The Australasian Bat Society Newsletter

Number 15 September 2000

Batophiles attending the 9th Australasian Bat Conference, Paterson, NSW, April 2000

- Instructions for contributors -

The ***Australasian Bat Society Newsletter*** will accept contributions for one of two broad sections of the Newsletter. There are two deadlines each year: 21 February for the March issue, and 21 September for the October 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 3_" floppy disk preferably in IBM format. Faxed and hard copy manuscripts will be accepted but reluctantly!! All submissions are to be sent 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 1.6mm left and right margins. Please use Microsoft Word version 97 or earlier.
- Manuscripts should be submitted in clear, concise English and free from typographical and spelling errors.
- Scientific Papers should ideally 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).
- 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.
- Scientific Articles are not being refereed routinely at this stage, although major editorial amendments may be suggested and specialist opinion may be sought in some cases. Articles will generally undergo some minor editing to conform to the ***Newsletter***.
- Please contact the Newsletter Editor if you need help or advice.

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- Editorial -

Peggy Eby was elected as Newsletter Editor at the last conference but soon after realised that she was not able to give commitment to the job this year. I agreed to edit the Newsletter for at least the next two issues and Peter Wilson kindly volunteered to act as Editorial Assistant.

This Newsletter is a large one with many articles submitted on a range of interesting and thought-provoking topics. So thanks to those of you who have contributed articles, and particular thanks to Greg Ford for compiling the recent literature section, to Les Hall and others for state roundup news, and to Greg Richards, Nicki Markus and Lindy Lumsden for help and suggestions.

The large number of articles has prompted us to change the format of the Newsletter slightly from previous editions (mainly reduction in font size) to reduce the cost of printing and postage.

Since it was me who cajoled Nicki Markus into taking on the position of Newsletter Editor two years ago, it is a pleasure to publicly thank her for doing such an excellent job as Editor. Perhaps not widely appreciated is that Lindy Lumsden has organised the printing and postage of the Newsletter for a number of years now, so thanks to you Lindy and helpers for all that work on behalf of the ABS.

Finally then, please take note of the new 'Instructions for Contributors' on the previous page - it is really helpful to us to have articles submitted in the standard format. Pete and I look forward to the next batch of submissions for next edition.

Bat on!

Terry Reardon

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- Australasian Bat Society: business and reports -

President's Report

Since this our first newsletter since the Conference, its my first opportunity to place on record my thanks to all those who worked so hard to put the conference together and make it such a success. To the organisers and others behind the scenes, congratulations on a fine job and thanks also to Tocal College for providing the venue at reasonable cost and our other sponsors; Fly By Night Bat Surveys, Greg Richards and Associates, Titley Electronics, Hunter Water and Bacardi Rums. Also, thanks to Bat Conservation International for their support and their award for the best conservation paper presented.

I would like to offer a warm welcome to all new members of the Society – the ABS continues to grow and I believe will continue to play a substantial role in raising the profile of bats in our region. There has been a small change in the make-up of the ABS Committee with most members staying on. Again I would like to express my thanks to members of the previous committee for their work over the last two years and welcome aboard to the two new members to the Committee, Greg Richards and Terry Reardon. I would personally like to thank the two parting members, Peggy Eby for the wonderful work that she did as Secretary (and she has been told, her wise council will still be sought on a range of issues!!!) and thanks to Nicki Markus for her great work in producing our Newsletter. And finally, I thank Nancy Pallin, our Public Officer, for her past and continuing role in keeping the 'official' affairs of the Society in order.

Since the Conference, I have been somewhat busy and in July I had the opportunity to visit Bat Conservation International in Austin, Texas. It was certainly very interesting to learn more about their operation and to see how things were being done in the USA. My trip was primarily focused on "Bats and Mines" issues and BCI's Director of their North American Bats and Mines Project, Sheryl Ducummon ensured that I had a full itinerary of places to go and people to see. A number of our members in Queensland, NSW and Victoria (and possibly WA) has been actively pushing the bats and mines initiative and it seems that we are making quite good progress in getting programs, similar to those in the USA, established here. The results of my trip will be presented shortly to the Australian Minerals and Energy Environment Foundation and I plan to further promote the issue at some mining industry conferences in the near future.

I was particularly interested to learn that, just as in Australia, not all USA bat research people necessarily agree on all conservation issues or on the means to address them! Unlike Australia, the USA has had no firm hand from its Federal Government to guide it in developing a threatened species list for the Nation, nor to develop strategic directions for the conservation of threatened species. This task has been taken on by BCI in close collaboration with numerous other groups to form the North American Bat Conservation Partnership. It was heartening for me to see that so many researchers were able to put their differences aside to collaborate on this project. It also made me appreciate more, the efforts made by Environment Australia to coordinate this same type of initiative to develop our own national threatened species listings (the things we sometimes take for granted!).

Meanwhile, back on home soil, flying foxes continue to provide us with conservation problems and, if we are to believe popular accounts, the Royal Botanic Gardens in Melbourne are labouring under the weight of plague proportions of Grey-headed Flying Foxes! No doubt the real situation is slightly less dramatic however there is no doubt that damage is being done to sections of the Gardens. ABS has written to all of the major players involved in this issue. Our approach has been non-confrontational, and while we have been providing appropriate and factual information on the conservation status of the species, we have also been offering assistance in developing a

solution to the problem that does not involve the killing of animals. We can only hope that we might be asked to become involved. To be effective in these situations we need to be able to offer viable alternative management strategies, something that we are probably capable of doing, given some lateral thinking and intuition.

Bruce Thomson

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Executive Activities – an update

The Executive changed structure slightly after the Annual General Meeting in April, and for better or worse you ended up with Greg Richards as Secretary, a change in Editorial team Terry Reardon and Peter Wilson, and everyone else opted to stay where they were. Many thanks to Peggy Eby who is taking a break after her role as past-Secretary. I can vouch for the large amount of work that Peggy must have done in two years – it certainly is a busy job!

Since the AGM the Executive has been involved in quite a number of assignments, and these include:

- Discussion about placing past **newsletters on the web site**.

- **Scientific Advisory Groups (SAGs)** will be formed ad hoc to provide expert advice and information on particular species, species groups, or issues. Basically, the SAGs are formed when required, and for as long as necessary to reach an outcome. The Secretary visited Environment Australia to discuss this initiative with threatened species officers.

  The concept of SAGs arose from a workshop that presented information to the NSW Scientific Committee on the status of the Grey-headed Flying Fox. This was an excellent forum and all participants learnt a great deal from each other, and the objectives of the exercise (presenting a case and reviewing critiques) were met. The expert group spent a great deal of time on this project, and over 120 pages of information was prepared and provided to the Scientific Committee.

- The **Melbourne Royal Botanic Gardens** issue (the attempt at euthanasia of the only permanent Grey-headed Flying Fox colony in Victoria) understandably created a great deal of work for the Executive. This included the co-ordination of a submission from the ABS to the Scientific Advisory Committee (SAC) that supported the proposed listing as Rare (equivalent to Vulnerable elsewhere). At the time of writing we are not aware that a final decision has been made by the Environment Minister, however, we were advised by letter in July that "the management program … has been suspended pending finalisation of the SAC's processes and [her] consideration of their recommendation".

The next item on our continually growing agenda, was the issue of **advertisements** being placed in the ABS newsletter and website. The decision was made that those advertisements with a commercial basis would have to be paid for, and they had to be bat-related, and the final decision for inclusion would remain with the Newsletter Editor and Webmaster.

- The Executive is currently investigating the implications of the new Federal ***Environment Protection and Biodiversity Conservation Act 1999***. Under this Act, proponents of

developments that may affect the environment can use Environment Australia's databases over the internet to ascertain what threatened species exist in the area that they want to develop, so that they can ensure that no impacts will cause an adverse effect. To our surprise, the only bat species listed was the Ghost Bat, which indicated that none of the information provided in the Action Plan for Australian Bats (where 9 species are listed) will be used by developers. This situation appears to have arisen either because none of these species have been nominated for inclusion in Federal legislation, or nominations have been delayed. We are now in a situation where a development proponent will be advised that these species do not legally require assessment.

The ABS wrote to the Minister for the Environment (Senator Hill) seeking his assistance to have Action Plan species urgently reviewed by the Threatened Species Scientific Committee, and their inclusion in the EA databases. Until this situation is resolved, any development south of the Tropic of Capricorn does not need to worry about threatened bat issues – at Federal level. However, the saving grace is that state legislation can over-ride the EPBC Act under a system called "bilateral agreements", but as it stands no action has been taken up from the Action Plan.

· Our intrepid webmaster (Herry) has been working away quietly in the background improving the internet communications. His latest activity is designing an **ABS listserver**, which will give us a "members only" centre for daily communication. This is an outcome of recommendations at the last AGM, and we take this opportunity to thank Herry for his considerable efforts with the ABS web site.

You can see that during the 5 months that have passed since the AGM the Executive has been extremely busy in dealing with issues on behalf of the membership, as well as the general housekeeping duties that are constantly present.

Greg Richards
Secretary

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Minutes of the 5th Biennial General Meeting of the Australasian Bat Society Inc

Held: Thursday, 27th April 2000, commencing 2:00 PM
Tocal Agricultural College, Paterson, N.S.W.

Chairperson: Bruce Thomson
Minutes: Peggy Eby

Open and Welcome: B. Thomson

Apologies: Linda Collins, Paul Gray, Chels Marshall, Len Martin, Mandy Sansom, Ian Temby, Bronwyn Wood

Minutes of the ABS Biennial General Meeting Rockhampton
read by Peggy Eby
motion to accept minutes as read:
moved M. Kerr; seconded N. Pallin
accepted unanimously by show of hands

Business arising
There was no business arising from the minutes.

Reports of Members of the Executive

President
Bruce Thomson

Secretary
Peggy Eby
Correspondence for the year was tabled, including the substantial correspondence originating from the website. Alexander Herr was thanked for his efforts as webmaster in forwarding correspondence to the Secretary. Several members of the ABS have been called upon to respond to requests for information from the website, particularly members of the Executive. Their efforts were also acknowledged.

During the past year, meetings of the Executive were conducted via email. This proved a satisfactory method for conducting the cooperative work of the Executive. Minutes were tabled.

Treasurer
Natasha Schedvin
Natasha presented the Treasurer's report and tabled an audited statement of accounts for the 1999 financial year (attached).

Income for the period 1 January to 31 Dec 1999 was $5,615.81. Income was primarily derived from membership subscriptions. Expenditure for that period was $2363.56. The largest items of expenditure were production and postage of the newsletter ($2179.53) and printing the Living with Bats brochure ($1500). The total surplus at 31 December 1999 was $11,255.86.

Membership Officer
Lindy Lumsden
Membership levels have continued to increase during the 1999 financial year, with 40 new members joining. In addition there has been an increase in the proportion of financial members: from 70% to 92%.

	31 Dec 1998	31 Dec 1999
	152	205
Financial Members		
Members unfinancial for 1 year	16	14
Members unfinancial for 2 years	49	4
Total members	217	223
% of members financial	70.0%	91.9%

Editor
Nicki Markus
Nicki announced that she would not be standing for a further term. She thanked the members of the ABS for their active support of the ABS Newsletter during her time as Editor.

Open discussion on the advocacy role of the ABS

Peggy Eby chaired an informal discussion of the role the ABS should take in advocating conservation and effective management of bats. Background information was presented (see ABS Newsletter, April 2000). The following points summarise the discussion.

- Members expect the Executive to take full responsibility for advocacy.
- Members vary widely in their definitions of effective advocacy by the ABS (e.g. numbers of letters written, amount of media coverage, influence with politicians).
- The forte of the ABS is as a source of accurate information.
- Public education is an important role of the Society.
- The Executive should devise a process for providing information to members on current issues.
- The Executive should report to members on their responses to particular issues via the website.
- People who represent the ABS in the media should be provided will suitable training.
- In the long term, the Executive should work to develop personal contact with politicians, promoting the ABS as a source of balanced, accurate, up-to-date information, with the aim of gaining a place “at the negotiating table”.

It was resolved that the ABS Executive should appoint Publicity Officers to act as the public voice of the ABS.
moved: Andrew Steed
seconded: Gill Bennett

It was resolved that the Executive put into place a mechanism for information exchange via email.
moved: Alexander Herr
seconded: Lawrie Conole

It was resolved:

1. That the ABS Executive will, on behalf of the ABS, act as an advocate for bat conservation by communicating with government authorities and the community in general.

2. That advocacy by the ABS Executive will take the form of either the provision of information on bats and situations that affect bats or an expression of the advocacy position or opinion of the ABS.

3. That the ABS Executive will confine its communications to the provision of information except where an ABS Position Statement covering the relevant topic has been agreed by the members.

4. That the Executive will take reasonable care in determining the accuracy of information on bats and situations that affect bats before they disseminate it, and this it will do by reference to known scientific (and other) authorities and references.

5. That the Executive has the authority to provide information on bats and situations that affect bats and express the position or opinion of the ABS to Government authorities and the general community, without requiring specific approval from the membership on each issue.

6. That all communications relating to advocacy, from the ABS Executive to external recipients must have the written or verbal approval of a majority of the Executive, be on ABS letterhead and be signed by a member of the Executive. Communications that do not conform to these protocols will not be communications from the ABS although the name of the ABS may be used or the ABS may be the implied author of the communication.

7. That all communications relating to advocacy from the ABS Executive to external recipients must be filed by the Secretary and made available to any member of the ABS at the following AGM or on demand.

moved: Greg Richards
seconded: Nicki Markus
accepted by show of hands

Elery Hamilton-Smith suggested the Executive hasn't the ability to implement these motions as it stands, and the Executive should develop strategies for their implementation. In the mean time, the Executive should respond to issues as they arise.

Election of Executive Officers

Chaired by E. Hartnell
All Executive positions were declared vacant and the following members were elected unopposed:

Position	***Member elected***	***Nominated by***	***Seconded by***
President	Bruce Thomson	L. Lumsden	P. Eby
1st Vice President	Marg Turton	M. Schulz	L. Reinhold
2nd Vice President	Kerryn Parry-Jones	M. Schulz	L. Reinhold
Secretary	Greg Richards	B. Thompson	B. Campbell
Treasurer	Natasha Schedvin	E. Hartnell	P. Eby
Membership Officer	Lindy Lumsden	N. Schedvin	A. Duffy
Editor	Peggy Eby	E. Hartnell	N. Schedvin
Public Officer	Nancy Pallin	D. Gee	G. Richards

The meeting continued with the new Executive in place.

General Business

Discussion ensued on the accumulated ABS funds and whether to expend some of these monies. There was much support for using funds to disseminate information to the general public, some discussion for and against a student award, and overwhelming support for expenditure on the activities of a Publicity Officer.

Reports from the Subcommittees on Education, Bats in Caves and Mines, Flying Foxes, and Bats and Viruses were tabled, though verbal from the latter.

The Education Subcommittee report was presented by Denise Ford, and in summary:

- there was concern that the ABS should have a dedicated seminar on education after the next conference
- there was a need to elect a person as an Education Liason Officer
- it was recommended that scientists transfer skills to students, NGO's, etc
- the ABS should develop a vision statement on education

The bats in Caves and Mines Subcommittee reported that they were at the 4th draft stage of a positioin statement but beacuse of the scale of the task had decided to work in three stages (caves, mines, then others such as bridges and culverts).

Olivia Whybird gave a presentation on proposed ABS policy on the protection status of the Spectacled Flying Fox.

The Bats and Viruses Subcommittee reported that there had been no communication or activity in the last 18 months.

The AGM closed at 4.51 pm to be continued next day.

Meeting re-opened at 1.41 pm 28 April 2000.

General Business

Motion: "That research programs be organised by the ABS with a team appointed by the Executive".
Moved - Martin Schulz, seconded - Sue Churchill - carried

Motion: "That the ABS support in a non-financial manner the survey of microbat maternity sites (Elery H-S.) and the distribution-wide Grey-headed Flying Fox counts (Peggy E.)".
Moved - Kerryn Parry-Jones, seconded - Greg Richards - carried

Motion: "That the ABS Executive has the power to approve ABS support (non-financial) for specific research projects".
Moved - Kerryn Parry-Jones, seconded Olivia Whybird - carried

Motion: "That the ABS move a motion of censure against the management of the Royal Botanic gardens Melbourne for the attempted eradication of the [flying fox] colony there".
Moved Gwen Parry-Jones, seconded - Janet Uden - not carried

Motion: "That the ABS move a motion of censure against the Victorian government for the attempted eradication of the flying fox colony in the Royal Botanic Gardens Melbourne".
Moved - Gwen Parry-Jones, seconded Janet Uden - not carried.

Meeting closed 2.13 pm.

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Financial Statement for 1999

	$ 1-Jan-99 to 31-Dec-99
GENERAL ACCOUNTS	
Income	
Membership subscription	5,587.00
Interest	28.81
TOTAL INCOME	5,615.81
Expenditure	
Audit and accounting fees	-
Bank fees	71.84
Exchange rate loss	-
Incorporation Fee	-
Insurance (public liability)	402.29
Newsletter (production & postage)	2,179.53
Stationery and postage	91.90
Executive committee (including travel expenses)	118.00
Flying fox (printing of Living with bats brochure)	1,500.00
NSW Dept. Fair Trading for lodging of Tax Exemp. Form	35.00
BALANCE OF ACCOUNTS	
ABS Gift Fund (Donations)	23.00
ABS Cash Management Trust (Investment)	10,000.00
TOTAL EXPENDITURE	4,363.56
OPERATING SURPLUS (1999) **	1,252.25
SURPLUS TO END OF 1998	5,041.61
Conference profit (carried forward)	4,962.00
TOTAL SURPLUS	**11,255.86**

** The once off payment for production of the FF brochure ($1500) has been deducted from this figure (ie. Total profit/surplus before FF brochure printing is $2,752.25)

CONFERENCE ACCOUNTS	
Conference Income	2,532.00
Conference Expenditure	50.50
SUB-COMMITTEE ACCOUNTS	
Income	
NSW Flying Fox surveys	2,415.00
Expenditure	
General subcommittee costs	40.00
NSW Flying Fox surveys	1,004.45

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Education Sub-Committee Report

At the April 2000 conference there was a brief meeting of people interested in educating people about bats. These recommendations were put forward at the ABS Annual General Meeting.

1. That the ABS will elect an education sub-committee or person to act as an education liaison officer.
2. That the ABS will have a post conference workshop/seminar on bat education after the next ABS conference in 2002.
3. That the ABS website will have a section on education which will act as networking resource for anyone interested in educating children and the public on bats and bat issues.
4. That the ABS scientific members will provide skills transfer and training for students, foresters, parks field officers etc as part of its charter.
5. That the ABS will develop a vision statement on who we are, what we do and future directions in order to clearly define our role/s to the membership and the public.

Since the conference

Following the conference there was an invitation from Alexander Herr to contribute material for the 'education section' of the ABS website. I emailed, faxed or posted this information with a call to all members listed as interested in the education sub-committee to contribute further ideas or content for the website or other educational materials. I only received responses from two people who suggested that information on microbats and how to keep them out of buildings was a priority.

I suggest that ABS members are severely stretched for time and resources in doing their bit for bat conservation in their local area and there is nothing left over to contribute to the ABS education sub-committee.

Draft Microbat leaflet

I offer a draft leaflet on microbats for members to use (see Newsletter insert). It could be adapted to your area by making the necessary changes on a copy and sending them to me. The leaflet has evolved over the last decade and was developed by Julie Spence, Anne Bowman, Devona Fraser and me. Lindy Lumsden had a quick look and recommended some improvements, which have been incorporated. Thank you to Denise Ford, Ann Bowman and Martyn Robinson for illustrations.

Please send suggestions for improvements or requests for an original copy to:

Nancy Pallin
45 Highfield Road
Lindfield NSW 2070
Phone 02 9416 7334 fax 02 9416 2815 pallin@bigpond.com

Nancy Pallin

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Bats in Caves – draft report from the ABS sub-committee

This draft paper has been prepared by a sub-committee of the Australasian Bat Society to describe the place of caves as a habitat for bats, and to outline policy and practice for bat conservation. Please send all comments to Elery Hamilton-Smith, P.O. Box 36, Carlton South, Victoria 3053, or to <elery@alexia.net.au>.

It is being circulated in draft format to members of the Society and also to both the Australian Speleological Federation and the Australasian Cave and Karst Management Association. Hopefully, all three organisations will in due course adopt it as a policy paper.

Introduction

Bats are an integral part of the natural environment. They undertake a range of important ecological functions including the control of insects and other invertebrates, the pollination of trees and the dispersal of rainforest seeds. A number of Australian bat species rely on caves for shelter during daylight hours as well as to raise young, mate and fulfil a range of other functions. For many of these species, caves provide the only habitats at which critical life functions necessary for their survival can occur.

This statement of recommended policy and principles in the conservation and management of cave-dwelling bats has been prepared to provide guidance to both land managers (both public and private) and those who visit caves.

The Place of Caves in the Life of Bats

Although some bats (see appendix) appear to use caves only occasionally or opportunistically, there are many species of bats which always or very often roost in caves (or substitute environments such as mines and water tunnels) throughout each day. It appears that this is generally related to the regulation and/or maintenance of required body temperatures at specific seasons of the year. Thus, the specific sites chosen often vary from season to season for each species, but often they are critical for survival.

Many of these species may also use mines, tunnels or other artificial structures as an alternative to caves. As special considerations apply to these, they will be dealt with in further papers.

The species using caves on a consistent basis are listed below.

Flying Foxes	
Genus ***Pteropus*** ***Pteropus alecto***	Although generally tree-dwelling, in some areas this species will roost in the entrance zone of caves.
Genus ***Dobsonia***	Commonly roosts in caves or mines, but within sight of daylight.
Horseshoe Bats	
Genus ***Rhinolophus***	Gather in summer at specific maternity sites, sometimes shared with bent-winged bats, but throughout rest of year are widely dispersed in other caves or mines. In southern states, large numbers may roost in specific hibernation sites.
Genus ***Hipposideros*** and ***Rhinonicteris aurantius***	Normally roost throughout year in caves or mines, various of which may be used as a maternity site.
Ghost Bat	
Macroderma gigas	Normally roosts throughout year in caves or mines, one of which in each region may be used as a maternity site.

Sheath-tailed Bats	
Genus ***Taphozous***	Commonly roost in caves or mines, often in the twilight zone, but also found in forest roosts.
Vespertilionid Bats	
Chalinolobus dwyeri	Usually roosts in caves or mines
Chalinolobus morio	Generally a tree-dwelling bat in Eastern Australia, but in Western Australia and the Nullarbor Plain, it generally roosts in caves in very large populations. Like the bent-winged bats, it selects specific caves as maternity sites.
Bent-winged Bats Genus ***Miniopterus***	This genus is widely distributed from Europe to the South Pacific. In Australia, it virtually always roosts in caves. Each population is based upon a single maternity site which appears to be chosen for the suitability to enable the bats to build up a high temperature (up to 36°C) in order to provide a suitable environment for the birth and survival of the young bats, which occurs in summer. Other caves (or mines) throughout the population range, which may extend for several hundred km. from the maternity site, are used throughout the rest of the year.
Genus ***Myotis***	Often roost in caves, although their definition of a cave is commonly a small cleft or hollow only 10-15 cm. in diameter.
Genus ***Vespadelus*** ***V. caurinus*** (Kimberly, N.T.) ***V. douglasorum*** (Kimberley) ***V. finlaysoni*** (Central deserts) ***V. troughtoni*** (Qld & northern NSW dividing range)	Usually Roost in caves throughout the year

Issues and Threats

Cave dwelling bats are particularly vulnerable because very large numbers may occur in one site; in some cases a maternity site may contain virtually all the female and juveniles of a bat population which when dispersed will spread over an area of up to 1,000 square kilometres. They are also dependent upon the cave environment for management of their own body temperature and metabolism. At the same time, they also depend upon the availability of food in the surrounding countryside. There are a wide range of potential threats to their survival:

Habitat Destruction	By mining, quarrying, inundation, filling of entrance
Habitat modification	Tunnelling or obstruction Damage during road building Rock collapse Rubbish dumping Microclimate changes as a result of regional changes, e.g., in groundwater levels or as a result of clearing surface vegetation Use of badly designed cave gates Invasive plants (e.g., lantana, blackberries) blocking entrances Alterations to predator access Tourism infrastructure or fencing at entrance
Reduction of food supply	Changes in land use or land management practices, including increased use of insecticides, land clearance, mono-culture planting etc. Draining of wetlands Wildfire

Poisoning	Impacts of some insecticides or fungicides Drinking from poisoned waters, e.g., some mine tailing dams Use of internal combustion motors in or near caves with risk of CO poisoning. Other pollutants
Human Interference	Inappropriate visitor behaviour or major disturbance of maternity or over-wintering sites

Sites of special importance include:

- Where bats are in a torpid state during winter, particularly in Southern Australia, as disturbance may use up the energy reserves required for over-winter survival
- During the birth and nursery period in acclimatising and maternity sites

Every effort must be made to minimise disturbance of bats during the seasonal use of these sites.

Unusual weather conditions, when bats may not be able to feed normally, may be a significant problem and again cause run down of energy reserves

Recommended Policies and Practices

1. All bat species are protected by appropriate legislation, but there should be continuing programs of public education to ensure the people are (a) aware that bats are protected species and (b) understand the ecological value of bats and hence the reasons for protection.

2. All Environmental Impact Assessments should include consideration of impacts on the biodiversity (including bats and insects) of the area concerned. It must be recognised that the feeding territory is of central importance, not just the roost site.

3. Where any changes or construction are to be undertaken in the vicinity of a roost site, every effort should be made to have an adequate Environmental Impact Assessment carried out (even informally) in order to minimise the impact upon the bat population.

4. All sites identified as being critical to the survival of bats should be given the most appropriate effective protected status. These sites certainly include maternity sites and caves or mines used for

over-wintering by large numbers of bats. They may occur in existing parks or nature reserves, but if not, efforts should be made to ensure their inclusion under proper reservation. If on private land, the owner may well, and many do, ensure effective oversight and protection; may be willing to ensure a permanent covenant for protection purposes; or may agree to selling a site for inclusion in a park or other protected area.

5. Any changes, whether natural (eg. rock collapse) or caused by human intervention, (eg. gates, viewing platforms, etc.) must be carefully reviewed to determine any damaging impacts upon bat populations and where possible, remedial action undertaken.

6. Where it is absolutely necessary, caves may be gated for protective purposes but this should be a strategy of last resort. If this is done, gates should be designed to provide continuing accessibility for the bat species that occur on the site, and after installation must be monitored to ensure that access has been maintained. All gates should be accompanied by an information sign that explains the reason for the gate, the need to avoid undue disturbance of bats, and contact details for further information or access permission. Once installed, gates should also be inspected regularly.

7. Every effort should be made to educate regular, occasional or potential cave visitors about the importance of bat protection. In any given region, this should give special attention to defining periods when and sites where disturbance is particularly undesirable.

For further information or species identification.

see Churchill (1998). ***Australian Bats.*** Sydney: Reed New Holland.

Appendix 1. Species only occasionally found in caves

Chaerophon jobensis
Chalinolobus picatus
Chalinolobus tuberculatus (N.Z.)
Mystacina tuberculatus (N.Z.)
Nyctophilus geoffroyi

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Bats in Mines

This draft paper has been prepared by a sub-committee of the Australasian Bat Society to describe the place of mines as a habitat for bats, and to outline policy and practice for bat conservation. Please send all comments to Chris Clague, Vision Touch and Hearing Research Centre University of Queensland 4072 or to c.clague@vthrc.uq.edu.au

It is being circulated in draft format to members of the Society.

Introduction

Bats are an integral part of the natural environment. They undertake a range of important ecological functions including the control of insects and other invertebrates, the pollination of trees and the dispersal of rainforest seeds. A number of Australian bat species rely on mines for shelter during daylight hours as well as to raise young, mate and fulfil a range of other functions. For many of these species, mines or caves provide the only habitats at which critical life functions necessary for their survival can occur.

This statement of recommended policy and principles in the conservation and management of mine-dwelling bats has been prepared to provide guidance to both land managers (both public and private) and those who visit mines.

The Human aspect of Mines

Abandoned mines often represent the last vestiges of early post European settlement in many areas and as such represent significant historical sites. Old mines also represent opportunities for geologists, rock-hounds and the public to examine an area for mineral occurrence or historical interests. Mines are however inherently dangerous and mines that have been disused even for a short time constitute what many may perceive as “an unacceptable level of risk”. Mines, even when operating may contain significant populations of bats, these animals must be considered when deactivating or rehabilitating a mine site. As human life is highly valued it is important to ensure that the land manager do not expose them selves to litigation due to the dangers inherent with mine sites. Thus abandoned and decommissioned mines may be destroyed in order to protect the public. The bat friendly closure of mines removes much of the liability from a site as well as protecting the bat population present.

The Place of Mines in the Life of Bats

Although some bats (see appendix) appear to use caves only occasionally or opportunistically, there are many species of bats which always or very often roost in caves (or substitute environments such as mines and water tunnels) throughout each day. It appears that this is generally related to the regulation and/or maintenance of required body temperatures at specific seasons of the year. Thus, the specific sites chosen often vary from season to season for each species, but often they are critical for survival.

Many of these species may also use caves. As special considerations apply to caves, they have been dealt with in a complementary policy document. As not all mines represent bat habitat or potential bat habitat, this document aims to deal with mines that house bats or have a high potential to house bats.

Subterranean mines also provide habitat for a number of other vertebrate and invertebrate species that on their own may justify the protection of the site. These species will not be considered in this document but they do represent integral parts of the system and should be taken into consideration.

The species using mines on a consistent basis are listed below.

Horseshoe Bats	
Genus ***Rhinolophus***	Gather in summer at specific maternity sites, sometimes shared with bent-winged bats, but throughout rest of year are widely dispersed in other caves or mines. In southern states, large numbers may roost in specific hibernation sites.
Genus ***Hipposideros***	Normally roost throughout year in caves or mines, various of which may be used as a maternity site.
Rhinonicteris aurantius	Normally roost in caves or mines
Ghost Bat	
Macroderma gigas	Normally roosts throughout year in caves or mines, one of which in each region may be used as a maternity site.
Sheath-tailed Bats	
Genus ***Taphozous*** and ***Saccolaimus***	Commonly roost in caves or mines, often in the twilight zone, but also found in forest roosts.
Vespertilionid Bats	
Chalinolobus dwyeri	Usually roosts in caves or mines
Genus ***Miniopterus***	This genus is widely distributed from Europe to the South Pacific. In Australia, it virtually always roosts in caves. Each population is based upon a single maternity site which appears to be chosen for the suitability to enable the bats to build up a high temperature (up to 36°C) in order to provide a suitable environment for the birth and survival of the young bats, which occurs in summer. Other caves (or mines) throughout the population range, which may extend for several hundred km. from the maternity site, are used throughout the rest of the year.
Genus ***Myotis***	Occasionally roost in mines.
Genus ***Vespadelus*** ***V. caurinus*** (Kimberly, N.T.) ***V. douglasorum*** (Kimberley) ***V. finlaysoni*** (Central deserts) ***V. troughtoni*** (Qld & northern NSW dividing range)	Usually Roost in caves or mines throughout the year

Issues and Threats

Cave and mine dwelling bats are particularly vulnerable because very large numbers may occur in one site; in some cases a maternity site may contain virtually all the females and juveniles of a bat population which, when dispersed, will spread over an area of up to 1,000 square kilometres. They are also dependent upon the cave like environment for management of their own body temperature and metabolism. At the same time, they also depend upon the availability of food in the surrounding countryside. There is a wide range of potential threats to their survival:

Roost habitat destruction	By quarrying, inundation, filling of entrances, the re-activation of old mines or the re-working of old fields, removal of timber shoring.

Roost habitat modification	Tunnelling or obstruction exploratory drilling Damage during road building Rock collapse Rubbish dumping Microclimate changes as a result of regional changes, eg. in groundwater levels or as a result of clearing surface vegetation Microclimate change as a result of changing air flow through the closure of current entrances or opening of new ones Use of badly designed mine gates Invasive plants (eg. lantana, blackberries) blocking entrances Alterations to predator access Tourism infrastructure or fencing at entrance
Reduction of food supply	Changes in land use or land management practices, including increased use of insecticides, land clearance, monoculture planting etc. Draining of wetlands Wildfire
Poisoning	Impacts of some insecticides or fungicides Drinking from poisoned waters Use of internal combustion motors or solvents in or near caves with the risk of CO or other poisoning. Other pollutants
Human interference	Inappropriate visitor behaviour or major disturbance of maternity or over-wintering sites

Sites of special importance include:

Where bats are in a torpid state during winter, particularly in southern Australia, as disturbance may use up the energy reserves required for over-winter survival
During the birth and nursery period in acclimatising and maternity sites
Sites utilised by rare species as a temporary or permanent roosting resource.

Every effort must be made to minimise disturbance of bats during the seasonal use of these sites.

Unusual weather conditions, when bats may not be able to feed normally, may be a significant problem and again cause run down of energy reserves

Recommended Policies and Practices

1. All bat species are protected by appropriate legislation, but there should be continuing programs of public education to ensure the people are (a) aware that bats are protected species and (b) understand the ecological value of bats and hence the reasons for protection (c) the inherent dangers of artificial subterranean structures (d) the value of disused mines both as bat habitat and as historical sites.

2. All Environmental Impact Assessments should include consideration of impacts on the bio-diversity (including bats and insects) of the area concerned. It must be recognised that the feeding territory is of central importance, not just the roost site.

3. Where any changes or construction are to be undertaken in the vicinity of a roost site, every effort should be made to have an adequate Environmental Impact Assessment carried out (even informally) in order to minimise the impact upon the bat population.

4. All sites identified as being critical to the survival of bats, should be given the most appropriate effective protected status. These sites certainly include maternity sites and caves or mines used for over-wintering by large numbers of bats or by endangered species. They may occur in existing parks or nature reserves, but if not, efforts should be made to ensure their inclusion under proper reservation. If on private land, the owner or manager may well, and many do, ensure effective oversight and protection; may be willing to ensure a permanent covenant for protection purposes; or may agree to selling a site for inclusion in a park or other protected area.

5. Any changes, whether natural (eg. rock collapse) or caused by human intervention, (eg. gates, viewing platforms, etc.) must be carefully reviewed to determine any damaging impacts upon bat populations and where possible, remedial action undertaken.

6. Where it is absolutely necessary, mines may be gated for protective purposes but this should be a strategy of last resort. If this is done, gates should be designed to provide continuing accessibility for the bat species that occur on the site, and after installation must be monitored to ensure that access has been maintained. All gates or fencing should be accompanied by an information sign explaining the reason for the gate, the need to avoid undue disturbance of bats, and a contact for further information or access permission. Gates or fences once installed should also be inspected regularly. It must be stressed that each mine represents differing conditions for the successful management of the void and that these conditions need to be assessed prior to any works being undertaken. If gating is selected as the preferred option then it is necessary to ensure that a suitable trial and familiarisation (for the bats) period is undertaken to ensure the success of the final, permanent structure.

7. Every effort should be made to educate regular, occasional or potential mine visitors about the importance of bat protection. In any given region, this should give special attention to defining periods when and sites where disturbance is particularly undesirable.

For further information or species identification.

see Churchill (1998). ***Australian Bats.*** Sydney: Reed New Holland.

Appendix 1. Bat species only occasionally found in mines

Chalinolobus picatus
Nyctophilus geoffroyi
Nyctophilus bifax

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ABS Cyberspace development update - adopt a bat page!

The new ABS homepage is progressing and is expected hoping to supersede the current homepage (http://batcall.csu.edu.au/abs) in the near future. The task the World Wide Web group has set at the 2000 Conference is ambitious but manageable in terms of information to display at our Window to the Cyberworld. The latest development can be seen under **http://batcall.csu.edu.au/abs/new**.

The general structure of the page is set and quite flexible in terms of content and layout. So far, the only restriction I have placed on the layout is that I will be using tables instead of Java scripts for reasons of download time for modem users and for my own sake (no I don't want to learn Java). The general outline of the page contains a table of content on the left-hand site with nine headings, which dynamically display their contents to the right. In HTML terms the pages are exclusively written as tables, no frames are used and html-tag formatting is being replaced by external style sheet formatting. However, to this stage the page looks rather plain, as I am unable to commit additional time for jazzing up. So I am hoping for enthusiastic people with good pictures and design ideas to contribute to our webpages. Particularly the main page will need some input, because this is our window to Cyberworld, it is the first page people will see when looking for the Australasian Bat Society on the Web.

Rather than contact people individually (yes I still have the list of volunteers from the conference dinner!), I would like to ask through this article for people's contributions. Please have a look at the new webpages (http://batcall.csu.edu.au/abs/new) and contemplate what you could/would/like to contribute/change. According to your computing/html ability you can either develop a whole page in html, or you can provide the contents for pages or subsections. It would be an advantage if people could take on the responsibility for the layout/content of one page (or more). I feel that we can develop on-line allowing for the wider WWW community to follow the progress.

Please contact me so I can coordinate our efforts.

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The Australasian Bat Society Discussion list now on-line

Dear ABS members,

As promised at our last ABS meeting in Tocal (May 2000), I have organised a discussion mail server. The intention of this server is to distribute ABS specific information between the members and the executives and to provide a discussion medium on any bat-related issues for ABS members. The list is moderated meaning that only people subscribed to the list will be able to send messages. Subscription is open to all ABS members with email.

In the following I append instructions for subscription and further information.

Cheers

Alex 'Herry'Herr

How to subscribe and unsubscribe from ABS list:
To get off the list, send a message to the mail server software that runs it, not to the list. The address of the server is:

majordomo@lorenz.mur.csu.edu.au

and the message should just say

unsubscribe abs <youremaillogin@your.host.au>

To get back on the list, send this message to

majordomo@lorenz.mur.csu.edu.au

subscribe abs <youremaillogin@your.host.au>

If you have any problems subscribing or unsubscribing then send a message explaining the problem to:

owner-abs@lorenz.mur.csu.edu.au

OK, now for some more general information**.**

Why Are We Here?

The ABS list is a mailing list for members of the Australasian Bat Society to raise and discuss bat related issues. It also serves as information exchange network between the ABS members and the ABS executives.

When you subscribe to ABS you will be able to:
- quickly and easily send messages to ABS members who have subscribed to this list;
- take part in on-line group discussions;
- make contact with other people with similar interests over long distances and without the hassle of working out time differences;

The abs list is moderated by Alexander Herr (Herry), Johnstone Centre, Charles Sturt University. I can be emailed at aherr@csu.edu.au

Guidelines

Topics can be anything to do with the ABS. Commercial postings are NOT permitted except with my permission.

Posting

To post a message to the list, simply send it to: abs@lorenz.mur.csu.edu.au.
To prevent infomation from non-list members, abs is a 'moderated' list, which simply means you must be a subscriber to post, and you must be posting from your subscribed address.

If you'd like to know who is on the ABS mailing list send this message to
majordomo@lorenz.mur.csu.edu.au
who abs

If you'd like to get this introductory info send this message to
majordomo@lorenz.mur.csu.edu.au
info abs

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The 10th Australasian Bat Conference – preliminary notice.

Welcome to Tropical North Queensland for the 10th Australasian Bat Conference, Easter, 2002. You will be met on arrival in Cairns whether it be by plane, train or bus. Delegates from overseas will find that Cairns is easily accessed by international flights.

Cairns is the gateway to the Atherton Tablelands, Cape York, Great Barrier Reef and Wet Tropics rainforest. The reef and rainforest areas are World Heritage listed because of the enormous diversity of plant and animal species – there are 6 species of megabats and over 45 species of microbats!

There will be pre and post conference tours to cater for delegates interested in both microbats and megabats. Suggestions so far include Cape Tribulation Research Station, Batreach in Kuranda and Tolga Bat Hospital for megabat field trips, and gated mines for microbats. Opportunities for research and bat handling will be available. Please let us know if you have ideas for the pre and post conference trips.

At this stage it looks like the conference will be held at the Cairns Colonial Club, a 3 to 4 star resort located on 10.5 acres of lush tropical gardens in Cairns city. The other contender is the Kuranda rainforest resort. Both provide reasonably priced accommodation and have full conference facilities on site.

Details of costs will be available in the next ABS Newsletter. Our conference committee include Christiana Roetgers, Olivia Whybird, Pam Tully and Jenny Maclean. Please direct all inquiries to:

Jenny Maclean
PO Box 685 Atherton, Queensland, Australia 4883
tel / fax: 07 4091 2683 (within Australia)
: +61 7 4091 2683 (international)
email: jenny.maclean@iig.com.au

So mark Easter 2002 in your diary. Travel to Cairns in far north Queensland for a memorable bat conference.

Jenny Maclean

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Changed your email address? Have you moved?

Please let us know if your contact details have changed recently – we discovered recently by the number of returned mail, that many email addresses are no longer valid. Please contact Lindy Lumsden, PO Box 137, Heidelberg, Victoria 3084, Australia. Phone No. (03) 9450 8694.
E-mail: Lindy.Lumsden@nre.vic.gov.au

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- Research Papers -

Old banding data for *Miniopterus schreibersii*: a potential goldmine

Peter Wilson, pwilson@zeta.org.au, Telephone: 02 4754 3038

The ecological study of bats is less than 100 years old, with most intense work occurring since the Second World War. One milestone in the study of Australian bats began in 1957 with the inclusion of bat banding into an expanded CSIRO bird banding scheme. This was the beginning of the Australian Bird and Bat Banding Scheme (ABBS) that continues to this day under the umbrella of Environment Australia.

Speleologists gave the initial impetus to commence coordinated bat banding in Australia. No doubt because of its abundance and the frequent contact with speleologists, the most prominent cave-dwelling bat species in south-east Australian, ***Miniopterus schreibersii***, became the first species to be banded under the fledgling CSIRO scheme. In terms of numbers banded and the geographical scope of the enterprise the collection of banding projects studying ***M. schreibersii*** in south-east Australia is perhaps unequalled in the world of population ecology and zoogeography. The ABBS gave a solid foundation to many pioneering studies. For example, it was through the ABBS that Peter Dwyer was able to collect and collate the data for his unparalleled body of work on the ecology and zoogeography of ***M. schreibersii*** (Dwyer 1963, 1964, 1966, 1969).

With renewed interest in matters miniopterine amongst a dedicated group of ABS members, it is timely to consider the old ***Miniopterus*** banding data and see what it may tell us. Mining old data ("data mining" is now a respected – and lucrative! – branch of the IT industry) may help us answer some interesting questions about the movement of individuals, population ranges, and the age and sex-ratio structure of populations. Using the latest statistical methods, we can also calculate estimates of population sizes at several points over the past 50 years or so. Reviewing the banding data also may help us better understand the distribution of the newly recognised miniopterine taxa (***M.s. oceanensis*** and ***M.s. bassanii***) in their suspected contact zone in and around Melbourne (Cardinal and Christidis 2000a, b, Rheinhold, Reardon and Lara 2000). Obviously, answering these questions may prove extremely useful in determining the current conservation of status ***M. schreibersii***.

My efforts to transcribe and reanalyse the ***M. schreibersii*** data began in 1983 with the gracious support of David Purchase and his staff in the then CSIRO ABBS office, and the kind consent of extant banders. For a number of reasons, work lapsed between 1985 and 1999. At last, the task is complete with all banding and recapture data collected between 1957 and 1984 now on computer files. (Data from 1984 onwards is already on the ABBS computerised record system.)

Some preliminary results from, and facts about, these data are:

- 68,116 individuals were banded between 1957 and 1984 by 23 banders operating at 157 sites (five of them with lactating females or juveniles present) spread from Rockhampton in Queensland to Naracoorte in South Australia, plus one location on the Adelaide River, Northern Territory.
- 9,570 live recapture (or "retrap") records were collected.
- 662 bands were recovered from dead bats.
- A rough preliminary analysis of recorded movements by banded bats recovered as dead animals reveals an approximate average movement from banding location of 26.3 km for ***M.s. oceanenis*** males and 40.4 km for ***oceanensis*** females. For ***M.s. bassanii***, the average distance moved by males was 15.53 km and for females 43.75 km.

- As indicated above, males tend to move shorter distances than females confirming the findings of Dwyer (1969).
- Several movements over 600 km exist in the data, but they are rather rare with about 99% of all recorded movements less than 350 km. (Some have been reported in Purchase (1969) and Dwyer (1969) while others have remained unpublicised.)

Another intriguing nugget from the data goldmine is the fact that in March 1966 the late Barbara Dew had banded lactating females of ***M. schreibersii*** in adits at Warragamba Dam in the Blue Mountains escarpment west of Sydney. In 1995, there was little evidence that these adits were being used regularly by bats (Ray Williams, pers. comm.), possibly due human interference including the fitting of non-bat-friendly gates on some of the adits. She also found pregnant females in abandoned 19th-Century goldmines at Hill End, about 80 km north of Bathurst, NSW. Heavily pregnant females are unlikely to be more than 30 km or so from their maternity site (Glenn Hoye pers. comm.). In the past, it was thought that no breeding took place between Wee Jasper and Bungonia near Canberra, and Willi Willi near Kempsey. This gave rise to the idea of zoogeographical "gap" in the species' distribution. Although individuals and small non-breeding aggregations have been known to occur in the gap for some time, there has been much puzzlement as to which maternity site individuals in this region are affiliated – one hundreds of kilometres to the north or one a similar distance south.

Barbara Dew's previously poorly known findings, together with recent findings by Hoye (2000) lead me to pose some provocative but I think highly relevant questions: Could the "gap" be an illusion? Could ***M. schreibersii*** really be an opportunistic user of all manner of caves, crevices, fissures, and man-made structures mimic them, as maternity sites provided they can support the appropriate cave micro-climate? In other words, is it – as the prevailing wisdom has it – absolutely necessary that the species use large limestone caverns to form vast maternity colonies? Perhaps the view that ***M. schreibersii*** "must" have its maternity sites in large limestone caverns is purely the result of a coincidental intersection of the interests of spelunkers and ***M. schreibersii*** which, with very few exceptions, peak or reach optimum conditions for both groups in water-eroded limestone geology or karst.

These questions should not be interpreted as suggesting that currently known maternity sites in limestone caves are expendable. Rather, I think they demonstrate the need to thoroughly survey non-limestone areas such as the vast and heavily dissected sandstone plateaus in the "gap", thus broadening the scope of caves to be protected. I see in the old banding data a hint that our current understanding of the needs of the species might be biased. In comparison with the effort expended banding at a few large maternity sites very little banding was done in the "gap". Dwyer (1969:669) briefly mentioned the potential problem caused by the uneven distribution of banding work across south-eastern Australia. In technical terms, the current view may be the result of biased search effort. Relying on biased information could lead us to conclude falsely that protecting karst and regulating human activities in limestone caves is the only necessary conservation measure for this species.

Some caution does need to be exercised when using historical data such these. In the very earliest phases of ***Miniopterus*** banding, banders were on a very steep learning. Often the notes given are rather sparse and there is very little information on breeding status of banded individuals. Later work is much more "information rich" to use an Americanism, but there remains the problem of observer differences. For example, most banders did not give an indication of the breeding condition of males – there are occasional references to "enlarged penis", but little else. There is greater consistency in reporting pregnant females, but probably far less consistency in classifying females as "lactating" or "post-lactating". This is in part due to the individual whims of banders in deciding (or remembering) to record that information at a given banding event, and in part due to differences between banders in identifying these stages of the female reproductive cycle. As another example, some banders recorded the presence of "juveniles", "yearlings", and "adults" in catches, but there is no way of knowing if they all used the same standards for placing individual bats into an age class. There are also the inevitable record keeping stuff-ups due to

things such as mis-reading of band numbers, transcription errors in the field, or between field notebook and banding schedule. Remarkably however, out of about 68,000 bands there were only about 120 such errors that lead to the abandonment of a record.

What will be happening to these data?. Apart from myself, several members of the ***Miniopterus*** interest group will be dipping to these data to help them understand the populations they are studying. Also, a copy of the newly transcribed data will be lodged with the ABBS.

Clearly, cautiously mining the old ***M. schreibersii*** banding data can answer a number of important questions about past populations sizes and the like, guide current conservation efforts, and help us better manage planned coordinated studies of the species. But even a preliminary review of these data also raises a number of intriguing and challenging issues about the ecology and distribution of the species, one of which I have highlighted here. Further data mining cannot answer some of these subsequent issues – only hard slog in the field, of the kind that gave rise to the original banding data, can do that.

Acknowledgements

I am grateful to the work performed by many banders over many years that gave rise to the current data. They include the late Barbara Dew, the late R. John Edge, the late Fred Shirrefs, the late John McKean, Peter Dwyer, Elery Hamilton-Smith, Peter Dwyer, David Purchase, Ken Simpson, Trevor Maddock, Andy Spate, Ian Wood, and several others. I also thank Glenn Hoye and Ray Williams for fruitful conversations and informative emails. I also thank Belinda Dettman, current manager of the ABBS for her assistance in completely this task.

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Roosts of a Male and Female Little Forest Bat *Vespadelus vulturnus* in northern New South Wales

B.S. Law and M. Chidel, Research and Development Division, State Forests of NSW, PO Box 100, Beecroft, NSW 2119

Introduction

Relatively little information exists on the roosts used by insectivorous bats in Australia. However, a consistent pattern is emerging in south-eastern Australia, whereby radio-tracking has identified that large mature trees with an abundance of hollows are preferred roosts. Most studies to date have been undertaken on larger species of bats due to the limitation of transmitter size and the recommendation of keeping transmitter mass below 5% of the bat's body mass (Aldridge and Brigham 1988). Recently, smaller transmitters (0.35-0.45 grams) have allowed more detailed investigations on some of our smaller bats (e.g. the Eastern Forest Bat ***Vespadelus pumilus*** – Law and Anderson 2000).

Here we report on roosts located by radio-tracking one male and female Little Forest Bat ***Vespadelus vulturnus*** in northern New South Wales (NSW). The data were collected concurrently with a more detailed study on ***V. pumilus*** at the same location (Law and Anderson 2000). ***Vespadelus vulturnus*** is a very common bat, particularly in the south of its range, where it inhabits a range of forest types (Tidemann 1995).

Methods

The study was located in Lorne Flora Reserve (LFR) near Kendall on the mid-north coast of NSW. LFR is a 182 ha reserve of mature wet sclerophyll forest surrounded by eucalypt plantations and regrowth forest in Lorne State Forest (see Law and Anderson 2000 for more details).

Bats were radio-tracked in the mating season from 5-9 April 1995. Bats were caught in harp-traps set along forest trails located on the boundary of the Reserve and thus separated mature forest from regrowth. We glued (Supaglue) single-stage transmitters with an 18-20 cm antenna (Titley Electronics, Ballina) mid-dorsally to the fur of bats. Transmitters weighed 0.4 g and represented 10 % of the body mass of a 4 g (mean) non-reproductive ***V. vulturnus***. Although greater than the recommended 5 % loading, pregnant females carry at least 29 % extra body mass during these times. Day roost trees were located by tracking bats on foot using directional antennas.

Results

One male and female ***V. vulturnus*** was caught and radio-tagged at LFR. The bats were found to roost in tree hollows of living Blackbutt ***Eucalyptus pilularis*** (4 of 8 roosts), Turpentine ***Syncarpia glomulifera*** (1 of 8) and dead trees (3 of 8). Most roost trees were very large (Table 1), although two of three dead trees that were used had diameters < 50 cm. Each bat changed roosts regularly within a localised area (Table 1), with the maximum distance between consecutive roosts being 120 m. On one occasion the female reused its roost in a ***S. glomulifera*** after one day's absence. The female roosted on a rounded spur in a mid-slope area, while the male roosted on the lower slopes of a gully. Both were in 40-50 m tall, wet sclerophyll forest. No observations were made of numbers exiting roosts at dusk or of the size of foraging areas at night. The roosting area of each bat was about 500 m from the location where the bat was trapped.

Discussion

Despite being among Australia's smallest mammals, ***V. vulturnus*** roosts were in the hollows of

very large trees. This is consistent with the behaviour of another small bat, ***V. pumilus,*** at the same study site (Law and Anderson 2000) and for other insectivorous bats that have been radio-tracked in south eastern Australia (e.g. Lunney ***et al***. 1985; Lunney ***et al***. 1988; Taylor and Savva 1988). The two bats from this study were captured on the boundary of mature forest and young regrowth, however, all roost trees were located in mature forest. Where mature forest is not available, ***V. pumilus*** uses alternative roosts such as hollows in ***Acacia***, or for maternity roosts, scattered mature trees, including those in rainforest (Law and Anderson 2000). Given the widespread occurrence of ***V. vulturnus***, it is likely that they also roost outside of mature forest when it is not available. Other aspects of the roosting behaviour of ***V. vulturnus***, such as changing roost trees on most days and moving short distances between trees, is similar to other tree-roosting bats.

The location of these breeding roosts on the lower to mid-slope areas is virtually identical to ***V. pumilus*** in the mating season. However, during the maternity season, ***V. pumilus*** shifts its roosts to riparian areas (Law and Anderson 2000). It was suggested that the association of maternity roosts with riparian areas could reflect 1. a habitat association with moist forest, 2. an association of colonies with dimly-lit areas that would reduce opportunities for predation by diurnal birds at dusk, or 3. an association with the microclimate of gullies, where potentially hot spring temperatures in this sub-tropical area are avoided (Law and Anderson 2000). It is unknown whether ***V. vulturnus*** mirrors this maternity season behaviour. This is of particular interest, because ***V. vulturnus*** were typically captured on upper slopes in this moist forest, whereas ***V. pumilus*** is more widely spread, with a possible bias to being captured more often along gully lines (Law and Chidel pers. obs).

These limited results support current practices by State Forests of NSW, which in addition to protecting riparian areas, retain strips of unlogged forest that interconnect adjacent catchments over ridgelines and retain habitat trees within logging areas.

Acknowledgements

Thanks to Graeme Price for assistance in the field and to J. Williams for comments.

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Table 1: Attributes of roosts of one male and female ***Vespadelus vulturnus*** radio-tracked in Lorne Flora Reserve, northern NSW (±standard errors are given).

Variable	Male	Female
Number of Days Tracked	5	5
Number of Different Roosts Found	4	4
Mean Diameter of Roost Trees (cm)	146 ± 39	111 ± 52
Mean Height of Roost Trees (m)	30 ± 9	35 ± 9
Mean distance of roost to creek-line (m)	50 ±17	68 ± 11
Mean distance between roosts (m)	68 ± 25	61 ± 30

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The bat fauna of the Jenolan and Wombeyan Caves Reserves, NSW

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Two bat surveys were undertaken in collaboration with Ernest Holland and Mia Thurgate of the Karst Resources Department in the Jenolan and Wombeyan area during two weekends in February and March respectively.

So far, 12 bat species (Table 1) have been recorded from the Jenolan area, and six species from Wombeyan (Table 2). However, there are no recent records on the bats from both areas. For this survey, bats were captured using harp traps and reference calls from captured bats were recorded (including ***C. dwyeri*** reference calls, which were also made available to NPWS).

Table 1: Species known from the Jenolan area until 1999 (Resource Inventory Jenolan Caves Trust, Thurgate pers. com.). Conservation listing according to NSW Scientific committee (2000).

Scientific name	Common name	Vulnerable
Chalinolobus gouldii	Gould's Wattled Bat	
Chalinolobus morio	Chocolate Wattled Bat	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	X
Miniopterus schreibersii	Common Bentwing Bat	X
Mormopterus planiceps	Eastern Free-tailed Bat	
Nyctophilus gouldi	Gould's Long-eared Bat	
Rhinolophus megaphyllus	Eastern Horseshoe Bat	X
Scotorepens balstoni	Western Broad-nosed Bat	
Scotorepens orion	Eastern Broad-nosed Bat	
Vespadelus darlingtoni	Large Forest Bat	
Vespadelus regulus	Southern Forest Bat	
Vespadelus vulturnus	Little Forest Bat	

Table 2: Species known from the Wombeyan area until 1999 (Resource Inventory Jenolan Caves Trust Thurgate pers. com.). Conservation listing according to NSW Scientific committee (2000).

Scientific name	Common name	Vulnerable
Miniopterus schreibersii	Common Bentwing Bat	X
Rhinolophus megaphyllus	Eastern Horseshoe Bat	X
Chalinolobus dwyeri	Large-eared Pied Bat	X
Scotorepens sp.	Broad-nosed Bat	
Scotorepens orion	Eastern Broad-nosed Bat	
Nyctophilus geoffroyi	Lesser Long-eared Bat	

The schedule for the trip was tight, and sleep for the first night was forgone after checking traps for bats around midnight and finding dozens to process. Lots of coffee was required to bring us through to daylight for the second round of trap-emptying. After the second night Ernie's early-morning insomnia and persistence ensured our rise by dawn to empty and pack the traps.

Trapping and aural surveys at Jenolan Caves for two nights yielded 33 bats from 12 species including four new records for the area (Table 3). Four of the bat species captured are listed as vulnerable in the ***NSW Threatened Species Conservation Act*** (NSW Scientific Committee 2000). Highlights were the captures of the threatened Bent-wing Bat and Greater Broad-nosed Bat.

Table 3: Bat species identified at Jenolan Hydro area. Species marked grey are new records. Conservation listing according to NSW Scientific committee (2000)

Species	Common name	Vulnerable
C. dwyeri	Large-eared Pied Bat	X
C. gouldii	Gould's Wattled Bat	
C. morio	Chocolate Wattled Bat	
F. tasmaniensis	Eastern False Pipistrelle	X
M. schreibersii	Common Bent-winged Bat	X
N. gouldi	Gould's Long-eared Bat	
N. geoffroyi	Lesser Long-eared Bat	
Scoteanax rueppellii	Greater Broad-nosed Bat	X
Tadarida australis	White-striped Free-tailed Bat	
V. darlingtoni	Large Forest Bat	
V. regulus	Southern Forest Bat	
V. vulturnus	Little Forest Bat	

Bat surveying at Wombeyan starting on a Friday in February was also very successful, particularly due to the enthusiastic help from our volunteers Rachel and Chris. After a busy night processing 43 bats, the morning after blessed us with further 35 critters. This was the chance for Mia to get hands on experience in sexing and measuring the forearm of cranky bats (which always seemed to find the cuticle). Jane Gough from NPWS met up with us on Saturday morning and was also roped into bat processing as scribe. Saturday evening Mia and Jane chose to set water bug traps over dinner (and red cordial), which left them with reheated pasta and not much more than two hours sleep for the weekend.

Trapping at Wombeyan yielded a total of 112 bats from 13 species. A fourteenth species, the White-striped free-tailed bat, a notorious high flier rarely caught in traps, was commonly heard in all areas. From the 14 bat species identified, five species are listed as vulnerable (Table 4).

In conclusion both bat surveys were a great success adding to the species list of both reserves and supplying base-line information for ongoing monitoring of species composition in the areas managed by the Jenolan Caves Trust. At Wombeyan records of the genus ***Mormopterus*** were missing. Further work should aim to detect ***Mormopterus*** and genera under taxonomic revision (such as ***Scotorepens*** and ***Mormopterus***) should be researched in conjunction with the Australian Museum and National Parks and Wildlife Service.

Table 4: Fourteen bat species were identified at Wombeyan. Conservation listing according to NSW Scientific committee (2000)

Species	Common names	Vulnerable
C. dwyeri	Large-eared Pied Bat	X
C. gouldii	Gould's Wattled Bat	
C. morio	Chocolate Wattled Bat	
F. tasmaniensis	Eastern False Pipistrelle	X
M. adversus	Large-footed Myotis	X
M. schreibersii	Common Bent-winged Bat	X
N. geoffroyi	Gould's Long-eared Bat	
N. gouldi	Lesser Long-eared Bat	
R. megaphyllus	Eastern Horseshoe Bat	X
S. orion	Eastern Broad-nosed Bat	
T. australis	White-striped Free-tailed Bat	
V. darlingtoni	Large Forest Bat	
V. regulus	Southern Forest Bat	
V. vulturnus	Little Forest Bat	

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NSW Scientific Committee (2000). Threatened Species Conservation Act Schedules 1, 2 and 3. http://www.npws.nsw.gov.au/wildlife/tscs00.htm.

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9th Australasian Bat Conference papers

Poster papers

To catch a bat with a harp trap (Karen Dobson, Lindy Lumsden and John Nelson)
Morphometric differentiation of ***Vespadelus finlaysoni*** and ***V.troughtoni*** in Queensland Greg Ford
The distribution of insectivorous bats in the citrus (***Citrus*** spp.) orchards in the New South Wales Sunraysia area (David Gee)
A design for a device to restrain small bats (Tamara Kincaid and Alexander Kabat)
Tolga bat rescue on the Atherton Tablelands (Jenny Maclean)
Creating bat friendly bridges (Chels Marshall and Jane MacFarlane)
Normal blood values for ***Pteropus poliocephalus*** and ***P.scapulatus*** (G.M. O'Brien and C.K. Endean)
Foraging activity during twilight by the tropical bat, ***Hipposideros speoris*** (Chris Pavey, Chris Burwell, Jan-Eric Grunwald, Chris Marshall and Gerhard Neuweiler)
Movements and survival of Grey-headed flying foxes as shown by six years of "retraps" at a release site for rehabilitated individuals (Kerryn Parry-Jones)
Thermal biology and roost selection of long-eared bats, ***Nyctophilus geoffroyi*** (Christopher Turbill, Gerhard Kortner and Fritz Geiser)
Infra-red technology to observe bats: a review of low-cost (Peter Wilson and Ray Williams)
New information on the southern limit of the Little bent-wing bat (***Miniopterus australis***) in New South Wales (Ray Williams and Glenn Hoye)

1. Spoken papers

Bat roosting boxes and factors affecting their success in Organ Pipes National Park 1992-1999 (Robert Bender and Robert Irivine)
The protection of cave dwelling bats in north Queensland through the construction and usage of bats gates (Chris Clague and Olivia Whybird)
What determines the distribution of bats in the Australian Wet Tropics? (Chris Clague)
Distribution of the Tube-nosed Insectivorous bat (***Murina florium***) in Australia (C.I. Clague, R.B. Coles, O.J. Whybird, H.J. Spencer and P. Flemons)
Roost tree selection and short-term foraging movements of the Little forest bat (Vespadelus vulturnus) on Phillip Island, Victoria (Susan Campbell)
The use of Anabat detectors and harp traps in broadscale surveys: the Victorian RFA experience (Ryan Chick, Angela Duffy, Lindy Lumsden, Graham Newell, Natasha Schedvin, John Silins and Campbell Beardsell)
Systematics of the Large bentwing bat (***Miniopterus schreibersii***) in Australia (B.R. Cardinal and L. Christidis)
Factors influencing the roost-site selection of mineshaft dwelling bat species in Victoria (Cheree Conely)
Fruit hardness, feeding behaviour, and resource partitioning in a New Guinea frugivore community (Elizabeth Dumont)
Tooth structure and salivary chemistry in bats (Elizabeth Dumont)
How stable is the structure of flying fox roosts? (Peggy Eby and Vivien Jones)
Assessing the abundance and distribution of Grey-headed flying foxes (Peggy Eby, Patrina Birt, Linda Collins and many others)
Applications of confocal microscopy to functional morphology: the effect of diet and wear on tooth sharpness and function in two microchiropterans (***Chalinolobus gouldii*** and ***C.morio***) (A.R. Evans and G.D. Sanson)
An assessment of known habitat and comparison with CRA modeled habitat for ***Kerivoula papuensis*** (Adam Fawcett, Brad Law and Brett Cann)
Torpor in Australian long-eared bats (Fritz Geiser and Mark Brigham)
The IUCN and protection of bat habitat (Elery Hamilton-Smith)
Bat images and postage stamps (Elery Hamilton-Smith)
The large forest bat (***Vespadelus darlingtoni***) on Lord Howe Island (Glenn Hoye and Margaret Hoye)
The discovery of two new and distinctive maternity roosts of the Large bent-wing bat in the Hunter Valley, NSW (Glenn Hoye and Margaret Hoye)

You too can be an international "Batpacker" (Robert Irvine)
The effects of a walkabout sawmill on the bat fauna of a lowland rainforest (Nancy Irwin
Evidence for a shift in timing of reproductive events in Tasmanian bats (Tamara Kincade, Susan Jones and Alastair Richardson)
The Christmas Island pipistrelle (***Pipistrellus murrayi***) - an endemic species currently in decline (L.F. Lumsden, J.E. Silins and M. Schulz)
A researchers guide for the ethical care and handling of microbats (Suborder Microchiroptera) in the field (Daniel Lunney and Alison Matthews)
Habitat selection by Microchiroptera in the logged, burnt, drought-affected Mumbulla State Forest on the south coast of New South Wales (Daniel Lunney and Peggy Eby)
The use of paddock trees by bats, with preliminary radio-tracking observations on ***Scoteanax rueppellii*** (Brad Law and Mark Chidel)
Long tailed bats in the rural landscape of New Zealand (Marieke Lettink, Jane Sedgeley, Brice Elbert and Colin O'Donnell)
Foraging movements of the Black flying fox (***Pteropus alecto***) in an urban environment (Nicola Markus)
Bats of the southwest Carnarvon Basin, Western Australia (N.L. McKenzie and W.P. Mui)
Investigation of physical processes and bat requirements in bat caves (Neville Michie)
Yesterday, today and tomorrow: Grey-headed flying fox colonies and their sites through time (Kerryn Parry-Jones)
Survey of columnar cacti and carrying capacity for nectar-feeding bats (Sophie Petit and Leon Pors)
Population size of southern bentwing bats (Terry Reardon)
Molecular and morphometrical systematics of the Australo-Papuan ***Miniopterus*** (Chiroptera: Vespertilionidae) (Linda Reinhold, Terence Reardon and Marcia Lara)
Bat activity in known age logged forests in southern Tasmania (Monika Rhodes and Martin Rhodes)
Towards defining adequate bat survey methodology: why electronic call detection is essential throughout the night (Greg Richards)
A re-assessment of the origins and evolution of Australian Microchiroptera in light of modern-day ecological patterns (Greg Richards)
How disk-winged bats stick (D.K. Riskin)
Captive maintenance of short-tailed bats and monitoring of wild bats during a Kiore eradication program on Codfish Island, Winter 1998 (Jane Sedgeley)
Threatened Species Conservation Act recovery plan for microchiropteran bats (Andrew Steed)
Low voltage open aerial conductor separation to reduce flying fox electrocutions (Jeff Simmons - won BCI Award for best conservation paper)
Long-term population dynamics of a hollow-dwelling microchiropteran (Natasha Schedvin)
The conservation status of the Spectacled flying fox (***Pteropus conspicillatus***) in the Australian Wet Tropics as determined by camp flyout census (Olivia Whybird and Stephen Garnett)
Methods for the objective interpretation of species distribution data using ***Scoteanax rueppellii*** as an example (Peter Wilson)

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- Reports and viewpoints -

We need an independent assessment of threat status for Australian bat species

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Introduction

We need an independent evaluation of the threatened status of all Australian bat species. I believe the Australian Bat Society is in a good position to provide the world with such an assessment, which must be free of political and corporate influences, and must not be compromised by government funding.

After all the work that went into The Action Plan for Australian Bats (BAP) (Duncan ***et al.*** 1999), why do I suggest that this issue be revisited? I suspect that many people feel that more species warrant threatened status than were included in the final BAP threatened species list.

I guess many of us had hoped that the Bat Action Plan, by making recommendations to the government that included nominating species for threatened status, would have provided such an assessment. In hindsight, that was surely an unrealistic expectation. This is not so much a criticism of the BAP as an indication of the constraints of the action plan process. I suggest that the inadequacies of the threatened species list arose from the political constraints of the action plan process but in particular from the procedure adopted to fulfil the broader objectives of the action plan. I suspect that these broader objectives have over-ridden the more restricted task of species risk assessment.

In this note I offer one perspective of the BAP, and hope to generate discussion on how an independent assessment of the threatened status of Australian bats could proceed.

The action plan process

The BAP, in line with other Federal Government action plans, nominates species for inclusion in the national list of threatened species. The Federal Government will decide whether to adopt the nominations, after the species are vetted by various committees. There is a Federal legislative requirement for action plans to adopt IUCN threat categories and criteria for species threat assessment, the outcome of which is likely to influential State Government legislation. The IUCN threat assessment procedure is the most universally accepted system in the world and has been in use in various forms for more than 30 years.

The adoption of IUCN criteria and the method used by Environment Australia in applying those criteria influenced species threat assessment in several ways:

a) The IUCN criteria are designed to gauge threatened status, not to set conservation priorities as occurred in the BAP. This crucial factor is explained further below.
b) The precautionary application of criteria advocated by the IUCN (IUCN 1994) was not clearly defined in IUCN guidelines and is open to interpretation. The criteria were interpreted in a restricted way in the BAP.
c) The IUCN threat categories and criteria are a fairly coarse yardstick for assessing threat status because they are designed to apply to all organisms at the global scale.

These issues are discussed further below.

Combining threat assessment with conservation prioritisation

A key factor that has deformed the evaluation of species threat status in the BAP arises from combining the process of species threat evaluation with determining species conservation priorities (e.g. for funding allocation), turning what the IUCN views as two separate processes (e.g. Mace 1999) into a single step. These processes are quite separate, because species prioritisation involves additional factors that are either not relevant to species threat assessments, such as the cultural significance of a species, or are not considered in the IUCN threat assessment process, such as the evolutionary uniqueness of a species.

An important consequence of determining threat status and conservation priorities in a single process is that it allows political or economic concerns regarding the number of species listed to influence considerations of threat status. I suggest that this has occurred in the BAP, where I suspect a legislative requirement exists to prepare and fund recovery plans for species that are given an IUCN threat status. However, the IUCN threat categories are " *..not designed to be directly translated into national legislative schedules and the setting of conservation priorities*" (Isaac and Mace 1999). The IUCN had received a number of complaints that the criteria for allocating species to threat categories were too broad, resulting in a high proportion of species in a country qualifying as threatened. This was not seen as a problem by the IUCN, who recognised that it arose because the two step process of evaluating species status on one hand, and prioritising species conservation status had been combined (Isaac and Mace 1999). This does not mean that Environment Australia was mistaken in prioritising with IUCN threat categories – they can do what they like!

The IUCN/SSC Criteria Review Working Group (IUCN/SSC1999) note that:

> ***"The difference between measuring threats and assessing conservation priorities also needs to be expanded, as there are many people who interpret the Red List as a means of priority setting."***

A single-step process that combines threat assessment with conservation prioritisation can be used to apply pressure to keep the proportion of the fauna allotted a threat status at a low level. For example, it would not be politically acceptable to have half the bat fauna listed in threat categories regardless of ecological reality. In fact, it would be seen as being extreme and somewhat ridiculous and as defeating the purpose of identifying a subset for priority under the assumption of limited financial resources (a fair assumption given the political climate in Australia). It's an unspoken truism that the number of "genuinely" threatened species must represent a small proportion of species! After all, it would be argued, we can't give anything but a small proportion a high priority – it would "devalue the currency"! This circular reasoning ensures that no matter how threatened a fauna becomes, only a minor proportion of species are allowed on the list – even the forest dependent fauna of a country like Australia that has one of the highest land clearing rates in the world! During the course of the 1997 workshop held by Environment Australia, participants were asked on several occasions to reconsider species threat status, because a much higher proportion of bat species were being given threatened status, compared with other fauna groups assessed for Environment Australia.

Applying the IUCN threat criteria

Several broad problems arise in applying IUCN threat criteria to assess species threatened status: how to interpret and apply the criteria; how to deal with differing levels of data uncertainty, and how to interpret the precautionary approach advocated by the IUCN guidelines as set out in IUCN (1994). Many aspects of these issues are complex and some are still unresolved by the IUCN.

Following adoption of the current criteria and threat categories in 1994, the IUCN realised that a number of problems exist in apply the criteria, that criteria were being interpreted and applied in different ways, and that the IUCN guidelines do not provide adequate information to guide assessors. A series of workshops in 1998-1999 reviewed the criteria, threat categories and related issues and culminated in draft revised criteria and categories (IUCN/SSC1999), that might be adopted at the World Conservation Union meeting in October this year.

The draft revision of IUCN criteria (IUCN/SSC 1999) state, in relation to the issue of data uncertainty:

> ***"...there is no clear guidance on how to deal with it in either the assessment of species or interpretation of listings. This is an important problem that constrains the use and interpretation of the Red List Criteria and Categories, and leads to irresolvable debates over particular issues. Many other problems with the criteria relate to this issue, e.g., the use of Data Deficient, the lack of criteria for Near Threatened."***

and under the heading of "Attitudes to uncertainty":

> ***"...assessors need to consider whether they have a precautionary or evidentiary attitude to risk (this is known as risk tolerance). A precautionary attitude will classify a taxon as threatened unless we are certain that it is not threatened. An evidentiary attitude will not classify a taxon as threatened unless there is strong evidence to support a threatened classification. Assessors should always apply a precautionary but realistic attitude to uncertainty when applying criteria. All preferences and attitudes should be explicitly documented."***

The workshop proceedings and other documents arising from the workshops make interesting reading and include Isaac and Mace (1999), Mace (1999), IUCN/SSC (1999) and Hilton-Taylor (2000). Most can be found on the IUCN web site (http//:www.iucn.org/). I suspect that many people who attended the 1997 workshop for the BAP will be surprised that the IUCN allows a more precautionary interpretation, as gauged from the IUCN documents, than was adopted by Environment Australia. However, Environment Australia is free to adopt a less rigorous interpretation of the precautionary approach.

Another attitudinal factor relates to the broader objectives of Environment Australia than those of species threat assessment. A member of the Editorial Committee advised me that, along with many other considerations, a rule of thumb used by the Committee for species nominations was whether the nomination could be defended in court. This could be an important consideration for a government agency, but is not relevant to species threat assessment.

A blunt instrument – are the IUCN criteria sensitive enough?

A fundamental goal of the IUCN criteria is to provide threat categories that are comparable across diverse taxa. The IUCN criteria have been designed to apply to all species except microorganisms, i.e. everything from trees, fish, moss, albatross and elephants. Designing criteria that are workable yet accommodate such an extremely diverse range of ecological attributes would be quite an achievement. However, in a way it's a pretty course yardstick compared with a system that is designed to accommodate the ecological characteristics of a specific faunal group such as bats.

The IUCN workshop on Range Areas and Uncertainty (Mace 1999) notes that:

> ***... it was important to discuss these topics and the Red List categories and criteria in the appropriate context. The Red List is a global list of threatened species and cannot be expected to give the high precision classifications that might be expected within taxonomic groups or within regions. The aim of the Red List is to provide overall information on the status of the world's species and to guide actions made at national and local levels. Most of the world's species are very poorly known, and for such a system to be effective it needs to be able to deliver classifications from limited information. A simple, inclusive but effective system is needed, rather than a detailed, specific and predictive one.***

The draft revision of the IUCN criteria and guidelines includes the following amendments to the Preamble:

> ***"....it is acknowledged that the criteria cannot take into account the life histories of every species. In certain cases, the risk of extinction of a species may be under- or over-estimated." (***IUCN/SSC 1999***).***

The BAP threatened species list

At the 1997 workshop organised by Environment Australia to revise the draft BAP, a considerable gathering of bat specialists from around Australia decided that 18 species warranted an IUCN threat category - see Table 1. An editorial panel consisting of 5 people was subsequently formed, and nine of those species were subsequently down-graded off any threat categories while one species (***Chalinolobus dwyeri***) was elevated to Vulnerable. (Threatened status consists only of Critically Endangered (CE); Endangered (EN), and Vulnerable (VU), Low Risk (near threatened), Data Deficient etc do not constitute threat status).

The legacy of the BAP is that only nine of some 90 species are nominated for consideration as threatened nationally. I suspect that few of us consider this to be an accurate reflection of the status of the Australian bat fauna - I suggest that it greatly underestimates the number of threatened species. This significant problem can be overcome by adopting a two step process of threat evaluation, followed by conservation prioritisation. However, this would be a more transparent process and transparency seems to be the enemy of modern government! If a significant proportion of bat species were determined as threatened, yet only a small number were given funding priority, it obviously begs the question – why?

Table 1. IUCN threat categories and criteria proposed for Australian bats at the 1997 workshop to advise the BAP, compared with final threatened species list in the BAP. Species with changed status are in bold.

Species	1997 Workshop outcome	Bat Action Plan
Pteropus conspicillatus	**EN (A1a)**	**LR(nt)**
Pteropus poliocephalus	VU (A2c,d,e)	unchanged
Pteropus macrotis	**EN(D)**	**LR(lc)**
***Pteropus* sp nov**	**CR (B1, 2e)**	**DD**
Nyctimene vizcaccia	**EN (meets CR B1 only)**	**DD**
Dobsonia moluccensis	**VU(B1, 2c)**	**LR(nt)**
Taphozous troughtoni	CR (B1, B2c)	unchanged
Rhinolophus philippinensis	EN (C2a)	unchanged
***Rhinolophus* sp. (intermediate form)**	**EN (C2a – inferred)**	**DD**
Hipposideros diadema inornatus	**EN (C2a)**	**DD**
Hipposideros semoni	EN (C2a, D)	unchanged
Saccolaimus saccolaimus	CR (A1a)	unchanged
Mormopterus norfolkensis	**VU(A1c)**	**DD**
Chalinolobus dwyeri	**LR nt**	**VU(A1a,C2a)**
Nyctophilus timoriensis (Eastern form)	VU (A1c,2)	unchanged
Macroderma gigas	**VU (A2c)**	**LR(nt)**
Rhinonicteris aurantius	**VU (B1, 2c) but "check"**	**LR(lc)**
Rhinonicteris aurantius (Pilbara form)		VU(A1c, B1, B2c)
Falsistrellus mackenziei	**VU (A2c)**	**LR (nt)**
Nyctophilus howensis	**CR(D)**	**EX**
Pipistrellus murrayi	EN(C1)	unchanged

Which threat assessment procedure?

I suggest we focus on assessing threat status of all Australian bat species. The second step, setting conservation priorities, partly relies on threat assessment and could be conducted at a later stage. The objective is to provide for the public a transparent assessment process that provides an evaluation of the current status of Australia's bat fauna. We might need two separate processes of species threat assessment, to meet two different objectives:

a) ***an assessment using IUCN criteria***. Criteria would be applied according to how the IUCN would apply them. Much greater explanatory information is now available than during preparation of the BAP. A review of IUCN threat status of bats will require extensive dialogue with IUCN assessors, ie the Chiropteran Specialist Group; possibly IUCN appointed regional assessors, and persons experienced in applying IUCN criteria in other groups of organisms. Australian specialist botanists and zoologists who participated in the IUCN criteria review workshops should also be consulted;
b) ***an assessment using more sensitive criteria***. This could be achieved by using either the IUCN criteria applied in a more precautionary manner than the global assessments adopted by the IUCN, or by adapting a different system, eg. that of Lunney ***et al.*** (1996) or Millsap ***et al.*** (1990).

Ideally, we should conduct both types of assessment. However, if time and resource constraints dictate a single assessment process, I suggest that option (a) is secondary to what I believe to be the primary objective of advising the public of the threat status of our bat fauna. This arises from the broad nature of the IUCN criteria, as discussed above. However, I recognise that some people might argue for a higher priority for (a), given the legislative implications following listing of a species on the ***IUCN Red List of Threatened Species.*** Perhaps it comes down to one's perception of the commitment of Federal Governments to environmental stewardship in relation to international obligations.

An example of how IUCN criteria could be adapted by the ABS in a review of species threat status is given below with an interpretation of how Criterion D could be applied in a precautionary way. I emphasise, the way in which criteria will be applied in nominating species for the ***IUCN Red List of Threatened Species*** will be determined by assessors appointed by the IUCN. The following interpretation might or might not be the same as that adopted by the IUCN.

A precautionary interpretation of Criterion D

I suggest that a substantial number of Australian bat species qualify for an IUCN threat category of Vulnerable under Criterion D2. (The only application of Criterion D for Critically Endangered is population size less than 50 mature individuals, and for Endangered, less than 250 mature individuals.)

The following definitions in italics are the <u>current</u> IUCN definitions – slight modification of these criteria is likely in the near future (IUCN/SSC 1999). Definition of Criterion D for the category of Vulnerable is:

D) Population very small or restricted in the form of either of the following:

1. ***Population estimated to number less than 1000 mature individuals.***
2. ***Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km2) or in the number of locations (typically less than 5). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.***

Location is defined, not as a simple locality record for a species, but as ***"..a geographically or ecologically distinct area in which a single event (eg. pollution) will soon affect all individuals of a taxon present."*** (IUCN 1994).

Subcriterion D2 has obvious application to many cave dwelling bats, eg. the genera ***Miniopterus*** and ***Rhinolophus***. Quite a few Australian bat species would qualify for Vulnerable under D2, irrespective of whether populations are currently facing threats and even if populations are stable. I believe that more species fulfil D2 than you would expect:

...wording of D2 criterion in the rules does allow assessors flexibility, ... and presents cut-offs more as guidelines than simple quantitative limits (by using the qualifier "typically"). In practice assessors have chosen to apply the D2 criterion literally but the sense of the text is in fact more flexible (Mace 1999)

In other words, it could be admissible if the number of locations exceeds 5, and is say 8 or 10.

I suggest that recognition of a substantial number of bat species as Vulnerable using D2 captures the essence of the IUCN definition. This approach certainly fits with the long recognised view (eg. Hamilton-Smith 1974) that Australian cave dwelling bats are at risk because of the concentration of significant proportions of a species at a restricted number of sites during, for example, maternity colony formation.

A final comment

I have not discussed the merits of threat assessment systems such as that of Lunney ***et al***. (1996) and Millsap ***et al.*** (1990). These certainly justify consideration, and might be more appropriate than IUCN criteria because a greater number of factors are considered. These systems should be carefully examined but space does not permit further consideration here.

Regardless of what system is adopted, the independence of the process is the central issue. An independent assessment has the important function of communicating to the community the uncensored views of bat-ologists regarding the level of threats facing our bat fauna. This role is increasingly urgent given the escalating sea of disinformation relating to matters environmental.

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Observations at bat roosts in the Adelaide Hills 1999-2000

Ken Sanderson, Biology Department, Flinders University,

(on behalf of fellow workers Joanna Bonner, Lorraine Jansen, Dan Jaeger and the good people who share their houses with bats)

Having surveyed bat activity nearly every week from March 96 to March 97 in Belair National Park (Sanderson & Kirkley 1998 Australian Mammalogy 20: 369-375), it seemed a good idea to study bats at roosts. This idea was put into action in February 1999 when Joanna Bonner arrived from Perth to do honours in Biology at Flinders University. We settled on 3 roosts to study, a) McLaren Flat, about 250 ***Chalinolobus morio*** and 40 ***Mormopterus planiceps*** have been in residence for several decades, and have been studied previously by Lorraine Jansen, b) Upper Sturt, about 30 ***Mormopterus planiceps*** have been present for at least a decade (and also studied by Lorraine Jansen), and c) Balhannah, where about a dozen ***Nyctophilus geoffroyi*** can be found.

Here is what happened, with some of the successes and obstacles still to be overcome. At all locations we found (after a while) the major exits, and so we sat and counted bats as they left (at Upper Sturt we stood on the roof). We also placed bat detectors outside roosts and counted calls as bats left, and generally got one burst of calls as each bat left, though some bats left without calling, and sometimes when a bunch left all at once, it was hard to count them either visually or by sound. We also let bat detectors run all night to see when bats returned.

a) McLaren Flat - we counted 230-240 bats visually, and up to 255 by sound. Bats were absent over winter (late May to early August) - Lorraine Jansen & Ken Sanderson lifted the roof a sheet at a time in June 1999 and removed 4 large barrow loads of bat guano plus bat skeletons, including some with bands, from Lorraine's banding about a decade earlier (800 bats over 8 years). Chris (householder) asked for guano to go on her citrus trees, which have cropped really well in 2000. Joanna Bonner and 2 friends sat out on the back verandah from 6:30 pm to 5:30 am 18/19 October 1999, and counted bats coming and going all evening. Two weeks earlier (6 October) Lorraine, Joanna, Stan Flavel and Dan Jaeger mistnetted 111 female and 10 male ***C. morio*** (including 3 banded 89/90) and 26 female and 11 male ***M. planiceps.*** About once a month Ken has been into the ceiling to see roughly how many bats are present and to photograph them. We have also tried to use an infrared camera inside the roost to watch the bats, but need to modify the setup in some way so that the camera is set back a few meters from the bats and can rotate (like the Naracoorte infrared cameras, but on a miniscule budget).

b) Upper Sturt - numbers of bats have been more manageable - we counted a maximum of 30 leaving the roost in April 1999; in 1999 Joanna visited Dan & Bev Jaeger regularly to stand on the roof and count bats, and in 2000, Ken and Dan have stood on the roof for up to an hour every week during the bat season (till mid May) and every other week since then, while we wait for bats to appear again (probably in September). The all night bat detector sessions showed that ***M. planiceps*** go out early in the evening, with the majority of activity around the roost in the first half of the night. Several evenings we saw bats returning to the roost, and were able to watch them flying around for up to 5 minutes before they entered the roost. This created a lot of activity on the bat detector, so that we could not count bats returning to the roost from bat detector activity. Lorraine, Bev, Dan & Ken mistnetted on 2 evenings - on 3 November 1999 we got 8 female and 2 male ***M. planiceps*** and again on 2 February 2000 we got 15 female and 4 male ***M. planiceps*** (including 1 banded 89). We recorded some bats on release, which solved a mystery for us, since we were able to positively confirm many unusual calls we had been recording near the roost were from ***M. planiceps*** (not at all like what we believed ***M. planiceps*** calls to be).

c) Balhannah - there are up to 14 ***N. geoffroyi*** here (in a roof without ceiling space) and the all night recordings (about 10 now) indicate that these bats often (but not always) spend most of the evening away from the roost and return in the hour or so before sunrise, and probably fly around

the roost for some time before entering (the bat detector may show the largest burst of activity at this time). Some of the bats find their way into the house where owners Ceridwen and Tim have photographed them. We have temperature/humidity loggers outside all roosts and inside roosts at Upper Sturt and McLaren Flat - they show that in the middle of the day roosts are often a lot warmer than ambient temperature.

We know quite a bit more about bats at these roosts now, but some things didn't work - we didn't get an automated method working which would accurately count bats coming and going and store the data in a computer for us - we expect it is possible (but haven't budgeted time or money to solve it). We'd also like to get an infrared viewing system working which would be flexible and allow us to sit downstairs by the fire at all of the locations and watch bats in comfort.

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Reflections upon Method

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I have returned from the conference feeling excited by the expansion of knowledge, but somewhat disappointed in the extensive stereotyping of bat research and survey methods. Having spent much of my career teaching research methods in a range of disciplines, perhaps I should expand on this. It seems to me that this is a reflection of several problems, and I will discuss these below, but first of all, let me discuss some practical examples.

Constantine ('Harp') traps

Perhaps I'm a sub-fossil, but I do regret that we no longer use the name of the inventor. It was an appropriate monument to the creativity and life-time inquiry of Denny Constantine's work.

I have only taken part in two very brief forest surveys, using the first such trap constructed in Australia (***Aust Bat Research News,*** 5). But, learning from the experience of other people experienced in mist-netting birds, I experimented with trap placement, and found that placing the trap parallel to obvious flyways and on the very margin of the surrounding bush rather than across the flyway caught more individuals and sometimes different species. This may not be true in all locations, but it worked for me.

I also hear people concerned about heat stress or other problems when large numbers of bats accumulate in the catching bag. When canvas is used to make the bag, this is inevitable. I used fibre-glass flywire mesh in my trap for just that reason and found I could catch up to 2,000 bats at a time without problems and this was a fraction of the numbers which Constantine handled on occasion. Why ever did we start to use canvas?

Ultrasonic Detectors

It seems clear to me that high-flying species, e.g., ***Saccolaimus flaviventris***, ***Miniopterus*** spp., probably some Molossids) are consistently under-reported. But in spite of Don Griffin's successful demonstrations at Chillagoe in 1980, there has been virtually no examples of using kite or meteorological balloons to lift an anabat up to where the high flying species are. Both insects and bats often fly at several hundreds of metres above the ground and have been recorded even thousands of metres up.

Flight altitude demands further exploration if we are to claim comprehensive assessment of bat faunas. It is analogous to Greg Richard's paper at the conference which pointed to the need for more comprehensive time coverage than is often the case. He demonstrated that many hours of trapping may be necessary to record ***S. flaviventris***, and I suspect this is simply because the species rarely flies low enough to be within reach of the detector at ground level.

Other possibilities

There are probably many other methods which might be utilised. One now hears little about trip lines or the use of UV lamps to concentrate insects and hence bat feeding, yet both of these have proved extremely productive in catching certain species.

Then although shooting is no longer appropriate, it is interesting to note that some of the 'extremely rare' species of SE Asia are those originally reported from shooting in the 19th century but only recently 're-discovered'. Similarly, it was shooting which changed the status of ***S. flaviventris*** from being one of the rarest bats in Australia to being widespread and abundant over much of its range, even though it now remains under-reported.

In summary, we should aim to always use a genuine diversity of catching methods, and constantly seek variations in method or trial new methods.

Why have we become stereotyped in methodology?

At the simplest level, we become hooked on specific methods and continue to use those with which we are familiar. This is common (and personally comfortable) in all fields of research, and means that all too often our studies, and hence our results, become methods-driven rather than objectives-driven.

If we think a little more about this, we find standardisation of methodology may often be argued as a good thing in itself, providing for more ready comparability or replication. Naturally, there are some kinds of research objectives which may demand either lateral or longitudinal comparability and then standardisation (and its proper documentation) is vital. But if our objective is to record all bat species, as is the case in regional surveys and many ecological studies, then standardisation is a major threat to effectiveness.

Dare I also suggest is that some well-meaning bureaucratic regulations also provide a major constraint upon experimenting with alternative methodology ? Just as one example, towards the end of my own banding experience, I tested the relative impacts of banding juveniles vis-a-vis adults. Regrettably, this was when I was forced by my professional work pressures to abandon bat research and so the results were not reported. But I found that, at least in ***Miniopterus bassanii***, ***M. oceanensis*** and ***Rhinolophus megaphyllus***, that there was no wing damage at all in bats banded as juveniles. Yet we now have procedures and regulations which prevent further methodological testing upon or indeed any studies of ***Rhinolophus*** which would be enhanced by banding.

Underlying all of this is a truly serious defect in science education and the acceptance or otherwise of research for publication. Very little attention is paid to the philosophical basis of research, other than the growing issue of ethics (which is generally limited to the enunciation of a set of practical rules). I know that many students have been directed to read Chalmers' excellent brief review titled 'W***hat is this thing called Science?',*** but I can find relatively few scientists who have internalised its potential for learning. Thus, science tends to remain rooted in a formal objectivism, essentially based upon the ideals of Descartes, who argued for a separation between reason and emotion or the cognitive and affective elements of experience. There seems little awareness of the extent to which this ideal is debated and repeatedly debunked in the philosophical literature, e.g., Bernstein's recent and seminal ***Beyond Objectivity and Relativism.*** Then there is the even more recent neurological evidence which establishes that the two are indissolubly linked.

Research design itself is generally based in a slavish devotion to Popper's falsification principle and an obsessive (but often erroneous) application of statistical analysis, even though both often suffer from the GIGO (garbage-in-garbage-out) problem which existed long before computers helped to make it more obvious. There is also a dualistic assumption underlying most of our thinking, with very little acceptance of the true concept of dialectic, let alone the extent to which there is never only one truth. The work of even the earlier epistemological philosophers such as Leibnitz, Kant and Hegel never seems to find its way into science education. All of this results in a lack of awareness of the complex philosophical issues involved.

So, returning to stereotyping, scientists would do well to not only look at some of the basic concepts in philosophy, but in particular, to look at the critique of scientific research contained in Feyeraband's ***'Against Method'.*** This argues the case for a much more open tradition of inquiry than that which the contemporary codification of science fosters. Feyeraband directs us very clearly towards genuinely original exploration, or at the very least, objective-based inquiry. Summarised as the anarchist theory of knowledge or the 'anything goes' theory, it certainly challenges us to exert real creativity in science rather than mindless replication of what everyone else has done.

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Rearing and release of spectacled flying-foxes at Tolga in far north Queensland, Australia

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There are many carers of orphaned flying foxes in Australia – mostly of the grey-headed flying-fox ***Pteropus poliocephalus*** and the spectacled flying-fox ***P. conspicillatus***. The black flying-fox ***P. alecto*** and little-red flying-fox ***P. scapulatus*** are less likely to come into care. Although the population of grey-headeds is far greater than spectacled and their distribution over a far greater area involves many more carers, the numbers of orphans that come into care in far north Queensland are often fairly similar. The reason for this is the impact of tick paralysis on the spectacled flying-fox. The total population of spectacled flying-foxes in the Wet Tropics of north-east Queensland is estimated to be about 100,000 and falling.

The numbers of spectacleds affected by tick paralysis varies greatly each year. Tick season is also baby season. Most orphans are the result of mothers dying from tick paralysis. Some have mothers that survive but their milk supply is unreliable. Many are found alone in the colony – their mothers have died with tick paralysis away from the colony or been killed in fruit orchards.

Rearing

Our methods of rearing have evolved from the unique situation of:

- managing large numbers of babies at a time, often 20 to 40 through until release, with another 20 to 30 fostered out but coming back for creching or release, and perhaps another 20 or so from the coast coming for creching or release;
- a floating population of babies whose mothers are ill in hospital with tick paralysis;
- a floating population of babies whose mothers have recovered from tick paralysis but their milk supply has not yet been re-established. These babies need to be suckling to help bring the milk back, but taken off regularly for feeds;
- having only two or three carers to manage the babies plus the hospital; and,

- a developmental physiotherapy perspective to growth and development of the young bat.

Milk formula

It seems that most orphans thrive no matter what formula is used, to the point where they are usually much bigger in bone length and weight than their wild peers. Different carers around the country have a preference for a particular milk. “Wombaroo”, “Nan 1” and “Nan 2” seem to be the most popular, though some carers use soya milks.

The study by Michael Messer and Kerryn Parry-Jones (Messer and Jones 1997) showed that the higher protein levels of “Nan 2” (or any human infant formula for babies over 6 months) were closer to that of flying fox milk than “Nan 1”.

Last year we used Heinz “Follow-on” for the first time, with no detrimental effect on weight or growth. This decision was for purely financial reasons – $ 9.95 for Heinz “Follow-on”, more than $14 for “Nan”. For those carers with only a few babies, cost may not be an issue.

Once on fruit, babies resisted all attempts to give them powdered cow's milk, but continued to drink infant formula until release.

Self-feeders

We introduced self-feeders as soon as the babies were hanging. Self-feeders are used widely for guinea pigs, etc. and are readily available from pet shops. They have two ball bearings in a feeder tube that is licked by the animal. All flying foxes, wild and captive, adult and young, learn to use them very quickly. All babies are still weighed and measured as well as an eye kept on the size of their bellies. The advantages are:

- for us, this means a lot less time bottle feeding and a lot more flexibility around feeding times; and,
- for babies, this better simulates the demand feeding of normal mother and baby, as well as providing milk during the night when we were sleeping.

It is important to clean the self-feeders at every change of milk and throw out any remaining milk after four hours or so. Some people have expressed concerns that the milk would not remain warm but this has certainly not caused problems in growth and development of the babies.

Exercise

Babies are left to exercise alone in the canopy at nights from about six weeks of age. We have them indoors, heater on in the room, unwrapped and able to exercise at will. We have a climbing frame made from wire mesh over a bathtub. This makes cleaning very easy. We have all the babies together – remember this means 20 to 40 babies. This can present problems with sucking. If so, we separate offending pairs of bats and create new bat groupings. The mesh frame has four compartments into which bats can have time out.

The babies move to the outside cage from about 200 g. The occasional bat isn't ready at 200 g, so we keep a close eye on them. We start to leave the release hatch open shortly afterwards, usually about mid January. We ask foster carers to return the orphans for creching by New Year. Young bats can then learn to fly in the real world instead of a cage. We are on five acres of wet sclerophyll forest and rainforest land in a valley with state forest on two sides. It is an ideal environment. No neighbours have reported orphans turning up. We are about 10 km as the bat flies from Tolga colony – far enough that the orphans don't find the colony prematurely. This is important as we don't want them to know where we live once we take them to the colony.

However bats have natural predators such as owls and pythons. Young bats learning to fly are easy targets. You need to assess the risk in your area.

We released 50 orphans from home in 1998 and over 10 to 20% still turn up now for a free feed occasionally. That year as babies came in from carers anytime up to late March we had the opportunity to discover that our orphans (raised at the hospital and early release into garden) were 15 to 20% bigger. I think this can be attributed to self-feeders and better bone density and muscle mass from better exercise opportunities. Not that bigger is necessarily better.

After three weeks the young bats are flying very competently. From early February we start to take them out to the release cage at the colony.

Release

Our release cage is a very large dog crate (720 mm high by 1100 mm long by 720 mm wide) winched up into the mid-canopy, about two to three metres lower than where the wild bats are hanging. We selected a part of the colony that is usually full of bats. The winch is bolted onto a post that is concreted in the ground. The winch has a housing that is vandal-proof.

If necessary we can have a number of posts around the colony and move the release cage. We put up to 15 bats in at a time. Last year we put them in for three days, let them out and put another 7 to 15 in, and so on until all 70 had been released. We're tempted to try two days next season.

For the first month all the bats would come down each day for food. The cage would be winched down and dinner hung from the cage – whole apples hung on S-hooks, containers of banana smoothie and self-feeders of mango and apple juice. After three months, now being fed every four days, we would still get at least 20 bats coming onto the cage. The feeding schedule is determined by the weather – the worse the weather the more often we feed them. In early July, I hung up some apples and three bats came onto the cage, four months after release and most of the colony having left for the coast (they were all gone three days later). I hadn't put food out for about three weeks. Occasionally wild bats come onto the cage but always fly away if we return.

The next step is to do some radio-tracking work. This may happen through the three year frugivore study that is happening up here with the Cooperative Research Centre of CSIRO.

One advantage of this release cage is that it can be folded up into a 1100mm by 720mm by 120mm 'suitcase' that is easy to get into and out of the colony. It even has a handle! The mesh is 75mm by 50 mm so must be lined with snake proof mesh. It has a zinxalume droppings tray which we remove once the bats have all left the cage and it is merely a feeding point. It cost $190 but with the cost of the winch, wire rope, and other fittings the total was about $ 400. At the end of release we clean it and store it away, but leave the winch and wire in place in the colony.

The Tolga colony is a little like Wingham Brush near Taree in that it is used as a recreational area. Within 50 metres of the edge of the colony there is a children's playground, public toilets and tennis courts. More than four tourist buses visit daily. The orphans in our release cage needed to be secure. We felt it would be too dangerous to have a ground cage. The orphans are only in the cage for a minimum time, but the cage is then a safe feeding point for several months.

It is interesting to think about the orphans' integration into the colony. They must be social outcastes in the sense that there would be no other motherless juveniles in the colony at that stage. Perhaps because they are usually bigger than their peers, the colony think they are 16 month olds? They climb down to a cage for a protein hit while their peers still have mum. How long do young flying foxes continue to suckle on their mothers? Certainly well into mating season – our orphans may be 'misfits' then for two months or so.

Volunteers

The rearing and release work is a huge undertaking, impossible without good volunteers. Please feel free to offer your services between October to January each year .

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Using small video camera for inspecting bat boxes and hollows

Terry Reardon, Evolutionary Biology Unit, South Australian Museum

Background

Small, inexpensive CCD video cameras coupled with infra-red light sources are being increasingly used for observing bats in caves and at entrances of tree roosts. I report here on a modification of this system for inspecting inside artificial roost boxes and tree hollows.

This project started as a result of a project at Cleland National Park near Adelaide, where some 150 artificial bat boxes (of varying design) were erected by the Friends of Cleland. When it came time to inspect the boxes, the NPWS became concerned about safety issues and the potential for litigation if someone fell from a ladder or was bitten by a 'rabid' bat. The boxes have not been inspected since their erection some four years ago. An additional impediment to box inspection was that many of the boxes are in steep well-wooded bush and it would be difficult to carry a sizeable ladder. While none of these issues was insurmountable, when combined they reduced the enthusiasm of the team.

In searching for methods to count bats in caves, I discovered a small CCD video camera that was small enough to be put through the opening of a standard bat box. It seemed to me that this camera could be mounted on a pole with a flexible gooseneck pipe so that it would be simple enough to inspect boxes without the need for ladders or being bitten. I have only just assembled this system, which has proved most efficacious. I inspected 20 bat and bird boxes and a few tree hollows in about 15 minutes. None of the boxes had bats, although an eastern rosella on eggs was observed in one box. The point here is that it would have taken considerably more effort to directly inspect these boxes with a ladder. I tried using the camera in a small cage containing 5 bat species and I could easily identify which species was which.

The prototype

The camera (pictured) has the lens mounted on a small printed circuit board. Viewed from the front, the camera is 16mm x 16mm while the length of the camera and circuit board is 60 mm.

The design described here is a first prototype, and I am sure that some modification could improve it. I wanted to maintain one dimension of the camera as close to 16mm as possible so it would fit into a standard bat box. . The other dimension was less critical so a light source of two infra-red LEDs were mounted either side of the lens (see figure) There were several options for housing and mounting the camera but I wanted to have a flexible pipe for at least 30 mm adjacent to the camera. Options considered included copper piping and microphone goosenecks but I found a 12v light in an electronics store which had a narrower gooseneck and a flared plug. I dismantled the plug and light head, compressed the plug in a vice such that I could partially insert the circuit board.

My prototype system is pictured below. The camera, LEDs and the monitor are powered by a 12v gel cell carried in a belt pack. About 12v from the monitor is supplied to camera and LEDs via twin

coax audio cable which also returns the video signal to the monitor. I chose this cable because it had a small diameter and fitted easily through the gooseneck. In fact the impedance of this cable is incorrect but the picture quality was excellent through 10m of cable. The LEDs were connected in parallel and each had a 560 ohm resister connected in series. These two LEDs provided ample light. The camera was secured into the flared end of the gooseneck using heat shrink tube. The monitor is supported by neck straps so it hangs at about tummy level.

The system is relatively inexpensive. The main components are listed below.

Monitor model # QM-3400 (Jaycar electronics)	$169
Camera model # AR717R (Oatley electronics)	$99
12v Flexilight #3PXLR BAS (for gooseneck) (Jaycar electronics)	$19
2 x IR LEDs #Z3235 and 2 x 560ohm 0.25W resistors #R0002 (Dick Smith)	$3
10 m twin core shielded audio cable #W2034 (Dick Smith)	$10
!2v 7.2 Ah DiaMec gel cell #SB-2484 (Jaycar Electronics)	$38

It would be preferable to have the camera head smaller, which should be possible with further development. I note that the lens is connected to the printed circuit board via a small 14 pin connector and thus the two parts are easily separated. If there was no loss of picture resolution it may be possible to mount the circuit board and lens at either end of the gooseneck which would indeed make the camera head much smaller and more manoeuvrable. Note also that the lens can be focussed (by loosening the small grub screw and turning the lens) but it may be worth investigating a wider angled lens. However my prototype worked exceptionally well for bat boxes. It should be useful for looking in high avens in caves.

It seems there is great potential for experimenting with infrared cameras. I have been discussing with colleagues about how to move around in bat caves with out disturbing bats with white light from torches. I mounted the camera described above and an infrared spotlight on a head band (similar to a head torch) and using the monitor at eye level, could easily negotiate my way around my cluttered backyard in the dark. There is glow from the monitor that would need to be shielded. I am experimenting with the screen from a viewer from an old style VHS video camera – the whole system might be a cheap alternative to image intensifying goggles.

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Natural wing tears in Large Bentwing bats (*Miniopterus schreibersii*)

Greg Richards

This note is for the information of bat carers who have problems with bats that come in with torn wing membranes. In a recent mass banding program in southern Queensland, nearly 5000 Large Bentwing Bats (***Miniopterus schreibersii***) were captured, and two of these had quite significant tears in their wing membrane (see photograph). They appeared to be flying without any apparent problems.

The repair of injuries such as these, which look quite ghastly at the onset, may not need to be treated. Perhaps it is best to let a wing-torn bat return to the wild, as it appears that at least some eventually survive.

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Bat virus update - Australian bat lyssavirus surveillance

Hume Field, Animal and Plant Health Service, Queensland DPI, Brisbane.

Surveillance of bats for Australian bat lyssavirus (ABL) continues to be undertaken by all States and Territories of Australia. The surveillance is largely passive, primarily consisting of 'rescued' sick, injured or dead bats, and bats presented for ABL exclusion subsequent to a potential human exposure. Active surveillance of wild-caught bat populations has been conducted by a QDPI group as part of an ongoing research project targeting emerging diseases of bats. In 1999, with funding support from the Wildlife and Exotic Disease Preparedness Program (WEDPP), and with the cooperation of Northern Territory and Western Australian colleagues, this group extended their surveillance of wild-caught populations across northern Australia.

Table 1 shows the passive surveillance data supplied by State NAHIS coordinators. Although species are not listed in the table, 7 of the 12 megabat species and at least 23 of the 57 microbat species in Australia have been surveyed. However, the number of bats surveyed per species is

limited, with a sample size greater than 30 being achieved in only four of the megabat species and three of the microbat species. The median sample size per species was 10.

ABL has been identified in bats in the Northern Territory and all States except Western Australia and South Australia. In addition to the ABL infection previously reported in the four (megabat) flying fox species and the microbat yellow-bellied sheath-tailed bat, evidence of infection has been found in a possible four additional microbat species in NSW - two unidentified micobats, and two bats of the genus ***Nyctophilus*** (long-eared bats), that gave weak fluorescent antibody test (FAT) positives on autolysed tissue.

In assessing relative surveillance efforts, it should be noted that the distribution and abundance of bat species are not uniform across Australia. For example, the normal range of flying foxes excludes South Australia and Tasmania. The sole megabat representative tested in Tasmania (and found seropositive) was a grey-headed flying fox found on King Island, presumably after a wind-assisted passage across Bass Strait. In Western Australia, although flying foxes are abundant in the north, people are not, and thus submissions are fewer.

The findings of the Queensland group's research are currently in preparation for publication. In summary, of about 400 wild-caught flying foxes from Queensland and northern Australia, none has shown evidence of ABL infection by FAT on brain smears. Although the sample Is non-random, the finding is consistent with a very low disease prevalence in the general flying fox population. Such an estimate contrasts strongly with that indicated by the (non-random) passive surveillance sample largely drawn from the population of sick and injured bats. Thus, the group with which members of the public, wildlife carers, and wildlife health professionals are most likely to have contact appears to present the highest risk of exposure to ABL infection.

Table 1: ABL surveillance of opportunistically sampled bats from 1996 to 1999
Positive includes specimens testing positive by a least one of fluorescent antibody test, immunoperoxidase staining, polymerase chain reaction, or serology. The 1999 data are incomplete (six months from Queensland and WA; one month from NSW and SA, and none from Tasmania and Victoria).

State	Megabats		Microbats		Unspecified		Total	
	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested
Qld	50	746	5	157	0	69	55	972
NSW	13	196	4	50	0	4	17	250
Vic	1	51	0	29	0	0	1	80
Tas	1	1	0	12	0	0	1	13
SA	0	6	0	4	0	10	0	20
WA	0	0	0	3	0	1	0	4
NT	1	37	0	15	0	8	1	60
Total	66	1037	0	270	0	92	75	1399

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- Contacts/Networks/News/Announcements -

A new bat book: *Flying Foxes: Fruit and Blossom Bats of Australia* by Leslie S. Hall and Greg Richards; Illustrations by Louise Saunders

Due for release in October-November, ***Flying Foxes: Fruit and Blossom Bats of Australia*** is the culmination of a very long project by Les Hall and Greg Richards. This book is part of the series on Australian fauna by the University of New South Wales Press, and has ten chapters in 130 pages or so. Overseas editions are being published by Kriger Publishers in Florida, a well known natural history publisher in North America

As well as an excellent series of illustrations by Louise Saunders, this book has a wonderful series of colour photographs that show the salient identification features of each species, but also illustrate several aspects of behaviour.

Chapters include an ***Introduction*** which outlines species distributions and taxonomic relationships. The ***Historical Background*** chapter discusses fossil history, aboriginal connections, and the first European discoveries of these bats. The chapter on ***Identification and Distribution*** also discusses extralimital ranges, and subsequent chapters move to the "nitty-gritty" of biology and ecology.

The ***Anatomy and Physiology*** chapter looks at flight, wings, muscles, blood supply, the brain and nervous system, the skeleton and skull, digestive system, teeth and reproductive anatomy. The chapter on ***Reproduction and Life History*** outlines the yearly life cycle of flying-foxes, female and male breeding cycles, reproduction in the smaller fruit and blossom bats, predators, parasites, diseases and mortality. The ***Behaviour*** chapter includes resting, grooming, camp structure, birth, mother/young relationships, mating and vocalisations.

The following chapters discuss the role of these bats in ecosystem function, and include ***Plant and Forest Interactions*** (diet, pollination, seed dispersal, flower and fruit characteristics and co-dependence between forests and flying-foxes), ***Ecology*** (including camp location, dietary guilds and several aspects of migration) and ***Conservation and Management*** (management problems and considerations, management options and methods, human interactions and exploitation).

The final chapter provides information on care and rehabilitation, and the rearing of orphan young flying-foxes. There is also an appendix that lists the plant species consumed by flying foxes and their smaller cousins.

The book is priced at $32.95 which includes GST, plus a postage and handling charge. Members of the Australasian Bat Society can obtain a 10% discount by sending the enclosed form (postage free) to UniREPS.

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ORDER FORM – FLYING FOX BOOK

Please send me ..... copies of ***Flying Foxes: Fruit and Blossom Bats of Australia*** by ***Leslie S. Hall and Greg Richards*** at the specially discounted price of $29.65 (normally $32.95). Add $8.75 postage and handling for delivery within Australia and New Zealand. For airmail to all other destinations, add AUD$12 for the first book and a further AUD$10 for each additional book. Due for publication in November 2000.

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News from around the traps

Queensland

Sharon Swartz and her team from Brown University, USA, were at UQ for two months (July-August) doing flight experiments in the Engineering Department's wind tunnels. Nine species of bats were filmed during flight including a ***Miniopterus australis*** who obligingly flew in the same spot in the wind tunnel for 8 minutes. Megachiropterans flown were ***Pteropus poliocephalus*** and ***Syconycteris australis,*** the former being a bit of a handful as only free-flying wild animals were being used. The data collected by Sharon will be fed into her very impressive computerised bat flight model.

At the DPI, Kim Halpin has submitted her PhD on Hendra Virus and is heading off to the USA. Janine Barrett continues her PhD research on Australian Bat Lyssavirus that has included several trips to Geelong to do experimental work. Hume Field has just returned from the USA where he gave a paper on his PhD work on ABL and then attended a lab workshop. Craig Smith is busy analysing field data on flying on flying foxes with Nicki Markus (UQ sampled during DPI viral studies.

At Griffith University, Monika Rhodes has commenced a PhD on ***Tadarida australis*** and Peter Howard has been involved in resolving urban flying fox conflicts and the gating of mines in Brisbane Forest Park. At the Queensland Museum Andrew Baker is working on the bat collection checking unusual distributional records and the identity of some vespertilionids collected years ago. Ian Gynther from QNPWS and Linda Reinhold from QDNR and Les Hall run regular bat information nights for Brisbane Forest Park at Mount Glorious (6 a year) which are mostly booked out. The night's activity combines a talk and a slide presentation with a research project which is looking at long-term monitoring of bats as well as comparing bat trapping results with simultaneous Anabat recordings at the same site. Linda, along with co-authors Brad Law, Greg Ford and Michael Pennay will soon release the much- awaited "A Key to the Bat Calls of southeast Queensland and northeast New South Wales". The DNR is about to commence a large project on the brigalow belt in southeast Queensland that will involve Linda radio tracking bats. Bruce Thompson (QNPWS) has returned from his conference on population studies on fruit-eating bats in South America and a month at BCI in Texas getting aquainted with the bats and mines project.

UQ, Elizabeth Jackson is completing her BSc Honours on the food and food resources of flying foxes in Brisbane. Nancy Irwin is busy analysing her ***Nyctimene*** genetic material collected in New Guinea. Nancy is about to submit a paper on the phylogenetic relationships within the Megachiroptera. Having obtained his PhD on the ecology of ***Kerivoula*** and ***Murina***, Martin Schultz went paddling a canoe in Alaska and visited Tom Kunz in Boston. Nicki Markus is about to submit her PhD on the ecology and behaviour of ***Pteropus alecto*** and Tajuddin Abdullah (UNIMAS, Sarawak) has almost completed his PhD on the ecology and genetics of ***Cynopterus brachyotis***. Steve Hamilton has submitted his MSc on the comparative ecomorphology of tongues and hair of the Megachiroptera from New Britain, Papua New Guinea. Steve is back in New Guinea. Patrina Birt is finalising her field work on ***Pteropus scapulatus*** and hopes to submit her PhD later this year. Chris Clague is writing up his PhD in Jack Pettigrew's lab. Rachel Geisel has returned from Cornell Vet School (USA) and has started writing up her work on flying fox salivary glands. A second paper by Shan Lloyd on ***Myotis*** reproduction, generated by her BSc Honours work, is about to be published.

Greg Ford (USQ) is toiling away on his MSc on bat habitat use in inland Queensland and is ”into stats mode now with the thesis due for submission in February. I'm starting to get very interested in the ***Mormopterus*** spp in southern inland Qld. Most captures measure up as ***M***. sp. 3 (Adams et al.), but recent ANABAT records from a single site at Southwood, NP (near Moonie) revealed both ***M***. sp. 3 and (apparently) ***M***. sp. 2, as well as a few calls that may be attributable to ***M***. sp. 4! Al Young and I are planning an expedition into the area later this year to target ***Mormopterus*** spp. We hope to record a range of reference calls and detailed morphometric data.”

Sue Chadwick-Luxon writes “I am currently completing a ‘Master of Creative Arts Qualifying’ course through James Cook University of North Queensland. My topic for this course are the Flying Foxes of North Queensland – ***P. conspicillatus***, ***P. alecto***, and ***P. scapulatus***. The thesis will cover their habitat, diet and the ongoing relationship between fruit bats and humans in this area of Australia. Once this course in completed, I intend to continue this line of study with a ‘Master of Creative Arts’ degree (another thesis!). The topic will expand to include two more fruit bats – Eastern Tube-nosed bat (***Nyctimene robinsoni***) and Queensland Blossom bat (***Syconycteris australis***) and the plants these animals associate with – both foraging and roosting. The most exciting activity that will develop from this research, will be the exhibition of a series of natural history/scientific illustrations. The illustrations will document northern flying foxes and fruit bats interacting with key botanical specimens. I am currently in the process of collecting the various

flowers and fruit required, along with reference photos of flying foxes/bats. **I would be most grateful if any Bat Society members have good quality photos of the above species, and would like to donate/lend copies for my research**. I can be contacted by email: robnsue@internetnorth.com.au ".

Victoria

Alistair Evans writes " My PhD research project is examining correlations between teeth and diet in insectivorous microbats, and as part of my work I'm interested in looking at some scat samples from a variety of Australian microbat species. I'm looking at differences between sizes of insect cuticle fragments in bats of different diets. If any bat workers have scat samples that they no longer require, I would greatly appreciate any number of samples they could send me. Please contact me, Alistair Evans, PhD Student, Department of Biological Sciences, Monash University, Victoria 3800 email: alistair.evans@sci.monash.edu.au ".

Grant Baverstock (gbaverstock@geelongcity.vic.gov.au) and Richard Dilena are currently surveying streams and rivers in the Otway Ranges (southwest of Geelong) in search for ***Myotis macropus*** to fill in some distribution gaps. Primarily they are concentrating on the Angahook - Lorne State Park at this stage, using harp traps over streams, ANABAT call detection and visual observations with spotlights over streams.

South Australia

Ken sanderson and Jon Codd are writing up Jon's honours study on diurnal energy budgets of southern bentwing bat at Bat Cave Naracoorte, Jon is now working with Chris Daniels in Dept. Environmental Biology, Adelaide University; Jon is examining the evolution and biology of lung surfactants in bats (and other animal groups). Terry Reardon (funded through a Wildlife Conservation Grant) and Stan Flavel, in collaboration with the University of Adelaide's Dept of Electrical and Electronic Engineering are investigating novel electronic counting methods for estimating the daily population of southern bentwing bats in Bat Cave, Naracoorte. Terry also has a grant to look at the distribution and roosting requirement for the hairy rostrum free tail bat in South Australia. Terry is also working with Bruce Thomson on the taxonomic status of ***Taphozous troughtoni*** (NHT funded).

ACT

Having survived a survey with colleagues at the Christmas Creek karst west of Townsville, where he only fell down a cave entrance once (!), Greg Richards is looking forward to a new project with CSIRO Entomology, studying the economic impact of bats in cotton crops. CSIRO's research to date on moth pests have indicated that bats may play more than a minor role, and it is hoped that this study will lead to the installation of artificial roosts to attract bigger bat populations. This project will be followed by another of scientific interest at Riverton Cave, another instalment of the annual mass banding program that is using mark-recapture modelling to monitor the maternity population. As a result of an interesting consultancy in western NSW last year, Greg has prepared a manuscript that shows the exten of habitat loss due to cropping and grazing, and why there will be local extinctions of threatened species through dryland salinity in the future - a sad scene but inevitable!

Western Australia

Norm McKenzie (CALM) gave a quick (over the phone) round-up of activities in WA. Norm and Bob Bullen are close to completion on two projects, the first is a study that enables reliable discrimination between ***Nyctophilus*** species based on echolocation calls; and the second, examining the flight power curves of Western Australian bats. Norm has in press 'The Fauna of the Canarvon Basin' and has written a draft of 'The bats of the Little Sandy Desert'. Norm also

reports that he and Tony Start have found a new colony of ghost bats just north of Kununurra. In his spare time, Norm has managed to complete the morphological measurements of Australian and Papuan ***Mormopterus*** (including most of type specimens) so the revision is in sight! Kyle Armstrong is at the writing up stage of his PhD on ***Rhinonicteris***.

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House for Sale!

Do you want to live in the midst of flying foxes at the Woodend Colony in Ipswich. This property is in possibly the premier Queensland location if you want to enjoy three species of flying foxes at close quarters. If you want to know more, serious enquiries may be directed to Bruce Thomson, QNPWS, PO Box 731, Toowoomba Qld 4350 ph: 07 4639 8324 fax: 07 4639 4524 Mobile: 0407 128 139 Email: bruce.thomson@env.qld.gov.au

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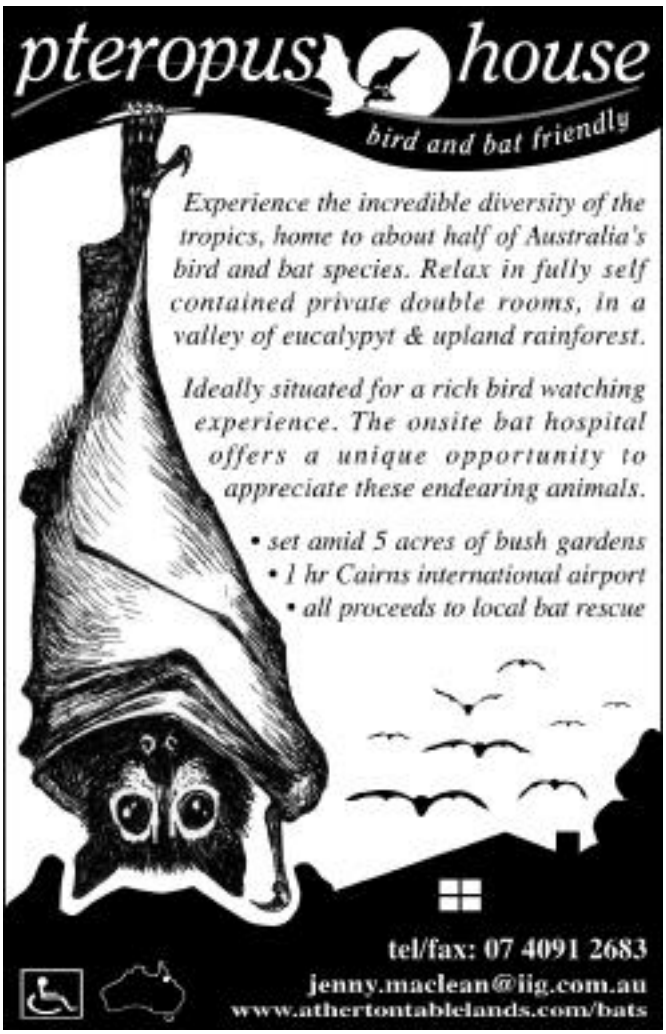

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US workshop on bat population monitoring

Peggy Eby alerted us to a great report from a workshop on problems and techniques for monitoring bat populations, held recently in the US. The report can be found at:-
www.mesc.usgs.gov/BPD/ireport.htm
Definitely worth a read.

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12th International Bat Research Conference - Malaysia August 2001

Information on the 12th International Bat Research Conference follows.

Pre-registration deadlines: (authors by 30th April 2001; others May 30th 2001)
Registration fees:

Regular pre-registration US$150
Student pre-registration US$100
Vendor pre-registration US$150
Late registration US$175
Late student registration US$120
Conference social event (optional) US$25

Lodging
Participants are requested to indicate the type of accommodation preferred. Although participants are expected to make their own lodging arrangements, the Organising Committee will assist in the booking arrangements based on the preference selected. Payment for lodging will only be accepted when checking in. Payment can be in cash or by credit cards, VISA, MASTERCARD, DINERS or AMEX. (Exchange rate: 1 USD = RM3.8 as of June 1999). The rates quoted are the standard rates and discounts can be obtained based on a minimum number of bookings. The hotels are located about a 5 to 20 minute drive from the university. The transport arrangements will be announced later. For updates please refer to the section "About Malaysia"

Room type US$/night 5-Star Hotel 150; 4-Star Hotel 100; 3-Star Hotel 70; Budget < 30

Dr. Zubaid Akbar
c/o 12th International Bat Research Conference
Faculty of Life Sciences
Universiti Kebangsaan Malaysia
43600 UKM Bangi
MALAYSIA.

Download information and registration forms from: **http://www.ukm.my/ukm/seminar/bat/index.html**

NOTE: ABS member and travel consultant, Sirena Wan, has contacted me to ask if was appropriate to offer her services to coordinate the travel arrangements (at good airfare rates) for ABS members who are going to Malaysia for the International Bat Conference. Since this could be off benefit to members, I am happy to include her offer here –

“We are able to organize individual trips as required and I will probably arrange short packages which will include flights and accommodation (if necessary) for people who just want to attend the conference only... I also have contacts with operators who organize special interest nature trips in Borneo and to most National

Parks on the mainland such as Taman Negara, which people may want to tag on to their trip after the conference perhaps to visit bats in Borneo!!...but if people want to "roost" at a beach resort, I'm sure I can also arrange that as well! Also, we can probably advise people who may want to extend their stay in Malaysia beyond the conference,
Please contact me if you have further questions.

Sirena Wan
Malaysia-Singapore Travel Specialists
Address: Suite 205-206
No. 2 Pembroke Street
Epping
NSW 2121
Phone: (02) 9868 5199
Fax: (02) 9869 7810
E-mail: jwasean@travelinfo.net.au

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-Recent Literature-

(compiled by Greg Ford - *fordg@powerup.com.au*) and Peter Wilson

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AUSTRALASIAN BAT SOCIETY
MEMBERSHIP APPLICATION/RENEWAL FORM

The Australasian Bat Society was conceived at the 4th Australian Bat Research Conference (Brisbane 1991) and became an incorporated society in 1998. The ABS unites people with a common interest in this unique fauna. Whether they be researchers, naturalists, foster-carers or fruit-growers, everyone benefits from our unification. By presenting a united front to assist the resolution of conservation problems, or to lobby politicians, or simply spread the good word to the public, the goals of the ABS are conveyed more efficiently than through individual effort. Every second year the ABS arranges the Australasian Bat Conference. Communication is promoted through a bi-annual newsletter, which contains research news and notes, and our web page on the Internet - http://batcall.csu.edu.au/batcall/abs/welcome.htm

Further information on membership can be obtained from the Membership Secretary:
Lindy Lumsden, PO Box 137, Heidelberg, Victoria 3084, Australia.
Phone No. (03) 9450 8694. E-mail <Lindy.Lumsden@nre.vic.gov.au>

MEMBERSHIP FORM FOR THE AUSTRALASIAN BAT SOCIETY

I wish to become a member/renew membership of the Australasian Bat Society. I declare that I subscribe to the Aim and Objectives of the Society and agree to be bound by the Rules of the Society.

Name: ..... Title: .....

Address:.....

.....

State ..... Postcode ..... Country .....

Phone: ( ) ..... Fax: ( ) .....

Email address: .....

I qualify for membership at the following annual rate (circle):

Standard ($A30) ***Student, Unemployed or Retired ($A20)*** ***Institutions ($A50)***

Outside the Australasian Region ($A40) ***Institutions Outside the Australasian Region ($A60)***

Signed: .....

My payment by cheque/bank draft for Aust$..... is attached, **OR**

Please debit my Bankcard / Mastercard / Visacard the amount of Aust$ .....

My card number is: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ Expiry date .....

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Signature .....

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