus*, Feral Cat *Felis catus*, Black Rat *Rattus rattus* and Giant Centipede *Scolapendra morsitans*. Although not considered the primary cause of decline, the recent explosion of the Yellow Crazy Ant *Anoplolepis gracilipes* is likely to have exacerbated the situation. It is also possible that some form of disease may be contributing to the decline, and this is currently being investigated, with biological samples collected in December 2005. At this time we trapped 52 individuals at the only location on the island where they can still be reliably caught. The majority of females (82%) were breeding, and had either just given birth or were heavily pregnant. Individuals were radiotracked and seven maternity roosts were located, predominantly under loose bark on dead trees. Maternity colonies contained 20-50 individuals. These investigations are continuing in an attempt to avert the imminent extinction of Christmas Island's only microbat.

Protection of the subterranean roost of *Miniopterus schreibersii* eastern bent-wing bat in South Eastern Australia

Rob Gration
80 Hobson Street Newport Melbourne Australia 3015.

The presence of the threatened *Miniopterus schreibersii* eastern bent-wing bat in a mine adit at Mt Piper Nature Conservation Reserve (Victoria) provided the impetus for the land managers (Parks Victoria) to restrict human access. The objective was to minimize disturbance to any roosting bats, and to address the risk management concerns for human injury and possible litigation. Parks Victoria, commissioned the design, construction and installation of a bat gate designed specifically for *M. schreibersii*. To date a bat gate that would restrict human access, whist not enforcing the abandonment of the roost, has not been achieved for *M. schreibersii*. The original time frame for completion was 5-months; however, design changes extended the completion date by 10-months. The gate has been operational since September 2004; in the proceeding 4-months, monthly internal surveys have been undertaken. There has yet to be direct evidence of bat activity; however, there has been indirect evidence in the form of scats and no sign of human activity. The design is the first of its kind in Australia, should the bat gate prove successful it could be applied Australia wide.

Management of Bat Cave, Naracoorte Caves National Park, South Australia

Steven Bourne
Manager, Naracoorte Caves National Park, World Heritage Fossil Site, Department for Environment and Heritage, P.O. Box 134 Naracoorte, South Australia 5271, Australia.

Bat Cave, in Naracoorte Caves National Park, is one of only two known maternity caves for the southern bentwing bat *Miniopterus bassanii*, hence site protection is essential for the long-term survival of the species. The park is a major regional tourism site, attracting over 60,000 visitors each year, providing an excellent opportunity for raising awareness of bats. Many years research has been completed at the park, contributing important information to our understanding of the species. Management of Bat Cave is a balance of research, conservation and interpretation, with the three areas closely linked. The Department for Environment installed infrared camera technology on a permanent basis into Bat Cave at Naracoorte Caves National Park in 1995, thereby developing an excellent non-intrusive wildlife experience. The innovation has been well received by visitors to the park and advances in technology have allowed several upgrades, greatly improving the quality of presentations.
Importantly, the Bat Observation Centre provides a forum for the presentation of research that has been undertaken at the park. Apart from the bats themselves, researchers have also investigated invertebrates and land use of the region and each project contributes to the information presented on guided tours. Access to Bat Cave is highly restricted, amounting to only a handful of visits each year for camera maintenance and for specific research projects. This paper presents the management of Bat Cave, Naracoorte, demonstrating the integration of research, conservation and interpretation and the role the park plays in the raising awareness of bats in general.

The population ecology of grey-headed flying-foxes (*Pteropus poliocephalus*) at the Royal Botanic Gardens in Sydney

Kerryn Parry-Jones, Anja Divljan, Glenda Wardle and Neisha Burton
University of Sydney, RMB 30 Wambina Rd., Matcham, NSW 2250, Australia.

Declines in populations of native species are often accompanied by altered distributions that can bring the remnant populations into closer association with human habitats. A colony of Grey-headed Flying-foxes has been continuously resident at the Royal Botanic Gardens in Sydney since 1995 coinciding with a 30% reduction in this vulnerable species. As part of a larger study on the population ecology of *Pteropus poliocephalus* we are focusing on the movements and foraging in the RBG, a recently established urban colony. We will determine the age and sex structure of this population, the site loyalty of individuals, their diet and foraging behaviour and how these patterns compare to other colonies. We are sampling the population by mist-netting the animals as they return to the Gardens after foraging. Each flying-fox is weighed, sexed and anaesthesised. Morphometric measurements and faecal and pollen samples are taken from each animal, and a small premolar tooth, which is used to age the animal. Each animal is banded with an ABBBS band and some adult animals will be fitted with radio transmitters. The flying-foxes are given long-acting antibiotics and when fully awake are released back into the Gardens. The data obtained from this study will be used to model the population of flying-foxes in general and the contribution of the Gardens colony, and will provide valuable information on resource partitioning between genders and ages of flying-foxes in the Sydney area.

Homing by *Chalinolobus tuberculatus* after translocation within and outside their home range

Joshua Guilbert, Michael Walker and Stuart Parsons

The remaining species of New Zealand bat (the long-tailed bat, *Chalinolobus tuberculatus* and short-tailed bat, *Mystacina tuberculata*) have declined considerably in both range and number, with the remaining populations classed as threatened or endangered. Translocation to protected habitats could ensure the survival of both species if a suitable protocol is developed. Despite translocation being a commonly used tool in wildlife management worldwide, many fail. The three known translocations of bats (one in New Zealand and two in Hawaii) have all failed, with attempts by the bats to return to their point of origin suggested as a possible cause. The objectives of this study were to 1) determine whether the *C. tuberculatus* can home and 2) if so whether magnetic cues are involved in homing. *Chalinolobus tuberculatus* changes day roost so regularly that no home location, analogous to lofts used by domesticated homing pigeons (*Columba livia*), exists to confirm a successful return following displacement. Therefore, to accomplish the homing objective underpinning this work, a radio-telemetry study was conducted to determine if Grand Canyon Cave (GCC) near Pio Pio in the King Country (central North Island) could be used to confirm a successful return for the local *C. tuberculatus* population. A new term was defined for homing studies: Home Reference Point (HRP), which is a location that, if monitored for a fixed period of time, can be used to confirm a homing event. Nine *C. tuberculatus* with transmitters attached were displaced to three sites and the cave monitored to confirm homing. Three bats were released within their known home range (5km from HRP), three were released on the border of their home range (10km from HRP) and three were released outside their known home range (20km from HRP). One of the bats released within the home range failed to return but all other bats, including those released outside the population's known home range, returned successfully within three days of release. These results demonstrate that *C. tuberculatus* is capable of homing from unfamiliar locations and suggest that the species possesses a long distance navigation mechanism.

The conservation of microbats in the Ryukyu Archipelago

Kuniko Kawai[1], Lázaro M. Echenique-Diaz[2] and Kyle N. Armstrong[3]
[1]Institute of Low Temperature Science, Hokkaido University, Sapporo 060-0819, Japan; [2]Division of Ecology and Evolutionary Biology. Graduate School of Environmental Life Sciences, Tohoku University. Aoba-ku, Sendai 980-8578. Japan; [3]Kyoto University Museum, Yoshida Honmachi, Sakyo-ku, Kyoto, 606-8501, Japan.

The long Japanese archipelago (24ºN – 45ºN) encompasses a wide range of geological, vegetative and human-modified regions within its c. 3000 islands. On its smaller islands, a range of threatening processes has the potential to result in the extirpation of whole populations and species of bats. These islands show a unique combination of geological terrain, landscape structure and cultural/religious customs that has resulted in different threatening processes. We present examples from several islands in the Ryukyu Archipelago where most Threatened Japanese microbats occur. These include islands such as Okinoerabu Island where agricultural practices are affecting roost availability through both destruction and smothering of caves; Iriomote Island which has abundant forest foraging habitat, but where ecotourism and agriculture are encroaching on roosts that occupy only the small marginal limestone terrain; Miyako Island where most of the vegetation has been cleared and extirpations have already occurred despite the availability of caves; Hateruma Island where remaining vegetation is still being removed but where local religious customs have the potential to be turned to good use in conservation of roosts. In the last few years, comprehensive population genetic and molecular taxonomic studies have begun, which are beginning to provide pertinent information in revisions of conservation status. We will discuss the potential weight of the various environmental and genetic factors that are contributing to draw these bat species into an extinction vortex.

When bats and planes meet: a proposal to limit the impact of bat strikes in the aviation industry

Simon Robson[1], David Blair[1], John Luly[2], Peter Pallot[3], Jen Parsons[1] and Louise Shilton[4]
[1]School of Tropical Biology, James Cook University, QLD 4811, Australia; [2]Tropical Environmental Studies and Geography, James Cook University, QLD 4811; [3]Aviation Operations, Townsville Airport, QLD 4814; [4]CSIRO Sustainable Ecosystems, QLD 4833.

Collisions between animals (typically birds) and aircraft represent a significant risk to the aviation industry, due to the resultant damage to airplanes and loss of life of passengers and crew. In order to mitigate the impacts of bird strikes, a sophisticated and successful management program has been implemented on a global scale, leading to considerable advances in our understanding of many aspects of the ecology and behaviour of birds likely to come into contact with aircraft. As a result of the successful reduction in bird strikes due to the implementation of these management plans, flying foxes now represent the group of animals most likely to strike planes around the airports of tropical Australia. Here we report on a proposed collaboration between the airline industry, relevant government agencies and James Cook University to obtain knowledge of the ecology, behaviour and migratory patterns of the flying fox species of tropical Australia, in order to develop management strategies to limit bat strikes on civil and military aircraft.

John Toop, Mount Etna and Ghost Bats (*Macroderma gigas*, Dobson.)

Lana Little and Les Hall
Queensland Parks and Wildlife Service, Box 37, Chillagoe QLD 4871, Australia.

John Toop died in September 2003. His passing ended a chapter in the Mount Etna dispute which recently had a peaceful ending with the signing of a reconciliation agreement for the management of Mount Etna Caves National Park between conservationists, the mining company and the Queensland State Government. Bat Cleft (the maternity site for a large colony of little bent-winged bats) and a number of important caves used by Ghost Bats are now protected. In 1975 Toopy was awarded a University of Queensland medal and enrolled as a postgraduate student to study Ghost Bats at Mount Etna. His project was initially funded by the Australian National Parks and Wildlife Service to whom

Toopy sent regular reports of his research. In 1979 Toopy was employed by QNPWS and remained so until his death. He spent a significant part of his professional life climbing in and out of the caves in the Mount Etna area gathering data on temperature, humidity, bat numbers, population structure and movements. Although he never submitted his thesis, data from Toopy's research has formed the basis of many of the management policies at Mount Etna. His understanding of caves, their use by bats, human disturbance and government policy led to the gating of caves and restricted access to caves at different times of the year. His data explaining the use of different caves by different age groups and sexes of bats at different times of the year has added significantly to our understanding of cave bat biology. He was one of Australia's pioneer bat researchers who is sadly missed. We will discuss a number of aspects of Toopy's research and its contribution to Ghost Bat biology.

Research at Tolga Bat Hospital

Jenny Maclean
President / Secretary, Tolga Bat Rescue and Research Inc, Pteropus Guesthouse, PO Box 685 Atherton 4883 Australia.

Tolga Bat Hospital is on the Atherton Tablelands, inland from Cairns. (www.athertontablelands.com /bats). The hospital has been operating since 1990, but expanded radically in its operations each year since 1998. This year it will undergo yet another expansion by opening its doors to the public as an ecotourism venture, and having a fulltime coordinator. I would like to talk about 4 different research activities conducted here in the last 12 months. 1. Barbed wire project. Data collected during a recent spate of 60 barbed wire rescues of Little Red flying foxes (LRFF) allowed us to convince Queensland Health to pay for the vaccinations of 5 of our members in 'hotspot' areas. 2. Trialing of satellite telemetry collars for Dr Hume Field's team from Queensland Department of Primary Industry and Fisheries. The collars are being used on LRFFs in the Northern Territory as part of the Henipavirus Ecology Research Group project (www.henipavirus.org). Observations over the initial three-month trial on 10 animals included collar loss, localized hair loss and skin-reddening / trauma in some animals. The study continues with 3 of the collared LRFFs for a further months. 3. A study with Dr. Janine Barrett in collaboration with Dr Geoff Smith of Queensland Health Scientific Services, in which we are collecting data on the incidence of ABLV in sick and injured bats on the Atherton Tablelands. 4. Release of orphaned SFFs. All orphans are microchipped, and their return to the release cage is monitored. This year's release data will be presented.

Testing treatments to arrest wing damage in vulnerably listed flying-foxes

Judith Hopper-Hallinan and G.M. O'Brien
Wildlife Assistance and Information Foundation, 58 Wideview Rd, Berowra Heights, NSW 2082, Australia.

Flying-foxes, Genus *Pteropus*, are critical to the health of forests. Most species are in decline, many listed as vulnerable. Interactions with human structures frequently result in sufficient damage to the wing that the animal must be euthanised. Trials investigating treatments to improve the chances of release after injury are focusing on damage from entanglement (barbed wire and loose fruit-netting). Three key sites for injuries are: patagium, finger bones and arm bones. Injuries are classified as closed, e.g. bruises, or open, .e.g. wounds. Three main treatments have been trialled to date: macadamia oil, a hydrogel with a film dressing, and Ilium Oticleans. Many injuries deteriorate then plateau, before healing commences. Healing time, in this discussion, is defined as the time from when healing processes commence to the time membrane integrity is restored. Overall, the duration of the healing phase was 8.9 ± 0.6 days (n=34). Healing rates: varied dependant on the site of the injury, with patagium injuries healing faster than those over bone ($p < 0.05$); were the same for closed and open wounds ($p > 0.05$); and, varied greatly with treatment type (p 0.05). This is the first quantitative information on wound healing in Megachiroptera; previously it has been necessary to extrapolate from other species. Macadamia oil is successful on new injuries, arresting membrane die back. The hydrogel-dressing combination appears to be slow but is successful with more complex wounds. The oticleans sample size is still small but initial indications are positive.

Wing injury rates in the Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)

Glenn Hoye
Fly By Night Bat Surveys PL, PO Box 271, Belmont, NSW 2280.

During handling of eastern bent-wing bats for other studies, injuries to wing and tail membranes were observed. The rate and type of injury was noted for bats from roosts situated in urban, rural and predominantly natural areas. At each roost site captured bats were examined for evidence of injury to the wing and tail membranes. Where injury to the body or head was evident this also was recorded. The sex and age of all bats was recorded. The weight and forearm length were also recorded for a sample of bats at each roost. The types of injuries are detailed as well the relationship of roost situation, sex and age to injury rates. Probable causes of wing injuries are also discussed.

POSTERS

New Caledonian flying-foxes: knowledge and population monitoring for conservation

Fabrice Brescia
Institut Agronomique néo-Calédonien (IAC), Wildlife Programme, BP 73, 98 890 Païta, New Caledonia.

The New Caledonian flying-foxes (locally called Roussettes) are the only native terrestrial mammals of the archipelago. The genus *Pteropus* is represented by three species: the two endemic ones *P. ornatus* and *P. vetulus*, and the Insular fruit bat *P. tonganus geddiei*. The genus *Notopteris* is represented by one endemic species, the long-tailed fruit bat *N. neocaledonica*. Scientific knowledge of this group of animals in New Caledonia is very scarce. Despite a legal hunting season existing, flying-foxes are heavily harvested all the year for human consumption (by both Melanesians and Europeans), where it is considered as a great delicacy and as a real part of the New Caledonian culture and traditions. In addition, fruit bats are also affected to other threats such as mining activity, forest fire… Whereas populations have declined seriously, very few studies have been implemented on New Caledonian flying-foxes, which constitute a lack to plan sustainable use of the resource. A population monitoring programme has been recently initiated and aims to improve the knowledge on new Caledonian flying-foxes (biology, ecology, distribution and status of species) to insure their conservation, to rationalize their management and to enable a sustainable use of the resource (e.g. possibly revision of the legal culling, establishment of protected areas in case of mining activity or tourism projects…). Involvement of the population and education constitute also a real part of this programme.

Demystifying *Mystacina*: Radio-tracking lesser short-tailed bats in New Zealand

Jenny Christie
Southern Regional Science Centre, Department of Conservation, PO Box 13049, Christchurch, NZ.

The New Zealand lesser short-tailed bat (*Mystacina tuberculata*) is the only known member of the endemic family Mystacinidae surviving today. The animals roost in tree cavities and are generally associated with old growth indigenous forest. Short-tailed bats are currently classified as threatened. Reduced population range and population decline are probably a result of widespread habitat modification through forest clearance by European settlers. The lack of information on home range requirements and patterns of nightly activity prompted this research in the Eglinton Valley, Fiordland National Park. I radio-tagged 21 short-tailed bats and found them to range collectively over a large area of 147 km^2. Most activity actually covered a much smaller area of 18 km^2. Home range size varied between individuals (100 % minimum convex polygons, MCPs: range = 1.3-62.2 km^2). Most individual ranges still covered quite a large area (100% MCPs: median = 4.8 km^2). Range shapes were confined by the Valley and were generally long and narrow (home range length: range = 2.2 – 23.0 km). Individual bats travelled large distances in a night and were capable of flying at speeds up to 44.3 km/h. Their mean flight speed of 2.5 km/h was relatively slow and most activity was concentrated in one or several small core areas (85% cluster polygons: range = 0.01 – 2.7 km2). Home range overlap was limited. Moderate levels of overlap among individual home ranges (median = 26.8%) decreased further in core areas (median = 3.7%). Bats generally roosted together as a group (mean ± SD group size = 324 ± 82 bats) in a tree cavity; sometimes they roosted by themselves. Emergence of short-tailed bats from their day roosts was significantly related to sunset time. On average, emergence occurred 42 minutes after sunset. The length of time individual short-tailed bats spent away from their day roost was strongly related to night length (i.e. dusk to dawn). Bats remained active throughout the night (mean ± SD = 457 ± 46 min) with only short (mean = 16 ± 8 min) and infrequent periods of inactivity recorded. Thus, lesser short-tailed bats have large home ranges, extended nocturnal activity, patchy distribution of core activity areas, and little range overlap. These range requirements have implications for reserve design.

Mother – infant interactions of the spectacled flying fox, *Pteropus conspicillatus*

Leisa Fisher
School of Animal Studies, University of Queensland, Gatton Campus.

Pteropus conspicillatus give birth to a single young from October to November. The mother and her infant maintain a close bond, especially for the first three weeks post partum, when the infant remains with its mother. Once the infant is approximately three weeks old, the mother leaves it behind at the camp, as it is too heavy for her to carry on foraging expeditions at night. Once the mother returns to the camp in the morning, she must be able to locate and reunite with her infant. This is achieved through vocalisations – each infant emits a unique call, termed infant isolation calls which the mother is able to recognise. Wild mother - infant pairs were studied at a *P. conspicillatus* campsite located at the Tolga Scrub (five minutes north of Atherton) on the Atherton Tablelands in Far North Queensland. Vocalisations and behaviour of mother – infant pairs were recorded whilst reuniting, with an ethogram constructed describing individual behaviours, their context and a description. Vocalisations were recorded on a digital audio tape recorder and analysed using a sound analysis program. Infant isolation calls were analysed to identify any components of calls which the mother uses to identify her infants location within the camp. Observations continued from November to February, with a noticeable trend where infants became less vocal during early morning recording sessions over time. Infants were observed to be capable of short flights around the camp at night in late December. This coincided with fewer infant calls being heard – and also infants were less vocal over time as they became less dependent on their mothers.

Foraging habitat use of bats in temperate forest in Japan

D. Fukui[1], N. Agetsuma[1], M. Murakami[1], D. A. Hill[2] and S. Nakano[3]
[1]Tomakomai Experimental Forest, Takaoka, Tomakomai 053-0035, Hokkaido, Japan; [2]School of Life Sciences, University of Sussex, Falmer, Brighton, BN1 9QG, U.K.; [3]Center for Ecological Research, Kyoto Univ., Hirano-cho, Kamitanakami, Otsu, Shiga 520-2113, Japan.

We surveyed foraging habitat use of insectivorous bats by broad-band acoustic surveys in Japanese temperate forest. To compare several types of habitats, we focused on forest types and occurrence of stream. In total, 3010 passes of bats were recorded. Proximity to a stream had a significant effect on the activity of *Myotis macrodactylus*. Activity of this species was higher in riparian forest than in non-riparian habitats. On the other hand, activity of *M. ikonnikovi* was higher in non-riparian than in riparian forest. Forest type and season had no significant effect on the activity of either *Myotis* species. Activity of *Nyctalus aviator* was significantly higher in autumn than in summer. Next, we focused on effects of adult aquatic insects on the foraging habitat use of insectivorous bats in spring by conducting a manipulative field experiment. In a deciduous forest, aquatic insect flux from the stream to the riparian zone was controlled with an insect-proof cover over a 1.2 km stream reach. The cover effectively reduced the flux of emergent aquatic insects to the riparian zone adjacent to the experimental reach. Adjacent to the control reach, adult aquatic insect biomass was highest in spring, and then decreased gradually. Terrestrial insect biomass increased gradually during the summer at both control and experimental reaches. Foraging activity of bats was correlated with insect abundance. In spring, foraging activity of bats at the control reach was significantly greater than at the experimental reach, and increased at both sites with increasing terrestrial insect abundance.

A Pontoon System for operating harptraps on lakes, creeks and rivers

Rob Gration
80 Hobson Street Newport Melbourne Australia 3015.

Animal welfare issues come into play when operating harptraps on water bodies, particularly those which can be affected by rainfall in the upper catchment or are under tidal influences. Employers can have occupational health and safety concerns for their field staff if they are required to work in, or near water. A pontoon system can alleviate both the animal welfare and occupational health and safety concerns of water based bat projects. The capture bag remains above the water at a pre-determined height regardless of varying water levels. The placement of the trap, and retrieval of bats does not require field staff to enter the water. The system has great potential for targeting "fishing bats". The pontoon system can be built in a couple of hours at a cost of approximately AUD$100. All parts are readily available and only basic tools are required.

Telomeres - A soft tissue chronometer for Australian bats?

Jon Luly[1], David Blair[2], Michelle Waycott[2], Samantha Fox[1,2], Jennifer Parsons[1,2], Simon Robson[2] and Jennifer Maclean[3]
[1]School of Tropical Environment Studies and Geography, James Cook University Townsville; [2]School of Tropical Biology, James Cook University Townsville; [3]Tolga Bat Hospital, Rescue and Research Atherton.

Determining the age of wild living flying foxes has long been problematical. The recent recognition that tooth cementum layers can provide annual ages for wild living flying foxes has provided a significant step forward in measuring age however age determination by counting tooth cementum layers has plenty of problems of its own. We propose using telomeres, nuclearprotein structures found at the ends of chromosomes, as a means of determining the age of flying foxes from soft tissue samples that can be collected simply and without significant distress to the animal. Once fully developed, the method offers a unique opportunity to measure ages of many individuals quickly, simply and with moderate cost.

Flying-foxes in Japan

Keiko Osawa and Yushi Osawa
The Bat Study and Conservation Group of Japan, 14-1-105 Sanko-cho, Kawagoe City, Saitama 350-0067, Japan.

There are 35 species of bats in Japan, two of which are flying foxes. One is the *Pteropus dasymallus*, which lives on Kuchinoerabujima and the islands south of it, located at latitude 30 degrees north, which is almost at the northern limit of the range of flying foxes all over the world. The other is the *P. pselaphon*, which inhabits the Ogasawara Islands. Because flying foxes in Japan live on small islands, their populations have never been large, but habitat destruction has shrunk the animal population further. *P. pselaphon* is endemic to five small islands, located about 1000 km south of Tokyo. Their estimated population is less than 300. As Chichijima, which holds the largest population among the five islands, is a tourist destination, the disturbance to their only roost and the development of nearby areas are serious problems. On the island, bats rely heavily on introduced plants, including commercial fruit, creating conflict between the bats and the fruit growers. *P. dasymallus* is classified into five subspecies, including one in Taiwan. It is also found in the northern Philippines. The status of *P. dasymallus* is a little better than *P. pselaphon*, as the estimated population reaches into the thousands. But among them, the subspecies *P. d. dasymallus*, whose population is estimated to be approximately 100 individuals, and *P. d. daitoensis*, whose population is estimated to be 300 are close to extinction, because their distribution is limited and all of the islands on which they live are very small.

The success of translocations of lesser short-tailed bats (*Mystacina tuberculata*)

Jay Ruffell and Stuart Parsons
School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland, New Zealand.

Translocation to predator free islands could be a key step in the conservation of lesser short-tailed bats (*Mystacina tuberculata*). However, a previous attempt failed because bats dispersed or died soon after release. In a second translocation three techniques were implemented to minimise the chance of dispersal or mortality: only juveniles were released, they were kept in an aviary at the release site, and they were provided with food and the aviary following release. This study assessed the short term success of this translocation, by determining if founders remained at the release site and maintained condition (weight) following release, to assess the efficacy of the release techniques and the feasibility of translocation as a management strategy. Infra-red video of the aviary showed that at least ten bats remained on the island three days after release, and recapture showed that at least nine remained eight months after release. However, bats lost weight. It is uncertain if this reflected a loss of condition, because they were heavier than bats from natural populations prior to release. As such weight loss was not a suitable criterion for assessing translocation success. Nevertheless, the translocation should not be considered successful; bats caught eight months after release had inflamed, scabbed ears and were balding. Ear damage could lower survival if it affects echolocation. Additionally, a possible cause was mite infestation, and this has proved fatal in captive populations. Identifying the cause of ear damage and balding and modifying the translocation protocol to prevent it may be important to achieve future success.

Conserving long-tailed bats – A local initiative

Jane Sedgeley and Sandra Parkkali
Department of Conservation, Southern Regional Science Centre, P.O. Box 13049, Christchurch, New Zealand.

The endemic New Zealand long-tailed bat (*Chalinolobus tuberculatus*) is an endangered species. Decreases in distribution are mainly attributed to forest clearance and the failure of bats to survive in open country and urban areas. Fewer than 200 long-tailed bats survive in the predominantly agricultural landscape of South Canterbury in the South Island, and their numbers are declining. Productivity and survival in this population is significantly lower than bats inhabiting unmodified indigenous forest. Research identified one of the main factors contributing towards this decline is loss of high-quality roost sites. In the absence of indigenous trees, most bats roost in introduced willow trees which do not provide optimum conditions for rearing young, and allow easy access for introduced predators (Sedgeley and O'Donnell, 2004). In 2003, a conservation management programme was initiated with the aims of restoring roosting and foraging areas, and controlling predators. It involved local farmers, non-government conservation organisations, the New Zealand Department of Conservation, and local government. As part of this programme the Royal Forest and Bird Protection Society developed a sponsored artificial-roost box scheme run in conjunction with many local people and researchers from the Department of Conservation. A total of 96 Schwegler roost boxes of four different designs are currently being trialled. The boxes have been checked for occupancy twice since they have been installed, each occasion at the end of the bat breeding season. In 2004, four roost boxes were occupied by a total of seven endemic geckos. In 2005, nine boxes were occupied by a total of 24 geckos, and two boxes had one or two bat dropping. The boxes were also used by endemic weta (Orthoptera) and rifleman birds.

Far North Queensland Flying-Fox Forum

Louise Shilton[1,4], Rowena Grace[2], Peter Latch[3,4], David Westcott[1,4]
[1]CSIRO Sustainable Ecosystems, Atherton; [2]FNQ NRM Ltd, Atherton; [3]QPWS, Atherton; [4]Rainforest CRC, Cairns, Queensland, Australia.

Here we announce the launch of the first Far North Queensland Flying Fox Forum - date and venue yet to be arranged at the time of abstract submission. Conservation management of the spectacled flying-fox, *Pteropus conspicillatus*, is a contentious issue facing natural resource management in northern Queensland. *P. conspicillatus* provide seed dispersal and pollination for a wide range of tropical plants, and are thus recognised as an integral component of World Heritage forests in the Wet Tropics. In May 2002, *P. conspicillatus* was listed as Vulnerable under the EPBC Act 1999, and damage mitigation permits have been granted to cull only one percent of the estimated population since the legislation. The population status of two other flying foxes in the region, *P. alecto* and *P. scapulatus*, are considered not to be threatened, and thus neither are protected under Federal or Commonwealth legislation. However, all three *Pteropus* species damage commercial fruit crops and cause economic losses to primary production in northern Queensland. Damage mitigation by means other than exclusion netting is of limited success, but netting is prohibitively expensive for many growers. Preliminary assessments of tropical fruit crop damage indicates that orchard attacks are highly variable geographically, and year-to-year. Here we invite all interested people to attend this forum to share their experience, ideas and solutions for flying-fox damage mitigation at orchards. We also welcome discussion of other flying-fox conservation and management issues such as camps in urban areas, tree damage in forest remnants, and ‘strikes’ at airports.

New data on flying fox species (*Pteropus* spp.) in Vietnam

Vu Dinh Thong[1] and Pham Quoc Hung[2]
[1]Institute of Ecology and Biological Resources, Vietnamese Academy of Science and Technology, 18 Hoang Quoc Viet Road, Cau Giay District, Hanoi, Vietnam; [2]Hanoi University of Education, 136 Xuan Thuy Road, Cau Giay District, Hanoi, Vietnam.

To date, three species of *Pteropus* have been recorded in Vietnam, including the small flying-fox *Pteropus hypomelanus*, Lyle’s flying-fox *P. lylei* and the large flying-fox *P. vamyrus*. *P. hypomelanus* was recorded at Con Son island in 1869, followed by *P. lylei* in Sai Gon, Gia Dinh former province in 1908 and then *P. vamyrus* at Phu Quoc island and Thua Thien-Hue province. For some subsequent decades, information on these species, especially the flying-foxes, was completely limited. Since 2001, a large number of detailed surveys on the bat fauna of Vietnam have been conducted through out the country, including the areas where the flying-foxes were previously recorded. The surveys indicate that these species have been undergoing a decreased in number, because of different potential threats such habitat loss, hunting etc. It is probably warned that these species would be ones of the first mammals of Vietnam which could become extinct, unless the influential factors were urgently minimised and prevented. Based on the recorded data, characteristics of these species, which might deserve to be listed in the Red Data Book for Vietnam in next editions, are described.

Short-tailed bats (*Mystacina tuberculata*) in Pikiariki Ecological Area, Pureora Forest Park, New Zealand

Jessica Wallace[1], Dai Morgan[1], Haley Cooper[2], and David Smith[2]
[1]Department of Conservation, Pureora Field Centre, R.D.7, Te Kuiti, New Zealand; [2]Department of Conservation, Maniapoto Area Office, 78 Taupiri Street, Te Kuiti, New Zealand.

The endemic short-tailed bat (*Mystacina tuberculata*) was once widespread throughout New Zealand, but mainly due to habitat loss they are now restricted to a small number of populations throughout the country, and considered endangered. Once such population was discovered in Pikiariki Ecological Area, Pureora Forest Park in the early 1990s - since then little research has been conducted on short-tailed bats within this area. Therefore, the aims of this study were to: (1) locate communal roost trees, (2) determine the minimum population size, and (3) monitor population movements within Pikiariki. Ten short-tailed bats were caught and fitted with radio transmitters between January-March 2006 and subsequent tracking identified eight communal roost trees, all within a 15 ha area. Video monitoring on bat emergence from roost trees showed the minimum population estimate to be approximately 570 (highest count 572). Individuals may have been occupying solitary roosts and/or another unknown colonial roost, therefore the actual size of the population is unknown. Although this data indicates that the much localised short-tailed bat population is persisting in Pikiariki since its initial discovery, it is recommended that annual surveys are implemented to determine if this population is stable, increasing or decreasing, so that an appropriate level of management can be instigated.

The successful relocation of a colony of Southern Myotis *Myotis macropus* following the replacement of Millfield Bridge, Hunter Valley, NSW

Ray Williams
Ecotone Ecological Consultants Pty Ltd, 39 Platt Street, Waratah, NSW 2298.

A poster paper presented at the 11th Australasian Bat Society conference in Toowoomba reported on the progress of this project. As part of the timber bridge replacement scheme being conducted by the NSW Roads and Traffic Authority (RTA), Millfield Bridge over Wollombi Brook has been replaced by a concrete structure. During the initial fauna surveys for the project in July 1999, a colony of southern myotis was found to be roosting within one of the many hollow corbels in the old timber bridge structure. Subsequent monitoring has found that the site under the old bridge was a permanent roost and maternity site. Births have been estimated to occur in two distinct periods, late October and early February. A search of the old bridge identified at least 34 potential roost sites, however, the main colony has only been observed to use two of these sites. Individual males were found to use some of the other roosts on occasion. Banding of the bats has resulted in over 100 individuals being marked and the colony size varies between about 10 – 50 individuals, with maximum numbers occurring during and just after the breeding season. A Bat Management Plan was prepared in July 2001. The Bat Action Plan resulted in the monitoring of the colony and a search of the locality for alternate roost sites. The new bridge design incorporated locations for artificial bat roosts. These were designed to similar specifications designed by Harry Parnaby for a bridge at Pottsville (Marshall and Macfarlane 2000 – poster paper 9th Australasian Bat Conference). The bats were monitored during and after bridge construction and the artificial roosts were installed under the new bridge. Prior to the removal of the old bridge, the bats were excluded from all known or potential roosts by placing shade cloth over all cracks and hollows. Exclusion at the main roost was carried out immediately prior to the bridge demolition in June 2005. The main roost corbel and four other selected corbels, known to be used as roost sites, were transferred to pre determined locations under the new bridge. Monitoring of all the roost sites under the concrete bridge determined that the main colony of approximately 35 individuals returned to the old roost corbel for the 2005/6 breeding season. The presence of non flying young in November 2005 and pregnant females in February 2006 indicates that roost is still being used as a maternity site. This poster paper will discuss the overall process and the results of the monitoring of this successful relocation.

Prize winners at the 12th Australasian Bat Society Conference

Due to a large number of very generous sponsors, the following prizes were presented at the conference:

BCI Conservation Paper, sponsored by Bat Conservation International, went to Moira Pryde for her paper 'Factors influencing survival and long-term population viability of New Zealand long-tailed bats (*Chalinolobus tuberculatus*): Implications for conservation'.

The Wimberley Prize (for the best paper or poster that aids rehabilitation, release/survival and rescue of bats), sponsored by Trish and Terry Wimberley, went to Judith Hopper-Hallinan for her paper 'Testing treatments to arrest wing damage in vulnerably listed flying-foxes'.

The Student Spoken Paper Prize, sponsored by De Gruyter Publishers, went to Andrea Dekrout for her paper 'One sex in the city? Early indications of an extreme sex bias in the use of city habitats by bats in Hamilton New Zealand and the ecology of male long-tailed bats (*Chalinolobus tuberculatus*) at the urban-rural interface'.

The Student Poster Prize, sponsored by Titley Electronics, went to Fabrice Brescia for his paper 'New Caledonian flying foxes: knowledge and population monitoring for conservation'.

The Student Travel Prize, sponsored by Greg Richards and Associates, went to Jen Parsons for her paper 'Spatial and temporal patterns of resource use by spectacled flying foxes (*Pteropus conspicillatus*)'.

Student Runner-up Prizes, sponsored by Rob Gration, went to Lisa Evans for her paper 'Bats and bugs in boxes: Do parasites influence bat roosting behaviour?' and to Christopher Turbill for his paper 'Thermal physiology of pregnant and lactating female and male long-eared bats, *Nyctophilus geoffroyi* and *N. gouldi'*.




Some of the recipients being presented with their awards. Clockwise from top left: Moira Pryde, Christopher Turbill, Jen Parsons and Lisa Evans (photos Kerryn Parry-Jones).

– Research Papers and Notes –

Standardising the common names of Australian bats – an update

Kyle Armstrong[1] and Terry Reardon[2]
[1]Kyoto University Museum, Japan; [2]South Australian Museum, Adelaide.

Introduction
The recent compilation of the third edition of 'The Mammals of Australia' provided an impetus amongst some members of the Australasian Bat Society to review the common names used for bats in Australia. This review inevitably raised issues such as grammar, regional and global consistency and descriptive clarity. The purpose of this note is to share more widely the results of that discussion and to present the reviewed list of standard common names for all currently recognised Australian bat species and subspecies for wider comment. The logical basis for the selection of some names and the use of grammar is explained.

Common names
From a biologist's point of view, common names are redundant. It would be far simpler if everyone used the unequivocal scientific name for all species. But of course, the use of common names for animals and plants arose independently of any taxonomic endeavour. Historically, common names have been coined for various animal species or species' groups in an ad hoc fashion and sometimes on a regional basis. Thus the same species may acquire a number of different common names.

Common names of animals are not governed by an international code of nomenclature equivalent to that in use for scientific names (see ICZN 1999). There are various grammatical conventions for common names, and while not as comprehensive, are nevertheless thorough, logical and grammatically correct where practicable. Examples of standardised lists that follow these already occur. The conventions and bird names put forward by Schodde *et al*. (1978) have been adopted in Australia, with updates on names provided intermittently later on (e.g. Christidis and Boles 1994). Common names of birds have received more attention than those of mammals and other smaller fauna, probably because more people are familiar with members of this group, their taxonomy is mostly resolved (at least at the species level), and because common names are less wieldy than scientific binomial nomenclature for 'everyday use'. There are no formal conventions for common names in mammals, though most authors follow authoritative references (typically Strahan 1995), museum checklists (e.g. How *et al.* 2001) and field guides (Churchill 1998; Menkhorst and Knight 2001), which often differ. The usage of common names is justified briefly in most of these (e.g. see the discussion in Churchill 1998:viii). Churchill (1998) states that "Bats don't really have common names as they are not commonly known creatures", and used the most recently published names available at that time for 80% of species. Menkhorst and Knight (2001) use the most recently published common names, stating in their introduction that "In some cases we have used different common names that we believe have advantage over those suggested by Strahan (1995)." Their principle for adopting some alternatives was based on the principle that "simplicity and shortness are desirable".

The standardisation of common names goes beyond simple pedantry or editorial predilection. The primary reason is to avoid confusion. Thus a goal of standardising is to have a single common name for each species and subspecies across Australia. Ideally, the names chosen should reflect unambiguously some feature of the bat, its scientific name or region of occurrence. Common names have a particularly important role as an interim nomenclature for species undergoing taxonomic revision (e.g. the free-tailed bats). The standardisation of the grammar of each name is also important, since accuracy is an important element in scientific writing at all levels and for presentation and professionalism generally.

Given that common names for Australian bats are not standardised in the various authoritative references and guides, and that there are good reasons for having a standardised list, the next consideration is naturally who should have the authority to compile such a list. Members of the Australasian Bat Society are perhaps the best placed to give guidance, given that most people working on, or with an interest in, Australian bats are members of our society. In fact, ABS members first published a revised common name list in the ABS Newsletter (Richards *et al.* 1993) and were involved in the Action Plan for Australian Bats (Duncan *et al*. 1999).

As stated earlier, the proposal of a new edition of 'The Mammals of Australia' being edited by Steve Van Dyck prompted a review of previous lists of common names, given the progress in the taxonomy of some groups. A new list was compiled by one of us (T. Reardon) and circulated to and discussed by members of the ABS executive and some other species' authors for 'The Mammals of Australia'. A modified list was provided to Steve in time for his deadline. The logical basis for the construction of the list follows.

Departures from consistency

After an examination of various books and lists, three types of departure from consistency were noted: descriptive terms, hyphen usage and capitalisation. We provide a basis for a standardised usage of each of these, and justify departures from the standard pattern for selected species in a similar fashion to Schodde *et al*. (1978).

Descriptive terms

The descriptive terms are obviously the most important aspect of a common name. Many are consistent with Richards *et al.* (1993). Inconsistencies used in various other publications such as the incorrect usage of 'horseshoe' bat for species in the Hipposideridae are easily resolved, since this family is recognised widely as the 'Old World leaf-nosed bats'. The use of flying-fox rather than fruit bat to describe members of the genus *Pteropus* (cf. the 'fruit bat' *Dobsonia*) seems well established already in Australia. For alternatives that seem to be used world-wide, such as 'ghost bat' and 'Australian false vampire bat' in the case of *Macroderma gigas*, we included the one most commonly used in Australia. We have also differed from overseas authorities such as Simmons (2005) by preferring 'free-tailed' over 'mastiff' for all Molossidae, and 'tube-nosed bat' rather than 'tube-nosed fruit bat' for *Nyctimene*. Some names have changed to make them more palatable, e.g. 'bristle-faced free-tailed bat' replacing 'hairy rostrum freetail bat' (over the alternative 'hairy-nosed freetail bat' it seems), since the word 'rostrum' is not a common word. Others have been standardised to match the common name given in their original description, e.g. Torresian flying-fox rather than Moa flying-fox for *Pteropus banakrisi*, though this might be one case that needs further discussion and consensus.

Many bat common names include a term relating to their distribution. In some cases, one alternative common name was determined to be inaccurate. In the example of *Vespadelus caurinus*, the common name was changed from 'western cave bat' to 'northern cave bat', which is easily justifiable after an inspection of their distribution. In other examples, the common name might be considered confusing. In the case of *Scotorepens* sp., at one stage listed as 'central-eastern broad-nosed bat, is listed as the 'un-named broad-nosed bat'. A more elegant descriptive name will be chosen during taxonomic revision, but is listed as such in the interim. The preponderance of the terms 'eastern, western, northern, southern and central' is high in our list, and while some names are well established, we should perhaps settle on other terms in future during taxonomic revision. A good case in point is the 'northern pipistrelle' *Pipistrellus westralis* – both terms are well justified by either their distribution or nomenclatural history, but there is more latitude to replace the common name if it is deemed appropriate. If we choose, it could remain as a quaint paradox! In a second example, significant confusion amongst authors also occurred when contributing to the latest edition to the 'Mammals of Australia' for the *Mormopterus 'loriae'* taxa 'little northern free-tailed bat' / 'little western free-tailed bat'. An alternative to 'distributional' terms is the meaning of the specific epithet, which is used for some species (e.g. orange leaf-nosed bat *Rhinonicteris aurantia*; Finlayson's cave bat *Vespadelus finlaysoni*), but we do not suggest renaming all species based on their specific epithet. Confusion arising from a preponderance of size-related terms such as 'little', 'lesser' and 'greater' does not seem to be an issue.

The greatest source of contradictory descriptive terms has to do with the form of the adjectives. The role of the hyphen in adjectival compounds is discussed below, but the form of the second adjective is relevant here. If we consider the first example of 'long-eared bat', the alternatives include 'longear bat', 'longeared bat' and 'longear' (minus the term 'bat'). In the case of the latter we favour the inclusion of the term 'bat' to signify that the species is a member of the Chiroptera. For the others, only the first example is grammatically correct. The suffix '-ed' is generally used in such adjectival compounds, though they are regularly culled by many bat workers in examples such as 'sheathtail' and 'freetail'. Analogous terms that reach prevailing usage amongst ornithologists were accepted in some cases (see Schodde *et al.* 1978). In the case of Australian bats, it is suggested that we should add the suffix where grammatically correct, and avoid collapsing words together, except where the compound word has already reached prevailing use in English generally (e.g. 'horseshoe'). This seems to be what the most current authoritative guides and references currently use (Nowak 1999; Simmons 2005). It might be argued that we should adopt more 'familiar' sounding names (e.g. 'longear'), abandoning grammatical correctness for something that might be more 'friendly' and assist in their 'public image'. Others might suggest that the more formal approach of grammatical correctness is better in the context of a world list of bats. While it might annoy some, we suggest that we standardise the form to 'long-eared', 'sheath-tailed' and 'free-tailed' in the interests of consistency and correctness.

Hyphen usage
The most variable part of a common name seems to be the use of the hyphen, and was the source of most confusion in the recent discussion. Some find hyphens truly irritating and have questioned their validity. There is indeed a logical basis for hyphens, and it is anticipated that if their use was standardised, the resulting irritation and confusion would be mostly avoided. The Australian Government recommends that writers of government publications follow its style manual (Commonwealth of Australia 2002). The version I (K. Armstrong) had access to via the web has disappeared following a reprinting, and unfortunately I do not have current access to the new version. However, according to the 2002 version, section 6.126 describes the correct usage of hyphens for adjective compounds, which we have adopted in the list.

Hyphens are used generally in English to avoid confusion when there is more than one adjective preceding a noun, which is the case with most common names for bats. In the example of 'large-footed myotis', the hyphen indicates that the feet of this bat are large, avoiding the connotation that it is a large bat that actually has feet. The absence of hyphens in 'chocolate wattled bat' indicates that the bat is chocolate, not its wattles, though it might be argued that such implied common sense is obvious in both examples here, especially when a name is well established. Furthermore, there is the temptation to add a hyphen in the second case for consistency to derive 'chocolate wattled-bat'. However, this is inconsistent with the style manual Commonwealth of Australia (2002: section 6.126), and in the list of Australian bats, we have used hyphens for connecting adjectives only, and avoided connections between adjectives and nouns.

The one obvious exception to non-linkage of adjectives and nouns is that of 'flying-fox'. Rather than launch into an extended explanation, hopefully it will suffice to point out that the beasts are bats rather than foxes, and the use of a hyphen avoids the connotation that they run around on four legs and attack medium-sized marsupials. This is another case where we have chosen to differ from Simmons (2005).

Capitalisation
According to the Commonwealth of Australia (2002: section 4.68), "The common names of plants and animals are not given initial capitals except where they contain proper names". Thus, in titles of articles and in the text, capitalisation should be avoided. There would be some exceptions where capitalisation could be deemed appropriate, such as in titles for discrete sections for a particular species in field guides of similar structure to Churchill (1998) and Duncan *et al.* (1999) for example, but only for the first word.

Common names for subspecies and 'forms'
In the list presented here, we have included common names for subspecific taxa or 'forms'. Sometimes it might be relevant to refer directly to a particular subspecies, though use of the scientific name might be superior for reasons of clarity. We have listed a separate name for each subspecies, as well as the species as a whole. Although the species-level name is unique, the scientific name of a subspecific taxon should be indicated in the first instance with the common name, lest it be considered as a full species mistakenly. Particular care should be taken in the case of *Rhinolophus megaphyllus* since the full species is listed as 'eastern horseshoe bat', and the two subspecific taxa are listed as 'northern horseshoe bat' and 'southern horseshoe bat'. We have tried to indicate a link between subspecies and the name used for the species as a whole, such as in the case of the 'greater long-eared bat' *Nyctophilus timoriensis*, where subspecies as forms are named as 'western greater long-eared bat'

etcetera. But in most cases, we avoided some adjectives in an effort to keep names as short as possible. In the case of *Rhinonicteris aurantia*, the Pilbara 'form' is listed as such under Commonwealth legislation, as it awaits the outcome of further work regarding its status, though Armstrong (2006) suggests that the common name 'Pilbara leaf-nosed bat' could be deemed 'available'.

Concluding remarks

We have settled currently on a list that derives from consistency with usage in other parts of the world, the authoritative style manual used by the Government of Australia, accepted forms of English grammar, prevailing usage, and, on occasions, brutally making a decision where one was required. We repeat that it is important to avoid confusion when referring to species by their common names, particularly because many taxa are still undergoing formal taxonomic revision. The Molossidae are a case in point, and we need to use standard common names in the interim. Furthermore, it is important to be consistent in a professional sense for the sake of the species we are often trying to help.

Hopefully the justifications described above are sufficiently clear and rational to allow general acceptance of the list. However, as mentioned in the Introduction, there is every opportunity for discussion and revision, especially after taxonomy progresses. The list follows the references.

Acknowledgements

The following people are acknowledged for their input on the list that was provided to Stephen Van Dyck, in alphabetical order of surname for political correctness: Peggy Eby, Greg Ford, Rob Gration, Glenn Hoye, Maree Kerr, Lindy Lumsden, Damian Milne, Nancy Pallin, Kerryn Parry-Jones, Harry Parnaby, Greg Richards and Bruce Thomson.

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Genus species Authority	ABS common name
Pteropodidae	
Pteropus poliocephalus Temminck, 1825	grey-headed flying-fox
Pteropus alecto gouldi Peters, 1867	black flying-fox
Pteropus scapulatus Peters, 1862	little red flying-fox
Pteropus banakrisi Richards and Hall, 2002	Torresian flying-fox
Pteropus brunneus Dobson, 1878	Percy Island flying-fox
Pteropus conspicillatus Gould, 1850	spectacled flying-fox
Pteropus macrotis epularius Ramsay, 1878	large-eared flying-fox
Pteropus melanotis natalis Thomas, 1887	Christmas Island flying-fox
Dobsonia magna Thomas, 1905	bare-backed fruit bat
Nyctimene robinsoni Thomas, 1904	eastern tube-nosed bat
Nyctimene cephalotes (Pallas, 1767)	northern tube-nosed bat
Syconycteris australis (Peters, 1867)	eastern blossom bat
Macroglossus minimus nanus Matschie, 1899	northern blossom bat
Megadermatidae	
Macroderma gigas (Dobson, 1880)	ghost bat
Rhinolophidae	
Rhinolophus megaphyllus Gray, 1834	eastern horseshoe bat
Rhinolophus megaphyllus ignifer Allen, 1933	northern horseshoe bat
Rhinolophus megaphyllus megaphyllus Gray, 1834	southern horseshoe bat
Rhinolophus philippinensis Waterhouse, 1843	large-eared horseshoe bat
Rhinolophus philippinensis (large form)	greater large-eared horseshoe bat
Rhinolophus philippinensis (small form)	lesser large-eared horseshoe bat
Hipposideridae	
Hipposideros ater Templeton, 1848	dusky leaf-nosed bat
Hipposideros ater aruensis Gray, 1858	eastern dusky leaf-nosed bat
Hipposideros ater gilberti Johnson, 1959	western dusky leaf-nosed bat
Hipposideros cervinus (Gould, 1854)	fawn leaf-nosed bat
Hipposideros diadema (Geoffroy, 1813)	diadem leaf-nosed bat
Hipposideros diadema inornatus McKean, 1970	Arnhem leaf-nosed bat
Hipposideros diadema reginae Troughton, 1937	Queensland diadem leaf-nosed bat
Hipposideros semoni Matschie, 1903	Semon's leaf-nosed bat
Hipposideros stenotis Thomas, 1913	northern leaf-nosed bat
Rhinonicteris aurantia (Gray, 1845)	orange leaf-nosed bat
Rhinonicteris aurantia (Gray, 1845) (Pilbara form)	Pilbara leaf-nosed bat
Emballonuridae	
Taphozous australis Gould, 1854	coastal sheath-tailed bat
Taphozous georgianus Thomas, 1915	common sheath-tailed bat
Taphozous hilli Kitchener, 1980	Hill's sheath-tailed bat
Taphozous kapalgensis McKean and Friend, 1979	Arnhem sheath-tailed bat
Taphozous troughtoni Tate, 1952	Troughton's sheath-tailed bat
Saccolaimus flaviventris (Peters, 1867)	yellow-bellied sheath-tailed bat
Saccolaimus mixtus Troughon, 1925	Papuan sheath-tailed bat
Saccolaimus saccolaimus nudicluniatus (De Vis, 1905)	bare-rumped sheath-tailed bat
Molossidae	
Tadarida australis (Gray, 1838)	white-striped free-tailed bat
Chaerephon jobensis colonicus (Thomas, 1906)	northern free-tailed bat
Mormopterus beccarii Peters, 1881	Beccari's free-tailed bat
Mormopterus loriae	little free-tailed bat
Mormopterus loriae cobourgiana Johnson, 1959	western little free-tailed bat
Mormopterus loriae ridei Felten, 1964	eastern little free-tailed bat
Mormopterus norfolkensis (Gray,1839)	east-coast free-tailed bat
Mormopterus sp. (form sp 4 in Adams *et al.* 1988)	southern free-tailed bat
Mormopterus sp. (form sp 4 (PQR) in Adams *et al.* 1988)	south-eastern free-tailed bat
Mormopterus sp. (form sp 4 (O) in Adams *et al.* 1988)	south-western free-tailed bat
Mormopterus sp. (form sp 3 in Adams *et al.* 1988)	inland free-tailed bat
Mormopterus sp. (form sp 2 in Adams *et al.* 1988)	eastern free-tailed bat
Mormopterus sp. (form sp 6 in Adams *et al.* 1988)	bristle-faced free-tailed bat

See over for the Vespertilionidae …

Genus species Authority	ABS common name
Vespertilionidae	
Chalinolobus dwyeri Ryan, 1966	large-eared pied bat
Chalinolobus gouldii (Gray, 1841)	Gould's wattled bat
Chalinolobus morio (Gray, 1841)	chocolate wattled bat
Chalinolobus nigrogriseus (Gould, 1856)	hoary wattled bat
Chalinolobus picatus (Gould, 1852)	little pied bat
Falsistrellus mackenziei Kitchener, Caputi and Jones, 1986	western false pipistrelle
Falsistrellus tasmaniensis (Gould, 1858)	eastern false pipistrelle
Kerivoula papuensis Dobson, 1878	golden-tipped bat
Miniopterus australis (Tomes, 1858)	little bent-winged bat
Miniopterus schreibersii (Kuhl, 1817)	large bent-winged bat
Miniopterus schreibersii orianae Thomas, 1922	northern bent-winged bat
Miniopterus schreibersii oceanensis Maeda, 1982	eastern bent-winged bat
Miniopterus schreibersii bassanii Cardinal and Christidis, 2000	southern bent-winged bat
Murina florium Thomas, 1908	flute-nosed bat
Myotis macropus (Gould, 1855)	large-footed myotis
Nyctophilus arnhemensis Johnson, 1959	northern long-eared bat
Nyctophilus bifax Thomas, 1915	
Nyctophilus bifax bifax Thomas, 1915	eastern long-eared bat
Nyctophilus bifax daedalus Thomas, 1915	pallid long-eared bat
Nyctophilus geoffroyi Leach, 1821	lesser long-eared bat
Nyctophilus gouldi Tomes, 1858	Gould's long-eared bat
Nyctophilus howensis McKean, 1973	Lord Howe long-eared bat
Nyctophilus timoriensis (Geoffroy, 1806)	greater long-eared bat
Nyctophilus timoriensis major Gray, 1844	western greater long-eared bat
Nyctophilus timoriensis (Geoffroy, 1806): (central form)	central greater long-eared bat
Nyctophilus timoriensis (Geoffroy, 1806): (south-eastern form)	eastern greater long-eared bat
Nyctophilus timoriensis sherrini Thomas, 1915	Tasmanian greater long-eared bat
Nyctophilus walkeri Thomas, 1892	pygmy long-eared bat
Pipistrellus adamsi Kitchener, Caputi and Jones, 1986	forest pipistrelle
Pipistrellus murrayi Andrews, 1900	Christmas Island pipistrelle
Pipistrellus westralis Koopman, 1984	northern pipistrelle
Scoteanax rueppellii (Peters, 1866)	greater broad-nosed bat
Scotorepens balstoni (Thomas, 1906)	inland broad-nosed bat
Scotorepens greyii (Gray, 1843)	little broad-nosed bat
Scotorepens orion (Troughton, 1937)	eastern broad-nosed bat
Scotorepens sanborni (Troughton, 1937)	northern broad-nosed bat
Scotorepens sp.	*un-named broad-nosed bat*
Vespadelus baverstocki Kitchener, Jones and Caputi, 1987	inland forest bat
Vespadelus caurinus (Thomas, 1914)	northern cave bat
Vespadelus darlingtoni (Allen, 1933)	large forest bat
Vespadelus douglasorum (Kitchener, 1976)	yellow-lipped cave bat
Vespadelus finlaysoni Kitchener, Jones and Caputi, 1987	Finlayson's cave bat
Vespadelus pumilus (Gray, 1841)	eastern forest bat
Vespadelus regulus (Thomas, 1906)	southern forest bat
Vespadelus troughtoni Kitchener, Jones and Caputi, 1987	eastern cave bat
Vespadelus vulturnus (Thomas, 1914)	little forest bat

New record of a greater long-eared bat in Victoria

Sally Koehler

Biosis Research Pty. Ltd., 38 Bertie Street [P.O. Box 489], Port Melbourne, Victoria, 3207. Email: skoehler@biosisresearch.com.au

On 16 November 2004, a greater long-eared bat *Nyctophilus timoriensis* was captured in a harp trap as part of fauna surveys for the proposed Long-term Containment Facility at Nowingi, south of Mildura, in north-western Victoria. This represents the fifth record of the species in Victoria and created much excitement amongst the zoologists at Biosis Research and generally in the wider community.

The single male greater long-eared bat (Plate 1) was captured in an area of Woorinen Mallee which supported a high density of large hollow-bearing trees. The harp trap was placed in a 'window' between an area cleared during past gravel extraction and a 'room' in the mallee vegetation (Plate 2). Anabat detectors were also used and long-eared bat calls were detected but it is not possible to reliably distinguish between the echolocation calls of long-eared bat species (Chick 2005).

Plate 1. The captured greater long-eared bat.

Plate 2. The room in the mallee vegetation.

Overall, from the surveys in November 2004 and January/February 2005, a total of seven bat species was recorded at Nowingi from harp traps, mist nets and Anabat detectors (Table 1).

Table 1. Bat species recorded at Nowingi

Common name	Scientific name	Source
white-striped free-tailed bat	*Tadarida australis*	Heard/Anabat
southern free-tailed bat	*Mormopterus* sp. 4	Anabat
greater long-eared bat	*Nyctophilus timoriensis*	Trapped
lesser long-eared bat	*Nyctophilus geoffroyi*	Trapped
Gould's wattled bat	*Chalinolobus gouldii*	Trapped/Anabat
chocolate wattled bat	*Chalinolobus morio*	Anabat
southern forest bat	*Vespadelus regulus*	Trapped

It is possible that an additional species, Gould's long-eared bat *Nyctophilus gouldi* may have been recorded by Anabat as it is one of the *Nyctophilus* complex that cannot be distinguished from recorded calls.

One further bat species, little forest bat *Vespadelus vulturnus* has been recorded in the local area (AVW) but was not recorded during the surveys.

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Acknowledgements

Thank you to: David Gee, Lindy Lumsden and Peter Menkhorst for confirming the identification of the bat; Ian Smales, Mark Venosta, Daniel Gilmore and Aaron Organ who were the other members of the survey team from Biosis Research.

Strange roost sites

David Gee

Wildtraces, P.O. Box 189, Gol Gol NSW 2738. Email dgee@wildtraces.com

I hope that you have all read the book at least once, or seen the film, ‘The Hitchhikers Guide to the Galaxy’ by Douglas Adams. One of the many theories in this series of books is the improbability drive, where strange things happen due to very highly improbable numbers:

> *“The principle of generating small amounts of finite improbability by simply hooking the logic circuits of a Bambleweeny 57 Sub-Meson Brain to an atomic vector plotter suspended in a strong Brownian Motion producer (say a nice cup of tea) were of course well understood”* Adams (1979).

I had a hitch-hikeran moment a little while ago. I was sitting in my shed thinking about nothing much, (a particular talent I posess), when all of a sudden I heard bat noises. It is a large shed with a high roof; at first I thought there must be some bats roosting in the ridge, but the sound was too close for that. Eventually I tracked the sound down to a hanging terracotta bat sculpture that I had hung up a month earlier. (First part of the improbably equation: Bat=bat).

Figure 1. Location of the bat roost.

Figure 2. Bats gain entrance to the bat via the wing folds.

Looking into the bat, I could see a bat looking out at me (Bat^2), it was a Gould's wattled bat, *Chalinolobus gouldii*. I could see that it had a band on its forearm (second part of the improbably equation). Had it not been for the presence of the band on the forearm I would have left it at that, but having seen the band and knowing that I had banded some bats in the shed a year earlier I wanted to find out what the band number was.

Figure 3. Bat^2.

Figure 4. Terracotta bat back in place.

The next difficulty to overcome (apart from surprise), was how to extract the bat from the bat; (Bat^2 – bat = bat?). The space was too narrow to get anything into it to help extract the bat and apart from breaking open the terracotta bat there was not much I could do. I did try shaking the terracotta bat but this proved a bit of a disaster as the hollow head of the terracotta bat was full of guano which distributed itself all over the kitchen cupboards and floor! So all I could do was wait for the bat to extract itself.

Subsequently, I was woken at 4.00 am to the sound of not one, but two bats flying around the bedroom. Once caught, I discovered that both bats were banded (Improbably equation completed: Bat^2 – 2(bat) = bat+bat). Both were males that I had caught and banded the previous year. The initial banding was done soon after I had built the shed. At that time, I was constructing some bat traps in the shed, and as I completed each trap, I left it erected inside. Consequently, I caught a number of bats in the erected traps.

So, not only had the bats found an unusual place to roost, they have been returning to the same site for over a year. They both appeared healthy and had no signs of injury due to the band.

After their eviction and measurement I have re-hung the terracotta bat back up in the shed and my two impro**bat**ail bats have returned.

References

Adams, D, (1979), *The Hitchhikers Guide to the Galaxy*. pp 68-69. Pan Books Ltd Cavaye Place: London.

Use of GladWrap as a weather protection technique for Anabat

Chris Corben
corben@hoarybat.com

Anabat detectors intended for outdoor, long-term passive monitoring need to be protected from the weather. This has most often been achieved by using a flat plate as a reflector and using it to deflect the incoming sound up into a microphone, which is protected from the elements. Alternatively, curved tubes have been used for the same purpose. The question has often been asked if a thin plastic membrane, such as 'GladWrap'" could be used to waterproof the microphone. This would offer a simpler solution, with the added advantage that it would be less likely to provide a home for local wildlife, leading to biofouling and reduced sensitivity. Last year, Margaret and Rupert Clarke in Wales showed me how they had used such membranes for weather protection.

On 10 May 2006, I conducted a crude experiment to assess the impact of GladWrap on the sensitivity and frequency response of an Anabat microphone. I ran four trials, the first and last being controls in which no membrane was employed. Two test trials used 'ClingWrap' manufactured by Glad as a membrane which completely covered the microphone. In the first test, the ClingWrap was loosely wrapped around the microphone and held in place by its own adhesive properties. In the second test, the membrane was more tightly applied to the microphone and held in place by a rubber band around the back of the microphone, thus keeping the membrane taught against the front face of the microphone, but not noticeably stretched.

A variety of frequencies from 15 kHz to 200 kHz were applied using an ultrasonic transducer connected to a signal generator. The RF output of an Anabat II detector was measured on an oscilloscope and compared to the signal being input to the transducer. The Anabat and transducer were aligned to ensure that the Anabat microphone was pointed at the transducer and the transducer was pointed at the Anabat. The frequencies were chosen to cover a wide part of the range of bat call frequencies, and to highlight peaks and troughs in the responses being monitored.

The results were unequivocal. The two controls gave very similar results, thus giving confidence that results were not influenced by other factors. The two test runs resembled each other much more than either resembled the control runs. Since absolute sensitivities are not important or meaningful here, the difference in decibels between each test run and the average of the two control runs was plotted to show just how the use of a membrane has changed the response (Fig 1). It is important to appreciate that Fig 1 does not show the frequency response of the Anabat detector, just the differences between the responses with and without membranes. In effect, at each frequency, the sensitivity of the detector without the membrane has been normalised to 0 dB.

Using GladWrap made the frequency response more spikey. This in itself is not a problem for bat detection, but my assumption is that these spikes result from resonances which are likely to vary from instrument to instrument. The consequence is likely to be that instruments weather protected in this manner will vary more than instruments with open microphones. If this is so, then calibration of GladWrap-protected microphones would not be as effective as it would be without the GladWrap. However, if the resonance is due just to the distance between the microphone diaphragm and the GladWrap, then it may be that this would be consistent enough that variation between units would not be a problem, provided the membrane was applied in a very similar manner between units.

Secondly, overall sensitivity was substantially reduced by applying ClingWrap. At most frequencies of interest, sensitivity was 10 to 20 dB lower than the open microphone, although interestingly, there was little difference at 45 kHZ. To put this in perspective, 10 dB is about the same as turning the sensitivity control down from 10 to 7, or from 8 to 4.

Based on the above, I would say that it is not surprising that using GladWrap has worked, but there is a substantial performance penalty. On this basis, I would not recommend it as a general way to implement weather protection, but there are situations where it might be a viable option. These situations would occur where both the following conditions are satisfied:

1) Sensitivity is not an issue. This is quite a common situation, especially where monitoring takes place at a roost. Anabat detectors are often set to reduced sensitivity to reduce the impact of noise such as insects or water, or to reduce the rate at which bats are detected (for example, to avoid very high detection rates for bats leaving a roost). In such situations, the loss of sensitivity due to the membrane can be offset by increasing the sensitivity to which the detector is set.

2) Between-detector variability is not an issue. This would be the case if the resulting data is not being analysed to show quantitative differences between detection rates at different detectors. For example, if the issue of interest is how activity varies across a year, rather than the magnitude of differences between sites, then variability in detector frequency responses will not be of importance. It would also be the case if sampling replication was sufficient to overwhelm between-detector differences.

There is still much to be learned about effective weather protection for passive acoustic monitoring stations. While the above experiment shows how GladWrap affects performance under some conditions, it is not a general answer. For example, the question remains how GladWrap would affect performance if removed from the surface of the microphone and placed over a window in the side of a box containing a detector. Hopefully, further experimentation will reveal better and cheaper solutions for protecting our equipment.

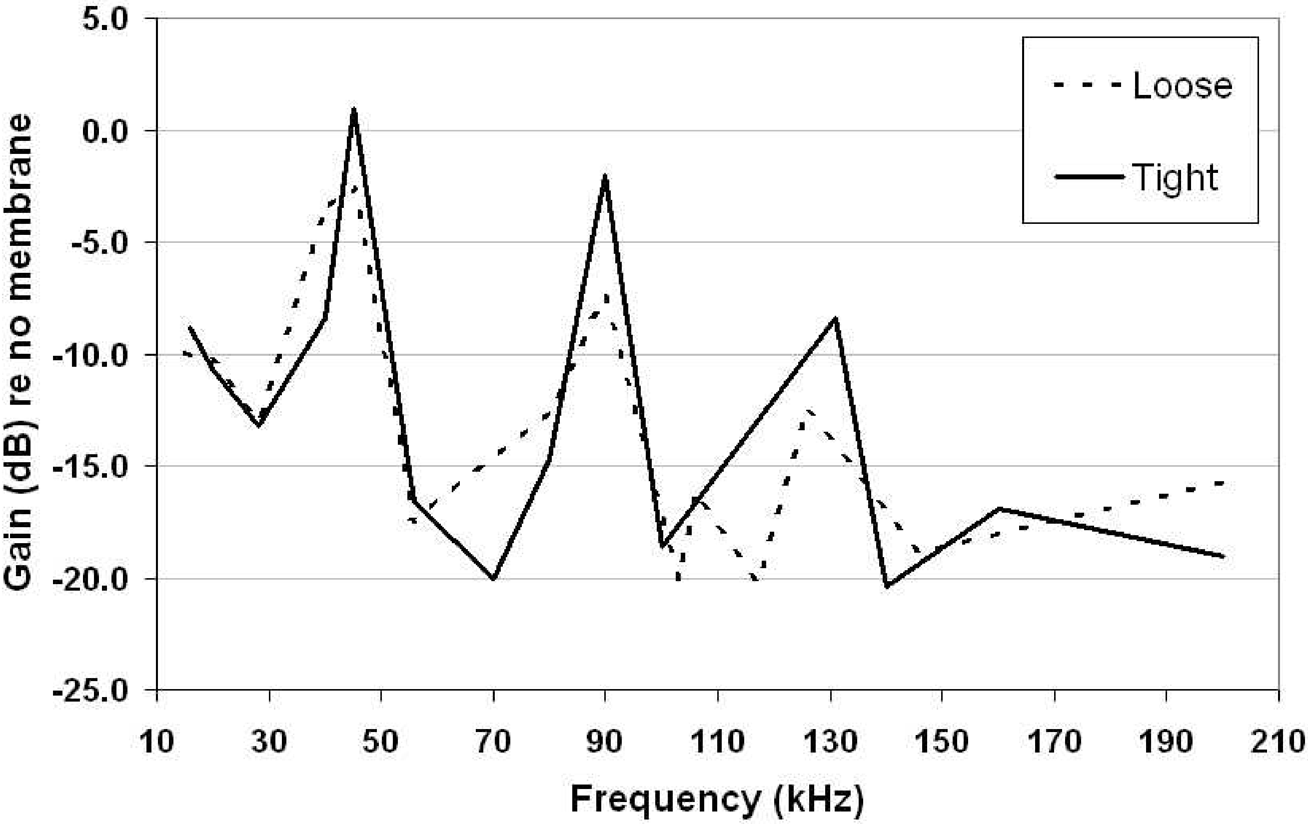


Figure 1. Effect of GladWrap on detector performance. The mean frequency response of the two control detectors without GladWrap has been set to 0 dB. The plot shows the reduction in the detector performance of the two GladWrap treatments compared to the control.

– Reports and Viewpoints –

12th Australasian Bat Society Conference, post-conference field trip: *Mystacina* and *Chalinolobus* in Pureora Forest Park, New Zealand, 22nd – 25th April, 2006

Susan Campbell and Lisa Evans
University of Melbourne, Parkville, Victoria 3010. Email: s.campbell3@pgrad.unimelb.edu.au

'Pre-ora, Perry-re-ora, P-roar-ra…', these were among the many variations in response to the frequently asked question, "where are you going?", encountered on our journey to PUREORA Forest Park, 5 hrs (and many grinding gear-changes) south of Auckland. Whacky name aside, the forest here was spectacular. Complete with beautiful ferns, big old podocarp trees, more ferns, glow worms, over-sized bugs (Weta's), more ferns, and of course, plenty of pekapeka (bats!).

Having so many experts together in this inspirational setting led to many impromptu workshops (facilitated by the fact that it rained, a lot!). Included in these workshops were how to climb REALLY big trees – safely (the sling-shot is quite cool), pit-tagging techniques (Jane Sedgeley pit-tagging a dead mouse was almost as cool as the sling-shot – whether or not the mouse originally died at the point of a pool cue is still being debated), a myriad of bat-detecting demonstrations with new technology and software courtesy of Chris Corben, radiotracking in dense rainforest with Jess Wallace who is conducting her research on roosting habits of the short-tailed bats (*Mystacina tuberculata*), forearm-banding the long-tailed bats (*Chalinolobus tuberculatus*) as part of a long-term monitoring project in Grand Canyon Cave, along with the usual transfer of local knowledge on the myriad of plant and animal species in the surrounding forest – including the fantastic kaka and tui birds. Alas, no kiwis, not even ones with prosthetic limbs, were spotted on this particular trip. Maybe next time.

As I mentioned, it did rain a fair bit during our stay at Pureora, but the NZ researchers seemed to think that this had no effect on our activities in the forest. On the contrary they treated the forest canopy as legitimate sampling space and had us out hauling up mist-nets and harp traps to great heights. Evidently, great capture success can be had up at these heights, and using a complex system of ropes and pulleys, this did prove to be true. Whilst we did catch a lot of bats, I personally think that 1) Colin O'Donnell never matured from playing with sling-shots in primary school, and 2) Jane looks so hot in tree climbing gear, that between them, 15 m high rimu or totara trees really don't present a challenge to this 'bat squad'. After seeing the heights (literally) these researchers work in to trap *Mystacina* and *Chalinolobus*, I will never again complain about getting a bit wet trapping for *Myotis* over water!

Led by this intrepid, orange-overalled Bat Squad, we managed to get our hands on 100s of short-tailed bats (*M. tuberculate* … but let's not get into the finer details of the sub-species classification here), and more than enough long-tailed (*C. tuberculatus*) to keep the paparazzi satisfied. Once our furry clients had been released, there was a walk through the cave to see giant weta's, equally as large (weta-eating?) spiders, glow worms and a nice view out the otherside, although whether the shin deep mud bath required to reach it was worth the effort is debatable – particularly for those having to deal with Australian Customs on the way home!

Of course, apart from catching bats, the second most important component of any field trip is food. In keeping with the gastronomic delights enjoyed at the Sky Tower conference dinner in Auckland, the catering for the post conference trip was equally as decadent, and, particularly in the desserts line – wonderfully excessive! (what ever did happen to all those boxes of left over slices…Colin?). Meal time on our second night was accompanied by two memorable events. Firstly, it seemed Rob Gration wasn't the only one who forgot to update his passport before flying overseas (YES, NZ really is an overseas destination!). Unfortunately, the officials in Japan couldn't issue Kuniko Kawai with a passport in time for the actual conference, but she arrived in time for the fun stuff and was able to present her data to an attentive audience – albeit projected onto a crinkled old white blanket! Following on from Kuniko-san's presentation, Chris Grant, Lisa Evans and myself hosted the annual ABS Super-Quiz –

super in too many ways to mention! The quiz was intended for the conference dinner, however the spherical nature of the venue made it a logistical nightmare, so our apologies to those who missed out (although perhaps you should count yourselves lucky!). Contrary to the rumours that the presenter's themselves seemed to be getting more laughs than anyone else, a good time was had by all, and the atmosphere was surprisingly competitive. The winners on the evening were Dai Fukui and Geraldine Moore's table, with a disqualification going to Simon Robson's table for writing (or more accurately – getting Dai-san to write) a Haiku instead of a limerick (in Japanese no less). The limerick award went to Colin and Jane's table – whose fabulous efforts, particularly by Gillian Dennis, produced not one but three poetic delights!!

Looking forward to siestas factored into the conference program for the next International Bat Conference in Mexico (and many a bat-pollinated shot of Tequila!).

Post-conference field trip photos (from top left): raising a harp trap up to a communal roost of short-tailed bats; a short-tailed bat singing roost hole; raising harp traps at the Grand Canyon Cave to catch long-tailed bats. Photos Lindy Lumsden.

Pics from the 12th Australasian Bat Society Conference, Auckland

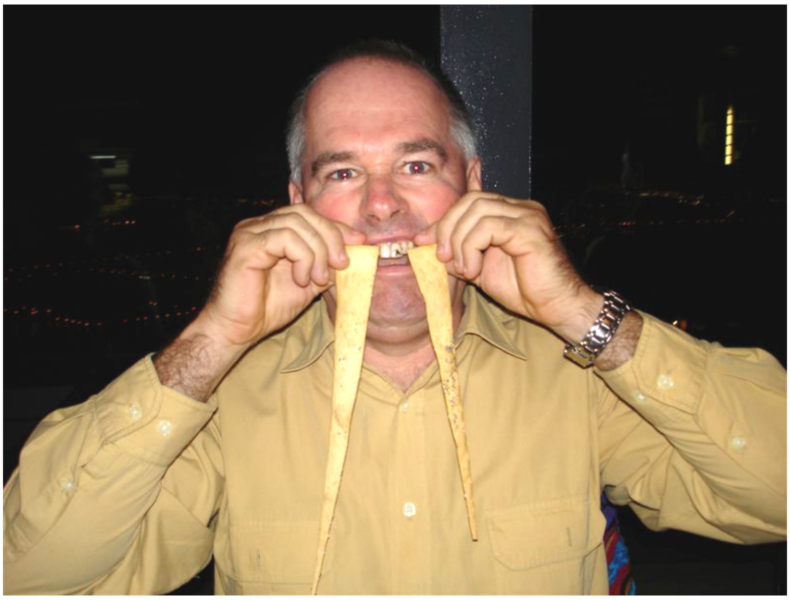
Clockwise from top: Luke Hogan, Margaret and Glenn Hoye, Kuniko Kawai and Jane Sedgeley with beers after the post-conference field trip; at the conference dinner, Chris Turbill, Rebecca Drury and little India; Georgina and Stuart Parsons; Stuart's Angels Susan Campbell, Jane Sedgeley, Lisa Evans and Bronwyn Stratman.

Thanks to Jane Sedgeley for the pics (this page and over) …

Left: 'Cousin It' x 3: alias Gillian Dennis, Jane Sedgeley and Lindy Lumsden.

Right: Lynda Stevenson and Narrawan Williams on the post-conference field trip.

Left: Luke Hogan eating a gourmet dinner while harp trapping.



Right: Glenn Hoye showing his inner self.

Above: Chris Corben, Chris Grant, Colin O'Donnell and Terry Reardon doing the Terry Wimberley inspired bat handshake.

Swazi bats

April Reside
All Out Projects Research Unit, Department of Biological Sciences, University of Swaziland, Private Bag 4, Kwaluseni, Swaziland. Email: aerbatchick@hotmail.com

Swaziland, Africa's second smallest country, nestled between South Africa and Mozambique on the south-eastern side of the continent, is home to 25 species of bat. Two of these are megabats, the rest insectivorous bats. The bat research in Swaziland is conducted by Dr Ara Monadjem from the University of Swaziland in conjunction with the conservation organisation *All Out* (www.all-out.org), and a few ring-ins including myself and the famous Dr Lindy Lumsden.

Most of the bat work comes from Swaziland's lowveld, the mostly flat-lying, thorny acacia scrubland in the east of the country. Swaziland's climate ranges from hot dry winters to even hotter, humid summers. In addition to the bats we share the reserves with spotted hyenas, greater bushbabies, zebras, wildebeest and a few antelope species. Neighbouring reserves have the added excitement of giraffes, elephants, rhinos and lions.

The bat work done by Ara's research team include ongoing work on the common slit-faced bat *Nycteris thebaica*, a community study and collecting echolocation call recordings for a bat call library.

Nycteris thebaica is a small, long-eared bat of the African family Nycteridae. *Nycteris thebaica* is common in Swaziland's lowveld but rarely caught or detected due to its quiet echolocation (it is a "whispering" bat) and its ability to avoid nets and harp traps. The *Nycteris thebaica* work is in two parts, firstly looking at recruitment, survival and roost fidelity of individuals in a population that inhabits road culverts in and around Mlawula Nature Reserve [see "Research on survival and movements of the Common Slit-faced bat (*Nycteris thebaica*) in north-eastern Swaziland" African Bat Conservation News 1, available on the web]. This work has been ongoing for 8 years and some interesting patterns of sex differences in recapture have emerged. The other *Nycteris* work is a behavioural study looking at home range, day- and night-roost use and foraging with the use of radio telemetry. Eleven individuals have been radio-tracked over a period of six months, making this the most extensive radio-tracking study of an African bat to date. Roosts have included warthog burrows, artificial structures and caves. Radio-tracking has been made exciting by hiding from poachers in the park, disturbing burrows filled with outraged warthogs and getting field assistants lost on top of mountains.

The community study is examining the importance of riparian areas for bat activity, by comparing riparian sites to the neighbouring savanna using ground nets, canopy nets and a harp trap. The riparian sites have greater species richness and greater levels of bat activity than the savanna. Most noticeably, one species of fruit bat Wahlberg's epauletted fruit bat *Epomophorus wahlbergi*, is frequently encountered in the riparian sites but rarely in the savanna. There also seems to be a seasonal difference in bat activity, with the summer and autumn months showing greater levels of activity than those of winter and spring. This is also true of invertebrate activity, though based only on the bycatch in the nets! Vertebrate bycatch has included fiery-necked nightjars, scops owls and a bushbaby preying on our bats.

Echolocation calls have been collected using an Anabat detector to create a call library. This library will be used to identify calls detected from free-flying individuals so that non-invasive bat surveys can be conducted. Such a survey would be used in conjunction with the current netting studies, and be especially useful for detecting the presence and activity levels of high flying species that are rarely caught under the canopy. For species with constant frequency calls both hand-held and release calls have been taken, while only release calls have been taken for individuals with frequency-modulated calls.

The work has been conducted with international volunteers from *All Out*. In addition to the volunteers, *All Out* also provide logistical and financial support to the research. The bat work is ongoing and we welcome any interested parties to join us in the field here in Swaziland.

Species caught during the community study in Swaziland:

Chaerephon pumilus
Epomophorus gambianus
Epomophorus wahlbergi
Hipposideros caffer
Hypsugo anchietae
Kerivoula lanosa
Miniopterus schreibersii
Mops condylurus
Myotis tricolor
Neoromicia africanus
Neoromicia capensis
Neoromicia zuluensis
Nycteris thebaica
Nycticeinops schlieffeni
Pipistrellus hesperidus
Rhinolophus darlingi
Rhinolophus simulator
Scotophilus dinganii

Clockwise from top: *Hipposideros caffer* by A. Reside; *Epomorphus wahlbergi* by E. Seamark; *Scotophilus dinganii* by E. Seamark; *Taphozous mauritianus* by A. Bamford.

Shocking Queensland: an electric grids update

Carol Booth
carol.booth@gmail.com

In 2001 the Queensland environment minister announced that electric grids could no longer be used to kill flying-foxes for crop protection. This decision has saved the lives of up to tens of thousands of bats each year. After all, in just one orchard in 2000, grids killed about 18,000 spectacled flying-foxes, according to the Federal Court in granting an injunction to prevent lychee grower Rohan Bosworth from electrocuting more bats (Booth v Bosworth).

However, in what would be no surprise to students of human nature, a ban on electric grid use has not effectively stopped their use. Regrettably, there is no ban on the existence of grids and, as they are operated at night on private property, it is little wonder that some fruit growers continue to use them.

Illegal use of electric grids
Since the 2001 ban, we know electric grids have been operated in at least three orchards in North Queensland. One has resulted in legal action, one is being investigated by the EPA, and one is known because a grower admitted on ABC Radio he had been electrocuting spectacled flying-foxes.

These three are very unlikely to be the only grids being used. Colleagues and I have been regularly checking only a proportion of known grids. Other grids are not being checked and the location of all grids is probably not even known. In the past couple of years I have by chance come across three grid systems that were never licensed for use and were not known to the EPA.

Three grids in use are worth worrying about. Because they are large-scale killers, and because their use is inhumane, even one grid operating is too many. Grids are very difficult to monitor for compliance. The Queensland EPA does not have the resources or legal capacity (to enter property) to comprehensively check whether grids are being illegally used. That is why the only way of preventing illegal use of grids is to require that they be dismantled.

The Queensland Ombudsman's recommendations
The Queensland Ombudsman, an independent body investigating complaints about the government, recently came to a similar conclusion after investigating my complaint about the EPA's failure to prosecute Rohan Bosworth. One of the Ombudsman's 11 recommendations was:

> EPA investigate options to prohibit the use of electric grids and require the removal of existing grids, including the option of pursuing appropriate amendments to the NCA [Nature Conservation Act] (or other relevant legislation).

The Ombudsman also said that "sufficient evidence exists to question the ongoing viability of the DMP [Damage Mitigation Permit] system for flying foxes." He stated doubts that killing small numbers of flying-foxes under DMPs offers effective crop protection, and concerns about the suffering of animals not killed outright by shooting and the impracticality of enforcing compliance. The Ombudsman recommended a review of the DMP system.

The Ombudsman's report is an indictment of many government approaches to management of wildlife issues and enforcement. While there has undoubtedly been a substantial improvement in the EPA's approach since 2000, when they failed to properly investigate my reports of Bosworth killing hundreds spectacled flying-foxes each night, their capacity to prevent illegal killings and to generally contribute to flying-fox conservation is still very limited. They have neither the legislative capacity to do the job properly nor – even more relevantly – the resources. The EPA wildlife unit is woefully underfunded. Wildlife management is politically contentious – the EPA receives more letters about wildlife than it does about any other environmental issue – and the government is loathe to further upset farmers. Thus, years after the EPA scientific committee recommended that spectacled and grey-headed flying-foxes be listed in Queensland, they still have not been listed because to do so would mean that farmers could not get permits to kill them.

So while we can lobby the government to do the right thing by flying-foxes, and make some gains (such as the ban on the use of grids), effective flying-fox conservation in Queensland (and elsewhere) depends on much better resourcing of wildlife management in general.

Please be one of the voices urging the Queensland government to require the dismantlement of electric grids, move away from allowing the killing of flying-foxes for crop protection, improve compliance, list threatened flying-fox species and increase funding to wildlife management in the EPA. Write to:

Premier Peter Beattie,
PO Box 15185
City East QLD 4002
ThePremier@premiers.qld.gov.au

Environment Minister Desley Boyle
PO Box 31
Brisbane Albert Street QLD 4002
elgpw@ministerial.qld.gov.au

Below I provide a more detailed update on two of the cases of illegal use of electric grids.

The Yardley case
In January 2006, ABC Far North Queensland Rural Report aired an interview with lychee grower Dick Yardley, in which he said he was defying the EPA ban on the use of electric grids because he believed it was not a lawful ban. While Mr Yardley did not specify why he believed this, it accords with what is unfortunately a fairly common (and erroneous) view of property rights in North Queensland: that on private property landholders can do as they please with the wildlife, and that if the government wants to protect wildlife they should pay for crop damage.

When asked whether he had been electrocuting bats since the EPA ban, Mr Yardley said:

> Yes. Not this last year but the year before we used our electric grids. We took out 700, we killed 700 bats in the electric grids. Another year before that by the time we got a damage mitigation permit, which we now know we don't have to get, the bats had eaten our crop right out because they took too long to give us that. The year before that we took out 400 in our electric grids.

The Yardley admissions demonstrate how inadequate EPA monitoring of orchards is. Unlike many orchards with grids, Yardley's orchard is highly visible: it can be seen from the main coastal highway. This case will also test the EPA's (and the federal government's) resolve or capacity to take on cases of illegal electrocution. If the EPA does not take action, then I or others will.

Booth v Frippery update
As I have written previously, in 2004 Dominique Thiriet and I discovered about 30 dead black flying-foxes in a lychee orchard near Ingham owned by Frippery Pty Ltd. I sought an injunction under the Nature Conservation Act to prevent further use of the grid, and orders requiring dismantlement of the grid and the payment of some restitution to assist the rehabilitation of injured or orphaned black flying-foxes.

That case was heard in the Planning and Environment Court in Townsville in 2005. There was no contesting that flying-foxes had been killed in that orchard. In fact, the grower, Merv Thomas, gave evidence that he had killed, without ever having any permit from the EPA, enormous numbers of flying-foxes. Based on Mr Thomas's own evidence of average numbers killed on various types of grids, we calculated he had killed more than 700 in 2004 and more than 50,000 since it became illegal in 1994 to kill flying-foxes without a permit.

However, Mr Thomas's barrister argued to the Court that this killing had been legal because Mr Thomas satisfied the three-pronged defence to taking wildlife under the Act; that is, Mr Thomas had been seeking not to kill wildlife, but to protect his crop, and that he could not reasonably avoid the killing because alternatives were too expensive or ineffective. Mr Thomas also contended he had been attempting since 1997 to develop a non-lethal electric grid and that he had finally succeeded in this.

Our evidence was that Mr Thomas had been illegally killing flying-foxes. We provided expert evidence that he could protect his crop non-lethally through netting and recoup his costs by saving the enormous amounts of fruit that he claimed flying-foxes ate or damaged. We also provided expert evidence that his so-called non-lethal grid provided a shock that was lethal or injurious to flying-foxes.

Unfortunately, Judge Pack accepted virtually all the evidence of the fruit grower, disregarded our expert evidence and interpreted the law to deliver a judgement that was disastrous in its implications for the government's capacity to regulate the taking of wildlife. Judge Pack in effect said that Mr Thomas had done nothing illegal in electrocuting thousands of flying-foxes without a permit from the EPA.

Of course, we had to appeal this judgement, not only because of the failure to stop the electrocution of flying-foxes on the Frippery orchard, but because it gave open slather to all sorts of wildlife killing. Recognising that it undermined their regulatory capacity, the EPA decided to join me in the appeal in the Court of Appeal in February this year. We argued that Judge Pack made numerous errors of law and that the judgement should be overturned.

The three judges in the Court of Appeal unanimously agreed that Judge Pack's judgement was wrong and should be overturned. Unfortunately, they considered there were insufficient findings of fact to rule on the orders we sought. Instead, they ordered that the case be reheard in the Planning and Environment Court before a different judge. We are currently preparing this case.

While what seemed to be an open-and-shut case has turned into a demanding legal saga, it should eventually lead to useful precedents: to establish new legal interpretations, to inspire other citizen action and to hold those who illegally kill wildlife accountable. It has of course only been run because of the contribution of many people: lawyers from the Environmental Defenders Office, barristers Chris McGrath and Stephen Keim SC, expert witnesses Hugh Spencer and Graham Minifie, Dominique Thiriet, and many others who donated to help cover legal costs.

What a disgrace!!!!

Mick Ferris
Oakey, Qld, 4401, Email: Ghostbat@bigpond.net.au

On a recent trip to Muntapa Tunnel, which is approximately 50 km north of Oakey, Queensland, with my partner and 8 yo daughter, we were confronted with an absolutely disgusting sight. The following are articles from the Toowoomba Chronicle, Queensland.

"Senseless cruelty in attack on bats. Fireworks, aerosol cans set fire to creatures
Toowoomba Chronicle, Monday January 16, 2006.

> A lot of malicious thought went into the vandalism of a bat colony north of Oakey.
>
> The hoodlums chose their weapons: aerosol cans, firecrackers and rockets. They chose their victims: a colony of insect-eating Bent-wing bats in the old Muntapa tunnel. And they considered their method.
>
> When the explosives went off, the bats had taken flight. As they flew frantically in and around the historic stone tunnel, the vandals swung at the panicked bats, possibly with sticks, killing and injuring the tiny creatures.
>
> "I found one bat that even had its wing ripped off," Michael Ferris, who yesterday discovered the burnt-out tunnel, said.

Mr Ferris, a member of the Australasian Bat Society, had driven to the tunnel, 50 km north of Oakey to take his daughter and partner on a Sunday outing.

He has been visiting Muntapa Tunnel, Queensland's longest railway tunnel and now the home of the robust bat colony, for the past four years.

"They close the tunnels in winter so the bats can breed, but in summer you can just walk through," he said.

What greeted him yesterday, however, was not what he wanted to see.

Exploded aerosol cans, used firecrackers and burnt bats littered the tunnel floor. There were ash, burnt sticks and some un-used rockets.

A magazine had been left behind, exposing the date of when the destruction took place; sometime after the beginning of January.

"It's just a blatant stupid act from people with nothing better to do," Mr Ferris said, angrily.

Bent-wing bats are furry, insect eating creatures about 5 cm long which live in colonies of hundreds. When the tunnel became disused the bats moved in and called it home.

"You can walk through Muntapa and they'll fly past you, and none of them attack you," Mr Ferris said. "Bats don't specifically attack people.

"They're virtually defenceless against humans," he said. Mr Ferris reported the attack to police who will investigate what they can."

Follow up article

"Bat Tunnel closed after vandalism attack
Toowoomba Chronicle, Wednesday 18 January, 2006.

The historic Muntapa tunnel has been closed following a vandal attack on a colony of small bats.

Queensland Parks and Wildlife (QPWS) senior conservation officer Bruce Thomson said the tunnel would remain closed until a better method of managing the historic and ecologically important site was developed.

"Because it's a remote site, there is no supervision of the area," Mr Thomson said. "We need to have a think about what's the best strategy for management."

Mr Thomson said he inspected Muntapa tunnel after the incident was reported and found another 20 dead bats. It appeared that a number of explosives, aerosol cans and mini rocket packs had been exploded in the cave.

Mr Thomson said severe penalties could be imposed if the perpetrators were discovered. The bats weigh only 15 grams, but eat twice their bodyweight in insects such as mosquitoes and heliothis moths.

"There are big moves in the US to establish large colonies of bats near crops as a biological control instead of chemicals," he said.

Anyone with information on the attack should contact QPWS or the police."

As far as I am concerned, Muntapa tunnel should be closed permanently to preserve the future of the bat colony. Only organised and supervised visits should be allowed. There is nothing to see in the tunnel apart from a lot of cobwebs, guano and graffiti. Even the bars have been bent to allow people to gain access when it is closed.

Above: Burnt to death

Above: Exploded can.

Below: Remains of a flare.

Below: Minus a wing.

Barbed Wire Action Plan. Draft for comment

Carol Booth
Queensland Conservation, 6 Henry St, Chapel Hill Queensland 4069, Ph 0402 701 276. Email: carol.booth@gmail.com

Queensland Conservation is the umbrella conservation NGO for Queensland. I have drafted this document in order to promote a coordinated approach to the barbed wire problem. Feedback from the ABS membership would be most welcome. This document will be distributed initially to relevant government departments and wildlife/conservation organisations. I can be contacted on the details above.

Contents

1. Introduction

Barbed wire is a major killer of wildlife in Australia: thousands of bats, birds, gliders and macropods become entangled and die each year. Barbed wire is both a conservation and welfare problem. Entanglements are considered a threatening process for a number of threatened species, including spectacled flying-foxes, grey-headed flying-foxes, mahogany gliders and ghost bats. It causes considerable suffering for entangled animals.

The deaths on barbed wire are largely preventable. In many cases, barbed wire does not perform an essential function, or else it could be replaced by other types of fencing and, where it is essential, relatively simple measures could reduce its impact. However, because there is so much barbed wire in the Australian landscape – in both rural and urban environments – and very little awareness of the issue, it is will be a demanding (but achievable) task to reduce the wildlife toll.

1.1. Purpose of the plan

The initial purpose of this plan is to engender support for combined action on the barbed wire problem by providing information about its impacts and outlining potential solutions. The intended audiences are individuals, groups and agencies interested in the welfare and conservation of wildlife affected by barbed wire. By developing a coordinated approach across species and interests, and pooling resources and information, we can ensure that proposed solutions maximise outcomes and are effective for all species affected.

1.2. Contacts for feedback or partnership

If you have feedback on this plan, please email Carol Booth (Queensland Conservation) at carol.booth@gmail.com (phone 0402 701 276). If you are interested in becoming a partner in this plan, please email Jenny Maclean (Tolga Bat Hospital) at jenny.maclean@iig.com.au (phone 07 4091 2683).

2. Scale of the problem

Because most barbed wire entanglements go unobserved or unreported, and most animals dying either on the fence or later from injuries or infections are scavenged, there is little information about the numbers of animals entangled and killed each year. More than 60 Australian species have been recorded entangled[1], including those listed in Tables 1 and 2. Those species thought to have the highest rates of entanglement are indicated by an asterisk. Bats (generally, but not exclusively, the larger species), gliders, cranes and nocturnal birds appear to be the most susceptible groups. Some of the affected species are listed as threatened under state and/or federal legislation. In some cases, barbed wire entanglements are regarded as threatening processes for threatened species, in particular for spectacled flying-foxes, grey-headed flying-foxes, ghost bats and mahogany gliders.

Animals rescued from barbed wire, particularly bats, have injuries that are generally extensive and horrific. The extent of damage from constriction of blood flow to wing membranes and other parts of the bat body rarely becomes obvious until four or five days later. If animals are released from fences, without first putting them into rehabilitative care, most would eventually die from starvation. Barbed wire injuries are the leading cause of long term treatment and rehabilitation for many bat carers.[2] Clearly, barbed wire entanglements are a major animal welfare problem.

Legislation referred to in Tables 1 and 2:

EPBC Act: *Environment Protection & Biodiversity Conservation Act 1999*
Qld NC Act: *Nature Conservation Act 1992*
NSW TSC Act: *Threatened Species Conservation Act 1995*
Vic FFG Act: *Victorian Flora and Fauna Guarantee Act 1988*

[1] These records were collated mostly by van der Ree (1999).
[2] Jon Luly (pers. comm. Feb 2006).

Table 1. Records of mammal entanglements in barbed wire.

Group	Species	Comments
Bats	Little red flying-fox** *Pteropus scapulatus*	*P. scapulatus* is particularly prone to entanglements. In the Millaa/Ravenshoe area (Qld) in Sept-Oct 1994 during a particularly windy period, 442 little red flying foxes were entangled, most along one 10 km stretch of barbed wire. Of those caught, 147 were unreleasable, and 30 were dead when found.[3] Approx. 200 carcases were observed dead on another stretch of barbed wire in western Queensland.[4] The Tolga Bat Hospital on the Atherton Tablelands (Qld) receives into care c. 100 flying foxes rescued from barbed wire fences each year.[5]
	Spectacled flying-fox** *Pteropus conspicillatus*	Listed as Vulnerable (EPBC Act). Barbed wire is considered a threatening process.
	Grey-headed flying-fox** *Pteropus poliocephalus*	Listed as Vulnerable (EPBC Act, Vic FFG Act, NSW TSC Act). Barbed wire is considered a threatening process.
	Black flying-fox** *Pteropus alecto*	Listed as Vulnerable (NSW TSC Act). van der Ree (1999) noted 124 records of entanglement.
	Eastern tube-nosed bat** *Nyctimene robinsoni*	Listed as Vulnerable (NSW TSC Act). van der Ree (1999) noted 41 records of entanglement. After Cyclone Larry in March 2006, nine tube-nosed bats were rescued from barbed wire fences on the Atherton Tablelands (Qld).[6]
	Ghost bat** *Macroderma gigas*	Listed as Vulnerable (Qld NC Act). Barbed wire entanglements have been recognised as a significant threatening process in the Pilbara, WA.[7]
	Yellow-bellied sheath-tailed bat** *Saccolaimus flaviventris*	Listed as Vulnerable (NSW TSC Act). On a barbed wire fence around Forty Mile Scrub National Park (Qld), 12 carcases were observed.[8]
	Diadem leaf-nosed bat *Hipposideros diadema*	On a barbed wire fence around the Department of Defence's Tully Land Command Battle School, at least six Diadem leaf-nosed bat carcasses were recovered[9].
	White-striped free-tailed bat *Tadarida australis*	
	Eastern long-eared bat *Nyctophilus timoriensis*	Listed as Vulnerable (EPBC Act, NSW TSC Act) (south-eastern form).

[3] Jenny Maclean (pers. comm.) January 2006. See also <http://www.jeffress.net/ffnff/barbwire.htm>
[4] Reported in van der Ree (1999).
[5] Jenny Maclean, <http://www.athertontablelands.com/bats/barbedwire.html>
[6] Jenny Maclean (pers. comm.) April 2006.
[7] Armstrong & Anstee S (2000); Norm McKenzie, CALM, WA (pers. comm.).
[8] Observed by Martin Schulz (pers. comm. Feb 2006).
[9] Scott Burnett, WPSQ (pers. comm. Feb 2006).

Table 1. *Continued*.

Group	Species	Comments
Gliders	Squirrel glider** *Petaurus norfolcensis*	Listed as Vulnerable (NSW TC Act, Vic FFG Act). van der Ree (1999) recorded 15 entangled in his study area in Victoria from 1994-1998 (systematic searches were not conducted) and noted 41 other records. In NSW barbed wire is recognised as one of the threats.[10]
	Sugar glider** *Petaurus breviceps*	van der Ree (1999) noted 78 records of entanglement, with 44 in Queensland.
	Mahogany glider** *Petaurus gracilis*	Listed as endangered (EPBC Act, Qld NC Act). The CRC for Tropical Rainforest Ecology & Management found that barbed wire is a significant cause of mortality for these gliders.[11] Since rediscovery of the species, 9 entanglements have been reported to QPWS, 6 fatal.[12] Injuries have been so bad that no releases have been possible.[13] These typically occur in summer.
	Yellow-bellied glider** *Petaurus australis*	Listed as Vulnerable (EPBC Act, Qld NC Act, NSW TSC Act). van der Ree (1999) noted 14 records of entanglement.
	Greater glider** *Petauroides volans*	van der Ree (1999) noted eight records of entanglement
Macropods[14]	Brush-tailed bettong *Bettongia penicillata*	
	Tasmanian pademelon *Thylogale billardierii*	Listed as Threatened (Vic FFG Act)
	Common wallaroo *Macropus robustus*	
Other	Koala *Phascolarctos cinereus*	Listed as Vulnerable (Qld NC Act in SEQ, NSW TSC Act). van der Ree (1999) noted six records of entanglement.
	Platypus** *Ornithorhynchus anatinus*	In a study in the Wimmera catchment by the Platypus Conservancy, a high rate of scarring on the bill, head, front feet and tail was observed – thought to be from encounters with barbed wire fencing in the water.[15]
	Grassland melomys *Melomys burtoni*	

[10] See <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10604>.
[11] Information at <http://www.rainforest-crc.jcu.edu.au/publications/infosheets/mahoganyGlider.pdf>
[12] Mark Parsons, QPWS (pers. comm. Feb 2006).
[13] Daryl Dickson (pers. comm. Feb 2006).
[14] van der Ree (1999) reported that many of his respondents reported numerous entangled macropods in fences, including Grey and Red kangaroos. He did not include them in his list because macropod entanglement is not specific to barbed wire fences – they also become entangled in plain wire fences.
[15] Information at <http://www.platypus.asn.au/platypus_in_country_areas.html> and <http://www.platypus.asn.au/helping_platypus_in_rural_areas.html>

Table 2. List of bird entanglements in barbed wire. [16]

Common name	Genus species
Sarus crane**.[17]	*Grus antigone*
Brolga**[16]	*Grus rubicundus*
Black-necked stork	*Ephippiorhynchus asiaticus*
Buff-banded rail	*Gallirallus philippensis*
Bush thick knee	*Esacus neglectus*
Emu	*Dromaius novaehollandiae*
Southern cassowary[18]	*Casuarius casuarius*
King quail	*Coturnix chinensis*
Wood duck[19]	*Chenonetta jubata*
Pacific black duck	*Anas superciliosa*
Hoary-headed grebe	*Poliocephalus poliocephalus*
Pelican	*Pelecanus conspicillatus*
White-faced heron	*Egretta novaehollandiae*
Pacific heron	*Ardea pacifica*
Nankeen night heron	*Nycticorax caledonicus*
Royal spoonbill	*Platalea regia*
Wedge-tailed eagle	*Aquila audax*
Brown falcon	*Falco berigora*
Australian hobby	*Falco longipennis*
Peregrine falcon	*Falco peregrinus*
Little button-quail	*Turnix velox*
Red-chested button-quail	*Turnix pyrrhothorax*
Lathams snipe	*Gallinago hardwickii*
Black-fronted dotteral	*Elseyornis melanops*
Masked lapwing	*Vanellus miles*
Silver gull	*Larus novaehollandiae*
Little corella	*Cacatua sanguinea*
Sulphur-crested cockatoo	*Cacatua galerita*
Galah	*Cacatua roseicapilla*
Red-rumped parrot	*Psephotus haematonotus*
Southern boobook	*Ninox novaeseelandiae*
Masked owl	*Tyto novaehollandiae*
Barn owl	*Tyto alba*
Grass owl	*Tyto capensis*
Tawny frogmouth**[20]	*Podargus strigoides*
Owlet nightjar	*Aegotheles cristatus*
Laughing kookaburra	*Dacelo novaeguineae*
Blue-winged kookaburra	*Dacelo leachii*
Dollarbird	*Eurystomus orientalis*
Eastern spinebill	*Acanthorynchus tenuirostris*
Magpie-lark	*Grallina cyanloeuca*
Willy wagtail	*Rhipidura leucophrys*
Magpie	*Gynmorhina tibicen*
Silvereye	*Zosterops lateralis*

[16] Primarily from van der Ree (1999); also K.N. Armstrong (pers. comm. March 2006).
[17] The Australian Crane Network focuses on barbed wire as particular problem for sarus cranes and brolgas, and provides extensive information on the issue on their website. Further information at <http://ozcranes.net/>
[18] Listed as endangered (EPBC ACT; Qld NC Act).
[19] In a review of the problems of fences across waterways, Allen and Ramirez (1989) documented entanglement of 47 different bird species internationally. They “suspect that the hazards of barbed-wire fences over water are greatest for birds that move long distances across the water to take flight or for birds that fly close to the water after taking flight.”

[20] Cheryl Cochran (Northern Rivers Wildlife Care) reports that they regularly encounter frogmouths entangled on barbed wire in northern NSW (pers. comm. Feb 2006).

3. Predisposing factors

Any barbed wire presents a risk of entanglement, but the risks seem to be greatest in the following circumstances:

- During the night: Most entanglements are of nocturnal creatures that probably do not see wire in the dark. Flying back to roost directly into the early morning sun may also blind animals to fences. It has also been suggested that microbats may mistake barbs for insect prey.[21]
- Fences across flight/glide paths: Larger birds and bats such as flying-foxes and ghost bats save energy if they fly close to the ground, so are vulnerable to fences in their flight path. Ghost bats also forage in low trees and capture prey on the ground, which brings them into contact with fences. In habitats where trees are widely spaced, e.g. in marginal or cleared areas, gliders have further to glide and thus their landing approach may not be high enough to clear a fence.
- Windy weather: In windy weather, bats and birds, particularly juveniles whose flight is weak, have problems gaining enough height above a fence or are blown onto a fence. Bats and birds may fly low in a head-wind just above the vegetation to reduce energy costs.
- Fences on ridge lines or where they are higher than surrounding vegetation (eg. around new plantings). Flying-foxes and birds, particularly those flying at night, may not see a strand of wire above the highest point of land or vegetation. For example, flying-foxes regularly get entangled in fences on the rim of a large gently sloping basin of land on the Atherton Tablelands which has a lake/swamp at the bottom.[22]
- Fences near food trees: As a flying animal leaves or is chased from a food tree it may dip and become entangled in a nearby fence.
- Fences around water: Flying-foxes and water birds get entangled on their flight to and from sewage ponds, wetlands and waterholes. Crane wingspan is up to 2.5 metres, and their long legs hang down for landing and take-off, so they need enough space around a wetland to take off.
- Fences across watercourses or barbed wire submerged in water. Platypus and water birds become entangled on barbed wire in and across water.
- New fences: Newly erected fences, where there were none previously, often have particularly high rates of entanglements (e.g. ghost bats in the Pilbara).
- Fences on forest/cleared land ecotones: Fences in these areas cause problems especially for microbats.
- Non-recognition: Animals may also simply not recognise a fence as a threat or as an object that is relatively immovable.[23]

4. Legal considerations

In some states, landholders with barbed wire fences that entangle protected wildlife may be legally liable for the harm or suffering caused.[24] Landholders would be liable under federal legislation (EPBC Act 1999) only if the erection of a fence was likely to have a significant impact on a listed species, an unlikely scenario.

Queensland: Under the *Nature Conservation Act* 1992, people have an obligation to avoid the killing, injuring or harming (including 'snagging') of wildlife unless they have a permit to do so or satisfy the defence in s 88(3), which states that "it is a defence to a charge of taking a protected animal in contravention of subsection (1) to prove that (a) the taking happened in the course of a lawful activity that was not directed towards the taking; and (b) the taking could not have been reasonably avoided."

[21] Chris Corben (pers. comm. Mar 2006): "This is based on the fact that echolocation cannot tell that a smooth surface is more than a point, and that much of the fence will not be "seen" by the bat, which will quite likely perceive the fence as an insect flying along beside the bat and will see the barbs as wingbeats."
[22] Jenny Maclean, Tolga Bat Hospital (pers. comm. Jan 2006).
[23] Armstrong and Anstee (2000).
[24] Environmental Defenders Offices from New South Wales, Victoria, South Australia, Tasmania and the Northern Territory have provided information for this section.

Therefore, in some circumstances, people may be liable for the entanglements of wildlife, particularly if it is a regular occurrence. There are third party rights under the NCA, which allow individuals or groups to take legal action to prevent breaches of the Act. There are no provisions under the *Animal Care and Protection Act* 2001 relevant to barbed wire entanglements.

New South Wales: All Australian native animals are protected under the *National Parks and Wildlife Act* 1974 and it is an offence to harm protected animals without a licence. It is an offence to harm a threatened species without a licence issued under the *Threatened Species Conservation Act* 1995. A landowner may be liable for wildlife harmed on a barbed wire fence on their property unless they can show that they have a licence or some other authorisation specified in the legislation. Anyone can commence proceedings in the Land and Environment Court to ensure that the requirements of the legislation are enforced.

Victoria: Part VII of the *Wildlife Act 1975* provides for offences in relation to wildlife. The Act prohibits taking or destroying wildlife without a licence or authorisation, (sections 41 to 43) "Take" or "destroy" are not defined under the Act, and as far as we are aware these terms have not been the subject of judicial interpretation in Victoria. The *Flora and Fauna Guarantee Act* 1988 does not provide an offence for taking fauna.

South Australia: Section 51(1) of the *National Parks and Wildlife Act* states that "a person must not take a protected animal or the eggs of a protected animal," which includes "indigenous, migratory and protected animals" (section 5). The Act does not define the term 'taking' so it is unclear whether barbed wire takings would be included. However, s52(2) provides that it is a defence to a charge of 'taking' to show that the taking was not wilful or negligent. The *Prevention of Cruelty to Animals Act* may require an owner who is aware of an animal caught in a fence to prevent any further unnecessary pain. Section 13(2)(a) defines an offender as a someone who "unreasonably" causes an animal unnecessary pain. Furthermore, 13(2)(f) describes an offender as someone who having [already] injured the animal (not being an animal of which that person is the owner), fails to take reasonable steps to alleviate any pain suffered by the animal.

Western Australia: Under the *Wildlife Conservation Act 1950* fauna killed by entanglement in barbed wire would constitute "taking" but that taking would be regarded as "incidental taking", provided that the purpose of the structure was not intended to take or harm fauna. However, there may be an exception to this if the fence is continued to be used in circumstances where it can be anticipated that it will take fauna in a repeated or regular manner, rather than in an occasional or unpredictable manner. Under the *Animal Welfare Act*, if it could be shown that the erection and use of barbed wire fences in certain situations was causing unnecessary pain and suffering to animals caught in the fence and the person responsible was taking no steps to prevent this, then s/he may be liable under that legislation for causing unnecessary pain to be inflicted on animals.

Northern Territory: The Territory *Parks and Wildlife Conservation Act* at section 66 makes it an offence to "take or interfere with protected wildlife unless the person is authorised to do so." However, the elements of both *mens rea* and *actus reus* of the offence would have to be proven. In short the unintended consequent harm caused to wildlife of erecting a barbed wire fence would not meet the mens rea test for the offence to be proved. Section 67 makes it an offence to take or interfere with unprotected wildlife for commercial purposes, unless authorised to do so. Once again, there is no relationship with injuries to wildlife caused by barbed wire fences. *The Animal Welfare Act* at section 6 provides: (1) A person must not neglect or commit an act of cruelty on an animal. However this protection suffers from the same difficulty outlined above.

Tasmania: Under the *Threatened Species Protection Act 1995* and *Wildlife Regulations 1999*, people must not *knowingly* take a listed animal without a permit. This includes killing, injuring, catching or damaging an animal. A permit can be issued authorising a landowner to 'take' a protected species under the Wildlife Regulations 1999 if the taking is necessary to prevent the destruction of stock or crops by the wildlife.

Other legal issues: It is often difficult to rescue entangled wildlife without cutting fence wire. Damage caused to private property by those who attempt to free animals may face a common law charge of nuisance. At Common Law physical damage to property is always regarded as unreasonable and therefore actionable in private nuisance. It should be noted that it is no defence to argue that the activities complained of benefit the public, or that the benefit to the public outweighs the detriment suffered by the plaintiff.

5. Options to prevent or reduce the barbed wire toll

5.1. Removal / replacement / alternative fencing materials
Use plain wire: The best option is for barbed wire not to be used at all in fences. Replacing the top one or two strands with plain wire will resolve most problems.[25] In Townsville, the 10th Terminal Regiment of the Australian Army installed plain wire on all their fences to avoid entanglements of juvenile bats which are released on its land and other bats at the Ross River colony. In some cases, replacement may be regarded as too costly or onerous. In some cases, landholders resist due to cultural, security or public liability concerns.

Remove fences: In some particularly entanglement-prone situations, such as along ridgelines or around wetlands, the best option is to remove the fence altogether and erect it elsewhere if need be. In many cases, if fencing does not serve an essential purpose, the landholder could reassess whether the fence is really required.

Use electric fences: To control stock access, electric fences may be effective, although the vegetation management required to maintain electric fences can be costly and time consuming, particularly in northern Australia,[26] and may not restrain cattle effectively since cattle may be prepared sometimes to suffer electric shocks. Electric fences may also kill and injure some native wildlife.[27]

Cover the barbs on existing fences: Barbs can be covered with tubing, particularly in entanglement hot spots. Gadgets have been designed for splitting poly pipe quickly and for applying the pipe to the fence (Fig. 1, see next page).[28] In entanglement hotspots, another option is to install an ‘apron’ of chicken mesh or similar over the fence.

Fig. 1. The polypipe splitter device that simultaneously splits and installs the pipe over barbs.

[25] In an excellent precedent Ballina Shire has recently replaced the barbed wire on the two top strands of a fence around four sewage treatment ponds. (reported by Cheryl Cochran, FFICN, 2005).
[26] As discussed at <http://ozcranes.net/consv/elec.html>.
[27] For example, some animals respond to electric shocks in ways which make them particularly vulnerable to death on electric fences, e.g. snakes often curl around a wire after being shocked, sugar gliders may wrap their tails around the wire and echidnas curl up in a ball (Lund & De Silva 1994, cited by Long & Robley 2004).
[28] The gadget has been developed by a member of the Northern Rivers Wildlife (Cheryl Cochran, Northern Rivers Wildlife Carers pers. comm. Feb 2006).

5.2. Improved visibility

Barbed wire can be made more visible to animals by adding visible (and often audible) objects to the fence, such as plastic flags and metal tags, and empty aluminium cans. Considerations include the introduction of waste to the environment, the effort required for installation and maintenance, and the cost.

Plastic signals: Plastic bunting or flagging made from surveyors tape or plastic warning tags such as are used on roadworks can be added to barbed wire to provide a visual and aural warning to animals. Bunting has apparently been successful at preventing flying-fox entanglements for >10 years at the Rockhampton rubbish tip[29] and also at the Amberley airforce base.[30] Bunting needs to be replaced about annually because of deterioration. Second-hand bunting can be obtained from caryard dealers. Plastic flags made from tape are cheap, but need to be regularly replaced due to deterioration. Flags need to be quite closely placed, at least every 30 cm or so.[31] Plastic should not be used on stock fences as cattle eat plastic, suffer digestive problems and may die.[32] Furthermore, we should consider that introducing more plastic into the environment is not itself creating an environmental hazard, though the cost-benefits could be assessed in each case.

Metal signals: Shiny metal tags or other metal objects, such as aluminium pie plates[33], can also act to make barbed wire more visible. Tags have been used on a DPI facility in Cleveland with no bat deaths recorded since (as at April 2005).[34] Beer cans have been used on camel fences at Newhaven, Birds Australia's property in the Northern Territory, and by iron ore mining companies in the Pilbara.[35] Metal plates have also been installed between the top two barbed strands atop a cyclone mesh fence around a power substation in the Pilbara.[36]

Others: Brightly-coloured plastic balls (like airstrip powerline markers) have been used to prevent powerline strike by cranes in Europe and the US and may also be useful for fences.[37] These might be a relatively expensive option for extensive lengths of fencing. Painting barbed wire with fluorescent or white paint would be worth investigating, although it is likely to need regular maintenance, may not be effective at night, and may be less visible than other options.

5.3. Other options

Remove food trees: Food trees close to barbed wire could be removed if this is the reason flying-foxes are getting caught. Unless the tree is a weed, however, this is not a good option for flying-foxes or other wildlife, and can be expensive.

Manage vegetation: In some cases, managing the height of vegetation may prevent entanglements. Birds and bats tend not to be caught on surrounding barb wire once closely-planted trees grow to fence height. Where fenceline grass is long, bat deaths may be reduced.[38] Furthermore, hedges of vegetation can be planted to replace barbed wire fences – prickly vegetation may inhibit access as well as barbed wire. Regular vegetation management is probably not feasible on relatively large properties.

Check fences: Improved surveillance of problematic fences and timely rescues would save some entangled creatures, however this will not address the causes of entanglement. While it may not be realistic to expect farmers with many kilometres of fences to regularly check them this could reasonably

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[29] Nigel Tuckwood, Waste Coordinator, Rockhampton City Council (pers. comm. April 2005).
[30] Rebecca Worrill, Civilian Environment Officer, Amberley Airforce Base (pers. comm. April 2005).
[31] A flying-fox was caught on barbed wire less than 40 cm from flagging (Dominique Thiriet pers. comm. Feb 2006).
[32] See <http://ozcranes.net/>
[33] Meredith Ryan (pers. comm. April 2005) reports that aluminum one-person pie dishes are effective and easy to install. They are bent and clamped by hand over the wire.
[34] Louise Saunders, Brisbane Bat Rescue (pers. comm. April 2005).
[35] K.N. Armstrong (pers. comm. March 2006).
[36] Ibid. In this case, barbed wire was required since substations should meet Australian Standards regarding the Restriction of Entry (point 10.4; AS 2067-1984) and plates were considered to be the best alternative.
[37] <http://ozcranes.net/>
[38] ibid .

be asked of landholders with short fences, such as those in industrial areas or rural residential areas. It should be requested in addition to other measures.

5.4. Approaches taken elsewhere

Barbed wire fencing is a welfare problem in Europe, particularly for deer and raptors. In Europe several councils in Italy, Austria and Germany have banned the use of barbed wire fencing.[39] The Norwegian Animal Welfare Act forbids the use of barbed wire unattached to other fencing material which is easy to see and makes explicit provision for local councils to ban its use for fencing.[40] The European Union Parliamentary Special Interest Group on Animal Welfare agreed in a March 2006 meeting to progress a proposal to ban the use of barbed wire fencing in agriculture and forestry, particularly as there exist cheaper and better alternatives, such as electric fencing.

Barbed wire fencing is also a problem in the United States. One regional NGO, the Jackson Hole Wildlife Foundation, has developed a campaign to remove barbed wire fences.[41] They provide information about safe fencing, organize groups of volunteers to take down old fences, and work with governments and landowners to either remove or alter problem fences. By 2005 they had removed about 132 km of fencing.

6. Economic and other issues

6.1. Relative fencing costs

There is a widespread perception that plain wire costs more than barbed wire (and it may have in the past). However, currently, plain wire is cheaper than barbed wire. Furthermore, it takes longer to run out barbed wire than plain wire.[42] The disadvantage of hi-tensile plain wire is that it is hard to tie off and hard to strain using old-style strainers (although twitchers and wire joiners make it easy).[43] As an indication of relative cost, the following prices were advertised recently:

1500 m hi-tensile plain wire $115	$77/km
750 m 3.15 mm plain soft $98 (10 Gauge wire in the old terms)	$131/km
500 m 4.0 mm plain soft $98 (8 Gauge wire in the old terms)	$196/km
400 m barbed wire $66	$165/km

The relative costs of various forms of fencing and mitigation measures need to be investigated.

6.2. Stock and fencing

There are different opinions about how necessary barbed wire fencing is for stock containment. Some graziers have found it is unnecessary and that high tensile plain wire is effective.[44] However, this may not work to contain stock in areas with lush pastures.[45] Barbed wire has the advantage of deterring stock from fence rubbing, which damages fences.[46] Much barbed wire is used out of habit from previous times when soft wire was not as strong and labour was cheap. Also, some farmers find high tensile wire difficult to work with. The relative merits of different types of fencing for containing stock in different situations need to be investigated.

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[39] Dr Ebner in a presentation to the Eurogroup for Animal Welfare, Brussels, 15 March 2006, as reported by the Secretariat.
[40] See <http://www.animallaw.info/nonus/statutes/stnoapa1995.htm>.
[41] See <http://www.jhwildlife.org/fencing.html>.
[42] Peter Richards (pers. comm. Feb 2006).
[43] Ibid.
[44] One grazier on 100,000 acres west of Charleville has found that high tensile plain wire with wooden posts every 0.5 km and star pickets in between contains his scrub cattle very well (Peter Richards [not the grazier in question] pers. comm. February 2006).
[45] Meredith Ryan, grazier and flying-fox carer (pers. comm.. March 2006): "When cattle are used to relatively 'lush' pastures they get very spoiled and as soon as they perceive that their current paddock is somewhat "grazed" they look over the fence and say "that's greener pasture where I want to be and through they go if there is not the deterrent barbed wire."
[46] Metalcorp Steel, <http://www.metalcorpsteel.com.au/products/category.cfm?GroupID=3&ProductLineID=30>

6.3. Fencing for conservation
Many barbed wire fences are erected in the name of conservation, e.g. to protect wetlands or vegetation, including those funded by the Natural Heritage Trust (NHT). Ideally, this means that the conservation motivation behind the fences will also extend to protecting wildlife from barbed wire. It should be a condition of NHT and other government funding that barbed wire not be used for fencing on the grounds that it undermines conservation of other species.

6.4. Human health
Wildlife entanglements can also be a human health risk. For example, members of the public often try to free flying-foxes from barbed wire and suffer scratches or bites, which can expose them to Australian Bat Lyssavirus. For this reason, Queensland Public Health recently funded the vaccination of five rescuers in barbed wire hotspots on the Atherton Tablelands after Tolga Bat Hospital presented records showing that 26 of 60 rescues were performed by unvaccinated members of the public, of whom four were bitten.[47] (The cost of fence remediation may be cheaper than vaccination of several people, and removes the source of the health hazard.)

Unfortunately, the threat of disease is likely to inhibit barbed wire rescues. This is a particular problem for flying-foxes with the threat of Australian Bat Lyssavirus. For example, in the Northern Territory, there was a media campaign with the main message of “do not touch or try to rescue bats” and no corresponding messages promoting compassion for entangled bats and encouraging people to call a rescuer.[48] Some rescuers have noted an increased callousness in people towards entangled bats since the risk of diseases has been emphasised.[49]

6.5. Insurance and liability
Barbed wire may be an insurance requirement in some situations. Wildlife rescuers have been informed by some landholders that a barbed wire fence was a condition of their insurance.[50] In some states, farmers may be liable for damage caused by stock escaping from their property and are either required to have barbed wire fences for public liability insurance or have the perception that barbed wire fences are the safest form of enclosure. The insurance situation needs investigation and liaison with companies to determine if some alternative designs would be covered.

7. Recommended actions

7.1. Coordination
Establish a barbed wire coordination group to promote actions to reduce the wildlife toll from barbed wire. Ideally, this group will involve people focused on each of the variety of species affected. It would primarily function electronically.

<u>Proposed membership:</u> Wildlife NGOs (such as Australasian Bat Society and bird groups), wildlife rescue/care groups, Wildlife Preservation Society Qld, RSPCA, government welfare units.

Seek funding for 2 years for a part-time coordinator/secretariat of the coordination group.

7.2. Research
At present, we have very limited and mostly anecdotal information about the extent, causes and impacts of entanglements and options for prevention.

<u>Entanglements database:</u> Set up a central database to record entanglements and other information such as species affected and site information. Request wildlife and rescue groups, government wildlife agencies, landholders and beekeepers to record and pass on information about entanglements. Analyse data to determine extent and patterns of entanglement. Data concerning mortality on electric

[47] Jenny Maclean, Tolga Bat Hospital (pers. comm. Feb 2006).
[48] Centre for Disease Control Bulletin Vol. 10, No. 4, December 2003. <http://www.nt.gov.au/health/cdc/bulletin/dec_2003.pdf>
[49] Louise Saunders, Bat Rescue Brisbane (pers. comm.. April 2006).
[50] Helen Gormley, ONARR (pers. comm. Mar 2005)

and other types of fencing could also be collected, particularly if promoted as an alternative to barbed wire fencing.

Causes of entanglements: Investigate causes of entanglement and assess whether proposed fencing alternatives are safe for all affected species.

Other fencing options: Explore options for making existing barbed wire fences safe for wildlife. Develop other options, preferably cheap, easy and lasting. Assess alternative fencing options for different situations: security, stock control, vegetation protection.

Economics: Investigate the relative economics of different fencing options.

Monitoring: Assess the effectiveness of approaches with monitoring of sites with different treatments.

Insurance: Investigate insurance requirements with respect to fencing.

Research promotion: Promote research projects to universities and research centres, including the development of potential Honours, Masters and PhD projects.

7.3. Manufacture innovation

Approach manufacturers of barbed wire to propose the development of new forms of wire which are both functional and wildlife-safe. For example, perhaps a special top strand wire which has bright anodised aluminium tags already attached could be developed.

7.4. Education

Educational material: Develop educational material about barbed wire, including websites and pamphlets, and request that governments, RSPCA and other organisations put the material on their websites or distribute pamphlets.

Government: Many barbed wire fences are government-owned, e.g. fences around national parks and government facilities. Provide information to federal, state and local governments about the problems of barbed wire. Request governments to set a good example by (a) conducting an audit of their barbed wire fences, (b) undertaking a risk assessment and (c) replacing or rendering safe any barbed wire considered to be a problem. Request local governments to provide information (perhaps through rates notices and on their websites) to residents, particularly new residents who are unaware of the issues with barbed wire.

NRM groups: Natural Resource Management (NRM) activities are responsible for many new fences in the landscape, often using barbed wire, for protection of vegetation, wetlands and riparian areas. Raise awareness about the problems of barbed wire and promote alternative approaches to fencing by writing to NRM groups, publishing articles in their newsletters and requesting that they develop guidelines to minimise the entanglement of wildlife in fences in NRM projects.

Farmers: Contact farming representative groups, such as National Farmers Federation, Agforce and Landcare, seeking cooperation on promoting alternative fencing options to farmers. Publish articles in their newsletters. Promote stories about barbed wire problems and solutions in rural media.

Industry: Contact industry representative groups seeking cooperation on educating their members about entanglements, and promoting alternative fencing options and improved surveillance and rescue procedures.

Wildlife care groups: Request wildlife care groups to promote barbed wire awareness in their local areas. Promote awareness and care protocols at conferences, such as the annual National Wildlife Rehabilitators Conference.

Landholders whose fences entangle wildlife: Provide information to land managers whose fences have entangled wildlife or pose a risk. The most effective approach will require case-by-case judgement as landholders who feel antagonised may refuse to report future entanglements. Assess assistance options for entanglement hotspots. Also see below in 7.5 – 7.6.

Sellers of fencing material: Seek to have labels attached to barbed wire for sale, warning purchasers about the hazards of barbed wire for wildlife and detailing people's obligations for wildlife conservation and welfare.

Media: Promote the issue and best practice fencing via the media. Use entanglement events (when it will not antagonise the landholder) to develop community awareness and sympathy. Promote mitigation actions taken by landholders in local media. Consider holding a barbed wire awareness day each year with a coordinated media campaign.

7.5. Incentives and assistance

Investigate the costs of mitigation in various circumstances and identify potential forms of assistance and incentives available to encourage mitigation. Assistance could take the form of contributions towards costs of re-fencing or labour to assist re-fencing or mitigation.

7.6. Legal reform and enforcement

In some regions, land managers who erect and retain fences causing the death, injury or harm of wildlife are potentially liable under wildlife legislation or local government laws; however, most people are unaware of such obligations. Education will motivate many landholders to take remedial actions. For recalcitrant land managers there may be legal options to force their compliance.[51] Legal reforms are needed to provide better protection for wildlife against barbed wire.

Develop awareness about legal obligations: Obtain legal advice about people's obligations to avoid the death, injury or harm of wildlife by entanglement in each state. Where people do have legal obligations to avoid harm to wildlife, place this advice and other information on websites, e.g. government and NGO websites, for public access. Seek to have this information displayed also on barbed wire for sale.

Inform landholders of their options and obligations: Each time a rescue is performed or entangled wildlife is observed, provide information to the landholder about the entanglement, the outcomes, problems with their fencing and their options for addressing the problems (including website addresses and organisations from which they can obtain further information). They may also be informed in a friendly way of their legal obligations and requested to take corrective action. Judgement will be required about what approach to a particular landholder is best. A legalistic approach may antagonise landholders and result in worse outcomes for wildlife. Develop template letters and pamphlets for landholders that can be used by wildlife care organisations.

Persuade recalcitrant landholders: If landholders do not take corrective action, legal warnings may assist. As a last resort in some states, third party applications can be made to the court to order that the landholder take action to prevent further entanglements.

Persuade governments to take responsibility: Seek education and enforcement actions from state governments and local governments.

Investigate legal reforms: Investigate ways to improve legislation. For example, propose reforms to welfare legislation, such as the Queensland *Animal Care and Protection Act 2001*, to recognise barbed wire as an avoidable welfare problem. Investigate reform under legislation regulating development to limit the use of barbed wire fences, for example, in codes for various types of development under the Queensland *Integrated Planning Act* 1997. Draft appropriate local laws for local governments and request governments to develop policies and laws on barbed wire use.

7.7. Rehabilitating entangled wildlife

Promote best-practice rescues and care of wildlife entangled in barbed wire.

[51] This would be justified in cases such as an urban golf course whose managers refused to remove unnecessary barbed wire that was killing dozens of bats - despite the offer of a rescuer to do the work to replace the barbed wire strands.

Publicise rescue options: Publicise contact details for wildlife rescue groups in each region and ensure that local and state governments have correct information to give to people about rescuing entangled wildlife. Where feasible, request property managers with problem fences to conduct daily searches and report entanglements.

Develop rescue and care protocols: Develop rescue and care guidelines for different species entanglements and promote to wildlife care groups.

Collect rescue information: Request all rescuers to record and share information about entanglements, including site of entanglement, species, condition, likely causal factors, and outcome of the wildlife involved. Pictures will be a useful resource. This information can be used to inform the landholder and be added to the entanglements database. For flying-foxes, it would also be useful to record the vaccination status of the rescuer.

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Vehicle mounted Anabats

Rob Gration, ideas-man, has done it again with this vehicle mounting system for an Anabat.

– *News and Announcements* –

Congratulations

Patrina Birt has recently (November 2005) had her PhD conferred from the University of Queensland. Her supervisors were Dr Les Hall, Dr Geoff Smith and Dr Peter Woodall. The abstract is below.

Mutualistic interactions between the nectar-feeding little red flying fox *Pteropus scapulatus* (Chiroptera: Pteropodidae) and flowering eucalypts (Myrtaceae): habitat utilisation and pollination

The aim of this study was to define the significance of eucalypts (Myrtaceae) to the lifecycle of the nectar and pollen-feeding little red flying-fox *P. scapulatus* (Chiroptera: Pteropodidae), particularly in comparison to the frequently co-occurring *P. alecto* and *P. poliocephalus*, as well the significance of *P. scapulatus* to the pollination of eucalypts.

The demographics and abundance of flying-foxes within 44 known daytime campsites throughout the southeast Queensland Bioregional Ecosystem, as well as several external to this area, were monitored on a monthly or opportunistic basis from September 1996 to August 1999, in response to available flowering. For all sites, flowering (40km radius) was assessed subjectively as light, medium or heavy.

Habitat utilisation by *P. scapulatus* was complex, and strongly associated with the annually irregular, highly ephemeral and frequently patchy flowering of various eucalypt species; being typically sporadic and transient (2 – 8 weeks) in most cases, particularly when flowering was light and patchy, and/or in inland areas where flowering was usually limited to one plant species in a particular area. In other cases it was seasonal or of atypical extended duration, particularly in coastal areas, and/or if there was consecutive flowering of two or more eucalypt species. There was a strong association between the yearly variation in the geographical location of both heavy flowering and large (>50 000) numbers of *P. scapulatus*. Significant eucalypt species for *P. scapulatus* in the coastal areas of the southeast Queensland Bioregional ecosystem were the summer flowering of *C. gummifera*, *C. intermedia* and *E. moluccana*. In the coastal areas between Gladstone and Rockhampton, significant eucalypts included *C. citriodora, C. clarksoniana, C. erythrophloia, C. intermedia, C. tessellaris* var*. dallachyana, E. moluccana, E. platyphylla,* and *E. tereticornis*. Eucalypt species such as *E. camaldulensis, E. melanophloia,* and *E. orgadophila*, and related genera such as *Syncarpia glomulifera*, provided important flowering resources inland.

In contrast, while both *P. alecto* and *P. poliocephalus* displayed obvious fluctuations in abundance throughout the year their use of habitat was more permanent and/or regularly seasonal, as well as more geographically consistent, including the occupation of maternity sites. Both species demonstrated a propensity towards nectar but utilised fruit resources extensively when available. In the southeast Queensland Bioregional Ecosystem, influxes of both species occurred annually over the spring/summer season when flowering and fruiting was at its most abundant and diverse. However, the pattern and density of abundance of *P. alecto*, and more specifically *P. poliocephalus*, was associated with the flowering of *E. tereticornis*, with reduced abundance occurring when flowering was light and patchy. Large influxes of *P. poliocephalus* were also associated with the annually irregular flowering of *C. citriodora*. Although the increase in abundance in spring/summer coincided with the birthing and lactation period, flowering variables accounted for more of the variance than the reproductive cycle of either *P. alecto* (82.6% and 15%, respectively), or *P. poliocephalus*, (47.2% and 3.7%).

A comparative study of the morphology and surface papillae of the tongues of *P. scapulatus, P. alecto, P. poliocephalus, P. conspicillatus, Nyctimene robinsoni* and *Syconycteris australis*, which was undertaken macroscopically using a dissecting microscope, and microscopically using a Scanning Electron Microscope, provided some anatomical evidence to support the greater reliance of *P. scapulatus* on nectar resources; shown above with respect to habitat utilisation. Tongues varied from being extensible and brush-like (with long hair-like tip filiform papillae) in *S. australis*, to club-like (with few papillae types) in *N. robinsoni*, to long-pointed (possessing several types of papillae including tip filiform) in the *Pteropus* species. In relation to the latter however, the tip filiform papillae of the tongue

of *P. scapulatus* correlated more strongly with those of other highly nectarivorous animals such as lorikeets, honey-possums, honeyeaters, and other predominantly-nectarivorous bats; being longer, denser and covering a relatively larger area of the tip.

Radio-tracking data indicated that *P. scapulatus* has the potential to generate diverse and widespread patterns of pollen dispersal for the trees in which they forage. Fourteen individuals (six females and eight males) were tracked throughout the night, from four daytime campsites located at Gladstone, Esk, Ipswich and Rockhampton, to establish plant species visited, behaviour while foraging in flowers for nectar, movements between flowering conspecifics, and distances traveled. Foraging movements were characterised primarily by territoriality, with subdominant animals continuously shuttling between flowering conspecifics both within a stand and within separate stands throughout the night. Distances travelled from daytime campsites to initial foraging areas ranged from 4 km to 23.5 km, while distances between successive foraging areas for those individuals that commuted between separate stands ranged from 0.5 km to 24 km.

The significance of *P. scapulatus*, and probably other *Pteropus* spp. to the pollination of some eucalypts was further supported by the finding that the floral traits of *C. citriodora, C. henryi, C. tessellaris, E. tereticornis* and *E. crebra*, corresponded closely with the pollination syndrome of Chiropterophily, including brush-like, white-cream coloured flowers that were presented conspicuously on the periphery of the canopy. They also displayed greater rates of anthesis, pollen availability and nectar secretion at night compared to the day.

As a collective, the results of this study indicate a mutualistic plant-pollinator relationship between *P. scapulatus* and those eucalypts in which they forage, where the interaction between the two, while not at the exclusion of others, benefits both. Although their effectiveness as pollinators needs to be established, this has obvious import not only for the conservation and maintenance of ecologically viable populations of *P. scapulatus,* but also the maintenance of the genetic integrity of native forests, particularly remnant and isolated eucalypt populations. Indeed, as habitat continues to be fragmented and modified, restricting movements of other pollinators such as insects, birds and non-flying mammals, *P. scapulatu*s, and other flower-visiting flying-foxes, will have an increasing role in genetically linking isolated and remnant patches of forest.

Finalisation of the Australasian Bat Society Standards for Bat Detector Based Surveys.

At the ABS Anabat Workshop held in February 2003, reporting standards for bat detector based surveys were developed by members of the society. The proceedings of the workshop and the draft standards were published in the ABS Newsletter Volume 20, April 2003 with a request for comments.

These standards were subsequently ratified by the ABS executive and will now be distributed to relevant Government Agencies, representative bodies and consulting companies.

Members seeking a copy of the ABS standards or who have suggestions regarding organisations that should receive copies, should contact Michael Pennay, convenor of the ABS Survey Standards Subcommittee, on (02) 6298 9718 or michael.pennay@environment.nsw.gov.au.

In the newspapers

Victorian Animal Welfare president Lawrence Pope and colleagues have continued their activites in the hope of reducing cruel behaviour towards flying-foxes. Lawrence has made comments in several media releases since the last issue of this Newsletter, which we unfortunately do not have room to include. However, the editor considered the newspaper article below to be typical of their efforts.

Progress Leader 28.2.06

NEWS

Covert bat patrols

PETER ROLFE

BAT crusaders are secretly patrolling areas between Boroondara and the Yarra Valley in an effort to protect some of Kew's most controversial residents.

A band of more than 20 animal rights campaigners last week began covert surveillance of fruit crops as far as away as Silvan, Belgrave and the Yarra Valley after fruit growers threatened to shoot grey-headed flying foxes.

Victorian Animal Welfare Association president Lawrence Pope warned fruit growers would be met with an "angry backlash" if the group caught anyone harming the endangered species.

While the bats have been blamed for destroying crops worth an estimated $400,000 in the valley and raiding backyard fruit trees in Boroondara, Mr Pope said they helped pollinate more than 100 native plants.

"It's extraordinary that in the opening moments of the 21st century, you have people who are threatening or killing a species that is in great decline," Mr Pope said.

"This is a keystone species and we've lost 99 per cent of them in the last 100 years."

Mr Pope said protesters would not trespass on private property but would inform police and Department of Sustainability and Environment officers of suspicious activity such as gunshots and spotlighting.

Lawrence Pope leads animal rights campaigners in a surveillance operation. Picture: TOM CAMPBELL N35PP310

The patrols come two months after the department ordered undercover patrols of Yarra Bend Public Golf Course to stop players taking deliberate pot-shots at the bats.

People caught killing bats face a $5000 fine or six months in jail.

» **To report anti-bat behaviour, phone Crime Stoppers on 1800 333 000 or the department on 13 6136**

– Recent Literature –

Compiled by Susan Campbell (publications between mid-October 2005 to April 2006).

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New Zealand bat sculpture in a town near the venue for the ABS Post-conference Field Trip.

Table of contents