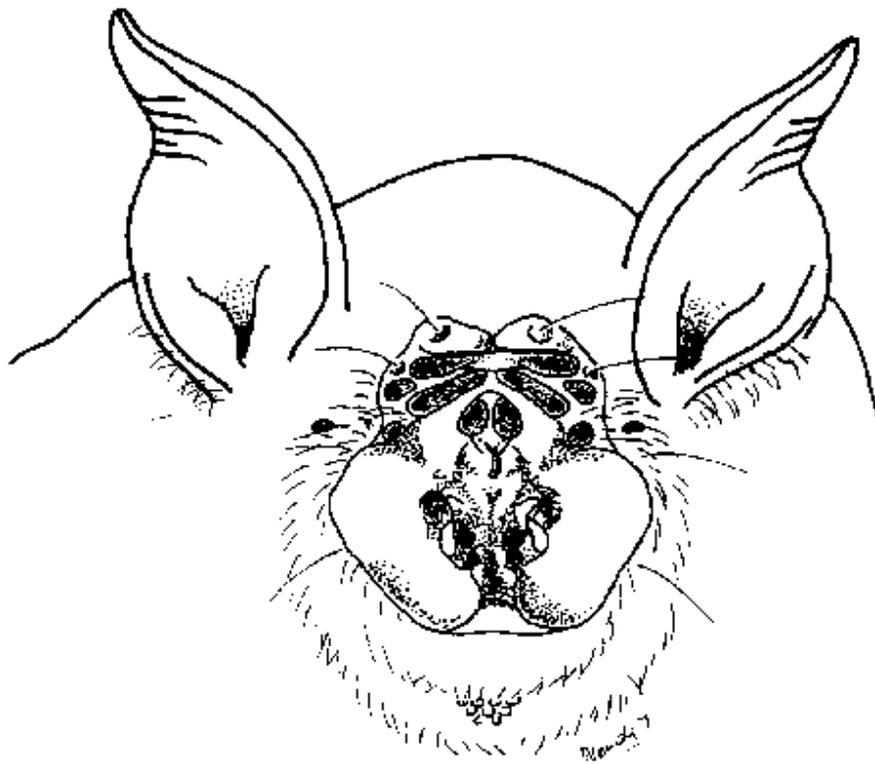


# THE AUSTRALASIAN BAT SOCIETY NEWSLETTER



Number 9  
October 1997



Australian endemic species: the Orange Leafnosed-bat *Rhinonycteris aurantius*.

Line drawing by Wendy Tweedie.

## INSTRUCTIONS TO 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:

### **For Scientific Articles:**

- Hard copy manuscripts should be posted to the Newsletter Editor at the address below.
- Electronic copy manuscripts should be submitted in plain text (ASCII) form on an IBM format 3½" floppy disk to the above address, or as an e-mail attachment, to the Newsletter Editor.
- Manuscripts should be submitted in clear, concise English and free from typographical and spelling errors.
- 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).
- 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 or BMP image files. Tables should be in a format suitable for reproduction on a single page.
- Manuscripts 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*.

### **For News, Notes, Notices, Art etc.:**

Hard copy should be posted to the Newsletter Editor at the address below. Electronic copy should be submitted in plain text (ASCII) form on an IBM format 3½" floppy disk to the address below, or as an e-mail attachment to the Newsletter Editor. Manuscripts should be submitted in clear, concise English, and free from typographical and spelling errors. Art in the form of line drawings and other monochromatic media may also be submitted. Some black and white photographs can be reproduced in the *Newsletter* after scanning and digital editing (consult the Editor for advice).

### **Special notes for electronic submission:**

Although electronic submission is strongly encouraged, there are a few ground rules. Plain text (ASCII) is by far the best format to eliminate system/software compatibility problems, and can easily be sent as part of the body of an e-mail message. This is the most *convenient* way for me to receive text generated on an Amiga or Macintosh. If attaching formatted DOS/Windows files to e-mail, please remember to tell me what word processing package has generated the file. My system can decode UU, MIME and BinHex attachments.

If none of this makes sense, please ask for advice from your local computer guru, system administrator or Internet service provider (ISP).

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## ACTING-PRESIDENT'S REPORT

This brief report is to summarise some of the events and issues that are relevant to the ABS since the last newsletter. Firstly, it is disappointing to report that two members of the Executive have resigned (for personal reasons). In June, Greg Richards stepped down from his role as President and earlier in the year Len Martin resigned as Vice-President. The Executive appointed Peggy Eby to fill the vacancy left by Len, and I agreed to act as President until the next General Meeting of the Society. Both Greg and Len have been productive servants of the ABS (the amount of Society business correspondence handed to me testifies to that) and they remain strong Society supporters.

In June, Environment Australia held a workshop in Canberra with the aim of getting agreement on the *Action Plan for Australian Bats*. The workshop brought together many of our country's most knowledgeable battos. The workshop was very productive and it was stimulating to have two days of learning and sharing information about bats. Many of us left the workshop with commitments to contribute to the Plan, although at this time, I know that many of us have struggled to meet the timetable. I feel confident that the final Plan will be a significant and useful document.

As I suggested in the last Newsletter, those people in Canberra for the Action Plan workshop, got together to have an informal brainstorming meeting on the future of the Society. Minutes of that meeting can be obtained from Lindy Lumsden, but I will mention a few of the points that came out of the session.

There was strong support for the continued existence of the ABS as opposed to merging into another society like the Australian Mammal Society. Many at the meeting felt the need for our Society to be more effective in educating the public about bats and to be more actively involved with conservation issues. There was some discussion about the format of the Newsletter, ie, whether it should remain in its current informal style or to revisit the notion of it being a refereed publication. The consensus was that the current format was appropriate because there are many journals available for publication of more substantial works. Our Society like many others is dependent on its productivity by the voluntary time given by its members. To achieve some of the ambitious goals in education and advocacy, the meeting considered the possibility of employing a part time officer. Although this was generally thought to be a good move, there was agreement that we should first incorporate and then look to generating the necessary funds. Several other issues were discussed and time ran out before we could cover all the items on the over-ambitious agenda. However the meeting was useful, and I am glad to see that the organisers for the next ABS conference have allowed considerable time for further discussion on the Society.

In June, an Incorporation/Constitution subcommittee was formed. After some investigation, the committee decided that the Society should incorporate in New South Wales. The sub committee obtained a set of model rules for associations in NSW and we have been adapting those for our Society. The draft is nearly finished and I hope to send out the Rules and Aims/Objectives to all members before the end of this calendar year, and hopefully we can be incorporated early next year. Once we are incorporated, this Executive and that which follows should look to developing a five-year plan. Many thanks to Kerryn Parry-Jones, Peggy Eby, Lawrie Conole, Lindy Lumsden, Andy Spate, Chris Tidemann, Chris Clage, Jillian Snell, Linda Collins, Colin O'Donnell and Harry Parnaby for helpful contributions with the constitution.

I have just attended a forum at the joint national conference of the Australian Systematic Botany Society and the Society of Australian Systematic Biologists. The forum discussed the future resourcing of general systematics in this country. The cut backs in funding allocated to the Australian Biological Resources Study (the main federal funding agency for systematic research), was a major concern of those at the forum. The Bat Action Plan workshop in Canberra highlighted the desperate need for systematic research on Australasian bats, and as such, our society will support the two aforementioned societies by also writing to the federal government pointing out the vital role of systematics for conservation and management of flora and fauna and by urging them to upgrade funding to the ABRS.

Finally, thanks to the organising committee of the *Eighth Australasian Bat Conference* for your work so far - the program and venue/s look enticing.

I look forward to a productive and energetic future for the ABS, and also look forward to catching up with everyone in Rockhampton.

**Terry Reardon**

Acting President

## VALE KARL KOOPMAN

With the recent passing of Karl Koopman, we have lost one of the world's greatest bat authorities. Karl Koopman had an encyclopedic knowledge of bats and shared his knowledge readily with bat enthusiasts from around the world. With the American Museum of Natural History as his source, Karl published widely on bats from all corners of the globe. Australia was one area in which he had a special interest, and he published a number of major papers dealing with the taxonomy and biogeography of Australian bats. He was always interested in what was going on in the Australian bat scene.

Anyone who attended International Bat Conferences will remember that Karl always sat down the front, in the middle, and always had a perceptive question to ask at the end of a talk. He was well liked and his knowledge of bats was admired and respected by his colleagues.

We will miss his familiar figure, helpful discussions, and wise advice.

Les Hall

## VALE J.E. HILL

**Summarised from:** Paula Jenkins (1997). John Edwards Hill, 1928 - 1997 - An appreciation. *Mammalia* **61**(2): 287-289

The only child of Albert Hill and his wife Marjorie Edwards, John Edwards Hill was born on 11 June 1928 at Colemans Hatch, a small town in Sussex.

As sole or joint author, he described many new taxa, comprising 24 species and 26 subspecies, (13 rodents, 37 bats), and 5 new genera and subgenera. The most important, however, was the tiny Bumblebee Bat or Kitt's Hognosed Bat collected by Kitt Thonglongya in Thailand, which formed the basis for the description of a new genus and species, *Craseonycteris thonglongyi* of a new family, Craseonycteridae. He completed several major revisions during his career, beginning in 1963 with *Hipposideros* and proceeding to *Philetor*, *Laephotis*, *Scotoecus*, *Hesperoptenus*, the Rhinopomatidae, 3 species of hipposiderids, *Mystacina* and the Vespertilionidae (the latter with David Harrison).

In view of his consuming passion for bats and their taxonomy, it is not surprising that, on retirement from the British Museum in 1988, he should continue his studies from his home in Kent. After a career in which he rarely suffered from illness, it seemed ironic that as his retirement approached, his health began to cause some concern and shortly after retirement he suffered a heart attack. Although he made a good recovery from this, his visits to the Museum decreased and he relied henceforth on his meticulously detailed notes and extensive collection of mammalian literature to continue to pursue his vocation. He wrote 11 papers during his retirement, including the greatly sought after memoir and bibliography of Oldfield Thomas, as well as contributing to the 2 joint publications with Gordon Corbett. In 1994 he suffered a severe stroke from which he recovered with remarkable speed. Within a short while he had resumed studying and writing to his previous high standard, producing 2 more papers during 1996. His vigour decreased to some degree, yet he was still working on his bats to within a few weeks of his death on 6 May 1997.





*Bats Are Beneficial*

## 8th Australasian Bat Conference, 1998, Rockhampton, Queensland

**Including the Australasian Bat Society General Meeting**

### *Call for Registration and Papers*

In 1997 at the Naracoorte 7<sup>th</sup> Australasian Bat Conference it was agreed that the next conference would be held in 1998. It was later decided that Queensland would be a great place to hold the next conference. Rockhampton was chosen as it has a number of interesting cave and bat sites. It has also been a focus of human and bat interaction. The theme of this conference is to be "***Bats Are Beneficial***"; we hope that by holding the bat conference in Rockhampton that we can collectively raise the profile and public awareness of bats in a positive manner. Rockhampton is in Queensland, situated on the Tropic of Capricorn, 40 km inland of the East coast of Australia. Approximately 7-8 hours drive North of Brisbane. The venue for the conference will be at the Central Queensland University, Building No. 32; Humanities Department, please refer to attached map. We hope that people from a wide range of backgrounds will be attending this conference. Anyone with an interest in bats is welcome to attend. If you know of anyone else that may wish to attend the conference, please give them a copy of these papers.

#### **Dates**

Registration and welcoming function on Tuesday 14th April 1998; conference papers and workshops begin on Wednesday 15th - Friday 17th April; field trips are organised for the weekend, 18<sup>th</sup> and 19<sup>th</sup> April 1998.

#### **Organisers**

##### **David Gee**

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Gol Gol NSW 2738  
ph (03) 50 248 708  
fax (03) 50 213 328  
dgee@mildura.net.au

##### **Mary McCabe & Dianne Vavryn**

64 Wentworth Terrace  
Rockhampton Qld 4700  
ph (079) 34 2788  
ph (079) 27 1051  
vavryn@networx.com.au

#### **Program**

Contributed papers, in both spoken and poster format, are invited. Spoken papers will be limited to 12 minutes each with a further 3 minutes for questions. In addition to the general sessions, we are proposing to hold a number of workshops to stimulate discussion on various issues. There will also be plenty of time for informal discussions. A general meeting of the Australasian Bat Society will be held on Thursday afternoon at the Olsen's Capricorn Caverns, Cathedral Cave.

#### **Workshops**

*Quality assurance for bat surveys:* This workshop stems from the discussion and workshop held at the last conference, Naracoorte. Issues for discussion could include:

- what constitutes a reliable bat survey;
- how should survey data be analysed;
- what level of interpretation can be taken from surveys done at different scales, ( for example, there are large differences between basic inventory surveys versus stratified sampling across habitats or seasonal surveys for population monitoring )

*Bats and Forests:* Our knowledge of the ecology and behaviour of bats living in forests is limited and forest ecosystems are being altered dramatically. It is planned to have a session at the conference on *Bats and Forests*, in a similar vein (although smaller) to the highly successful symposium held two years ago in Canada, organised by Robert Barclay and Mark Brigham. Robert Barclay is currently in Australia, and he and several of his students will be at the conference, so

it is an ideal opportunity to bring people together to focus on the range of issues associated with the conservation of bats in forest production areas (e.g. impact of forestry, roosting requirements, foraging requirements), and the roles bats play in forest ecosystems. The format is likely to be presented papers followed by discussion. We encourage those actively conducting research on forest-dwelling bats to present their results at the conference, and for those interested in forest and wildlife management and silviculture to attend and participate in the discussions.

*Should the Society operate a bat call library?:* Stemming from the workshop above, and perhaps being combined with it, we should again discuss the pros and cons of having a centralised echolocation call library. Such a library would accord with quality assurance for surveys. If this concept is accepted issues for discussion could be:

- should the library be a commercial arm of the Society
- should there be a return for effort to those who provide calls
- does the society have an obligation to help new people in this field,
- should users of the library be committed to return distribution information to a centralised database

*Commercialisation of Flying Foxes:* Harvesting of our native fauna has always been a contentious issue, this is especially so for flying-foxes. There are two quite separate schools of thought on this subject, and we should aim to develop a Society policy through discussion and objective analysis of the situation. Points for discussion could include:

- are there any conservation benefits in commercialisation of flying-foxes
- how do we ensure that quotas would be accurately set for sustainable harvesting
- if a quota was to be set, how do we measure populations to gather baseline data, rapidly and accurately

*Resolving issues of Flying Foxes in urban areas:* Flying Foxes in urban spaces create problems with interaction with the general public. Issues for discussion could include:

- how do we educate the general public to be more tolerant of flying-fox camps in their environs,
- how should the question of removal be decided, ( bats have rights, but so do people - how do we reach a compromise ).
- what are the legal issues re: health risks to the general public
- how do we relocate a problem colony

## Abstracts

Abstracts for papers (both spoken and poster) are to be submitted to David **no later than 20th February 1998**. Abstracts (including the title etc) are to fit into half a page which allows for approximately 200 words of text. It will be presented in single line spacing in 10pt Times New Roman or similar font. The first line contains the title in capitals; the second line left blank; the third contains the author/s; the fourth the address/s; and then the fifth line is blank before the start of the text. Abstracts should be as informative as possible giving a summary of results to be presented. Please indicate on the registration form if the paper is to be presented as a spoken or poster paper.

If possible, abstracts should be electronically submitted, either via Email to [dgee@mildura.net.au](mailto:dgee@mildura.net.au) or on a 3.5" floppy disk. The preferred format is as a MSWord for Windows file ( IBM ). A submitted disk should include the name of the author, and the name of the computer program and system. People that do not have access to Email or computers are welcome to submit a typed copy.

A hard copy of the abstract should be included with the registration form regardless of how else it is sent.

Abstracts will need to be received by 20<sup>th</sup> February to be included in the book of abstracts, which will be available at the start of the conference. Abstracts will also subsequently be printed in the *Australasian Bat Society Newsletter*.

Bat Conservation International has generously decided to finance the printing of the papers presented at this conference. These will be available to delegates after the conference is completed.

**IF YOU WISH FURTHER INFORMATION ABOUT THE CONFERENCE OR WISH TO RECEIVE THE REGISTRATION FORMS, PLEASE CONTACT DAVID GEE.**

Contact can be made either by telephone or email or ordinary mail.

## PUBLICATIONS FROM THE 1998 CONFERENCE

All papers presented at the conference will have abstracts published in the *ABS Newsletter*. Thanks to financial support of Bat Conservation International, we will receive a subsidy to publish all papers dealing with bat conservation in a book, so we encourage you to consider this theme when deciding the subject of your presentation. The working title so far - and this is subject to change - "*The conservation of Australian Bats: issues, problems and solutions. Papers presented at the 1998 Australian Bat Society Conference.*"

Although we are yet to finalise many aspects of this publication, for the moment we envisage that all authors will receive a free copy, and other conference participants will be offered a copy with an extremely attractive discount. Sales elsewhere will assist us in recovering whatever costs we can for BCI.

All papers will be peer reviewed and to encourage fast production **ALL AUTHORS WILL BE REQUIRED TO HAVE A DISKETTE FILE OF THEIR MANUSCRIPT PLUS ORIGINAL FIGURES/PLATES TO BE HANDED OVER AT THE CONFERENCE**. Only under exceptional circumstances will this deadline be extended, as we are trying to avoid past situations where the delay of one or two manuscripts have held up final publication, making the publication out of date when printed.



## 11<sup>th</sup> INTERNATIONAL BAT RESEARCH CONFERENCE

**Brasilia, August 2-6, 1998**

In order to promote scientific interchange cooperation among bat researchers throughout the world, the 11th International Bat Research Conference is being organised by the Department of Zoology of the University of Brasilia. Technical sessions of the meeting will take place at the Pousada dos Pireneus Hotel, in Pirenópolis, a small, charming town near Brasilia.

**Meeting Location:** Brasilia is the purpose-built capital of Brazil, located in the central region of the country. It is a new and modern city, founded only 37 years ago, with its late twentieth century design and architecture that has caused UNESCO to declare the city a Human Heritage site. The Central Brazilian Highlands are a region of great ecological value, covered by approximately 2 million square km of tropical savannah as known as "cerrado" that hold 80 species of bats. The climate is mild: the sun beating down hard at noon, but the air is cool by night. July corresponds to the cool and dry season when virtually no rain occurs and relative humidity may fall to less than 20%. Brasilia has an international airport with flights to and from the US, Europe and within Latin America. From Brasilia one can reach any part of the country by plane, by car or long-distance buses.

**Scientific Content of the Meeting:** The meeting will emphasise cutting edge and little known aspects of scientific knowledge regarding neotropical bat biology. However, contributions in any field of bat research in the world will be welcomed. The contributions will be grouped in sessions that will cover general subject matters, symposia, or workshops. The latter will deal mainly with subject matter focused for a more restricted audience. The themes currently projected for the general sessions are: Behaviour and Communication; Conservation; Echolocation and Feeding Ecology; Ecology; Education; Evolution and Systematics; Morphology, Growth and Development; Physiology; Reproduction.

Those individuals interested in organising a symposium or workshop should contact <[IBRC11@guarany.unb.br](mailto:IBRC11@guarany.unb.br)> or 11 IBRC, Caixa Postal 04474, Brasilia DF, 70919970, Brazil. Papers contributing to general sessions are unrestricted in subject matter, while participants in symposia or workshops should get in touch with their respective convenors or organisers.

**Site of the Meeting and Accommodations:** The technical sessions will take place at the Pousada dos Pireneus Hotel, in Pirenópolis. Participants will be checked in at the Pousada dos Pireneus, a five stars country hotel, at low prices for this event. There are other possibilities of even cheaper accommodation in town within walking distance to the meeting place.

**Deadlines:** Those interested in organising a symposium or workshop should send a formal proposal to the Organising Committee before July 15th, 1997. The second circular will be sent in late July 1997. It will include additional information regarding the specific site of the meeting, options regarding pre and post-meeting workshops, tours and excursions, information for spouses of participants, a first call for papers, a preliminary list of technical session topics to help focus potential participants, and registration forms.

**Registration Costs:** Firm information regarding registration costs is not available at the present time but will be provided in the second circular. However, it is anticipated that rates will be held down to moderate levels. Students and those individuals who register early will enjoy a substantial discount in registration costs.

**Correspondence:** In order to facilitate communication among participants and organisers of the meeting and the sending of registration information and abstracts, the organisers call on all potential participants to, whenever feasible, use electronic mail. The electronic mail address to be used for all queries and requests is:  
<[IBRC11@guarany.unb.br](mailto:IBRC11@guarany.unb.br)>

To lower the work load of the participants and organisers, future circulars will also be sent by electronic mail to those participants who request this option, and will also be distributed through a variety of distribution lists and listservers.

Organising Committee

Postal address for correspondence:

**11<sup>th</sup> International Bat Research Conference**

**Universidade de Brasilia**

**C.Postal 04474**

**BRASILIA 70919-970, DF, BRAZIL.**

Fax number: 55-061-2741141

Conference Host

Jader Marinho-Filho, Universidade de Brasilia, Brazil

Program Directors

Wilson Uieda (UNESP, Botucatu, São Paulo) and Ludmilla Aguiar (Universidade de Brasilia, DF)



## LETTERS TO THE EDITOR:

16 May 1997

**Bronwyn Wood**

PO Box 278

North Sydney 2059 NSW

I'm a (financial) microbat and megabat rehabilitator member of the ABS.

A few days ago I was called out to rescue a microbat - the finder was absolutely terrified by what she'd heard in the media about the Lyssavirus, refused absolutely to touch the bat (lying on the ground by this stage) - she knocked on neighbours' doors while I waited on the phone till she found one at home willing to pick the bat up for her. I advised them of the correct way to collect the animal - put a large soft cloth over it and collect the animal gathering it up in the folds to avoid the possibility of being bitten, then put bat, cloth and all inside a pillow-case turned inside-out and secure the top with a rubber band or piece of string. She was initially unwilling even to have her cloth or pillowcase in contact with the bat, until I was able to reassure her to some extent that the Lyssavirus could not be caught from these and all she had to do was to wash them in the normal way when the bat was removed. I asked her to then leave the bat in a quiet dark safe place away from cats or dogs, until it could be rescued.

When I arrived to collect the bat, she had placed it on the floor, in an open doorway behind a screen door, presumably to allow ventilation for any Lyssavirus germs!

When I examined the bat (a female Lesser Long-eared Bat *Nyctophilus geoffroyi*) it had thick yellow urine (probably suffering from severe cystitis) and was obviously in pain.

I explained what was wrong to the finder and tried to reassure her that it was not symptomatic of Lyssavirus. and to give her some reassuring factual information.

I commenced the bat on oral antibiotic, but it died later that day. I will pass the body on to my experienced wildlife vet for postmortem when next I visit.

I am concerned that the bat was left to suffer longer than was necessary because of the finder's fears. I do not blame the finder, in fact I think it was highly praiseworthy of her to try to get help for the bat in spite of her fear.

I would plead with other member rehabilitators, to use a calm and sensible approach when dealing with the Lyssavirus issue, whether writing articles for publication, or speaking in person to members of the public, and try to defuse the hysteria surrounding it.

In this way we can truly fulfil our responsibility to the animals whose welfare we are entrusted with.

I would be most grateful if you would consider publishing this letter in the next Newsletter of the Australasian Bat Society.

1 September 1997

**Hugh Spencer**

Director

Cape Tribulation Tropical Research Station

Australian Tropical Research Foundation

PMB 5 Cape Tribulation via Mossman

Queensland 4873 AUSTRALIA

The Australian Tropical Research Station has a Website:

<http://www.altnews.com.au/austrop>

in which you will find information on the Research Station, opportunities that exist for research in the lowland wet tropics, rates, equipment and facilities available.

The Daintree lowland wet tropics, most of which is World Heritage Listed, is a much under-researched region, relatively rich in bat fauna, both micro and mega. It is also unique and represents the last remnants of forest types that were relatively common before the advent of intensive clearing for urban development and sugar cane farming in the Innisfail - Cairns region.

However, its future is very uncertain as it is under heavy development pressure both from private developers and Queensland Government departments, most particularly, the Department of Minerals and Energy which is insistent in its desire to supply grid electricity to the region, thus opening it up to rural-residential development. This would be an ecological tragedy of international proportions.

To inform people further on this issue, there is a further web page at the same site entitled "Daintree Rescue". Have a look at it, and support our efforts to conserve the area.

**Glenn Hoye**

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**BACK ISSUES OF B.C.I.'s BATS MAGAZINE AVAILABLE.**

Recently Bat Conservation International offered a good deal on past issues of BATS magazine. Instead of getting just a copy for myself, I purchased additional copies as I thought other people in Australia may be interested in a set. I have ten sets left, each consisting of the available back issues from 1983 until 1995 (38 issues in total). They contain some interesting articles and good pictures of various bat species from around the world.

I am happy to break even on the cost of acquiring the back issues and postage to whoever is interested. They are available for \$30 a set, which includes postage.

23 September 1997

**Jillian Snell**

GPO Box 5047  
Sydney 2001 NSW

**ENERGY SUPPLIERS AND THEIR PROGRAMS FOR REPLACING 'BARE WIRE' POWERLINES WITH ABC CABLE TO PROTECT WILDLIFE**

As recent scientific research has highlighted the ecological importance of flying-foxes as pollinators and dispersers of seeds in our forests, there is an increasing public awareness that these native animals should be treated with respect. Cruelty to such animals is no longer acceptable. Therefore Energy Supply companies will increasingly be expected to prevent deaths of native animals particularly where it occurs repeatedly.

The energy supplier 'Integral Energy' has an Environmental Enhancement Policy with regard to trees/bare wire power lines and replacement with aerial bundled cable (ABC). Whereas the energy supplier 'Energy Australia' has, for a number of years, agreed to carry out reconductoring with aerial bundled cable, wherever practicable, on a 50/50 cost-sharing basis with local councils at the request of the local council.

Some local councils in Sydney are willing to look at potential power line deathtraps for wildlife, particularly where 'bare wire' power lines run through or adjacent to trees that wildlife feed in. Recently North Sydney Council Tree Preservation Officer and Ku-ring-gai Bat Colony Committee together identified 17 sites where aerial bundled cable would be of benefit not only to urban wildlife, but also to the community as a whole. The advantages of ABC installation over 'bare wire' power lines are as follows:

1. The short term costs of installing insulated, resilient, single strand ABC needs to be compared with ongoing costs which include repairs, tree trimming, removal of live and dead animals from 'bare wire' power lines.
2. The community benefit from improved visual amenity by removing the ungainly coat-hanger appearance of 'bare wire' power lines and allowing trees to grow naturally around the aerial bundled cable.
3. Reduction in cost and time allocated to linesmen to rescue baby flying-foxes and their electrocuted mothers from power lines. Furthermore local inhabitants are not subjected to the distress of an electrocuted, slowly dying animal and the frantic calls of its offspring trapped on 'bare wire' power lines.
4. Costs, time and need for training of linesmen to deal with flying-foxes following the identification of the Australian Bat Lyssavirus. Sensible precautions need to be taken for the safety of linesmen and the public.

Discussion of this matter with Integral Energy's Environment Officer confirmed that although Councils were not interested in cost share of cables in their district, Integral Energy were happy to fast track ABC replacement if wildlife groups requested it.

Surely the advantages of reconductoring with ABC will outweigh costs in the long term. We do understand that this problem cannot be solved overnight, however power lines are the responsibility of the 'Energy Suppliers'; and Energy Suppliers should carry the cost of their responsibility, particularly when aerial bundled cable replacement is requested where 'bare wire' power lines are dangerous to the public, tree trimming crews and repeatedly kill wildlife.

This comment on aerial bundled cable should be noted by all Energy Supply companies throughout Australia.

22 September 1997

**Marg Turton**

E-mail: <turtonm@acay.com.au>

### **BATS AND MINES: ENDANGERED SPECIES IN ENDANGERED HABITAT !**

Habitat loss is a problem being experienced by many species, unfortunately bats are no exception. Loss of microchiropteran habitat and roost destruction is occurring through deforestation, habitat degradation, recreational caving, human interference and mining. As a result of the loss of these 'traditional' roost sites, large numbers of cave dwelling bats now use abandoned mines as regular roosting sites. Whether the use of these abandoned mines is directly due to these interferences or to the bats ability to adapt to new roost sites is unknown. Like caves, these abandoned mines offer bats the advantage of darkness, protection from predators and a stable microclimate. Although abandoned mine shafts seem to the purist to be 'artificial' roost sites they must now be seen as vital bat habitat. Some mines would also undoubtedly be used for hibernation, although probably do not meet the rigorous requirements for maternity roosts.

Several bat species Australia-wide roost in abandoned mines, some of which are classified as vulnerable under section 2 of the Threatened Species Conservation Act (1995). The species most affected in NSW include the Common Bent-wing *Miniopterus schreibersii*; Little Bent-wing Bat *Miniopterus australis*; Large-footed Myotis *Myotis adversus*; Little Pied Bat *Chalinolobus picatus*; Large Pied Bat *Chalinolobus dnyeri* and the Eastern Horseshoe Bat *Rhinolophus megaphyllus*. The exact number of Australian bat species that utilise mines is unknown, but to give an indication surveys in the USA show that 29 of 42 American bat species utilise abandoned mines, over half.

In the last few years, many state governments throughout Australia have stepped up mine closure efforts in an attempt to address public safety concerns. Abandoned mines can pose a serious hazard to any members of the public foolish enough to investigate them. They are prone to rock falls and often contain 'bad' oxygen deficient air and where coal seams are exposed, the potential for fire. Thousands of these abandoned mines on both public and private lands

throughout Australia provide a significant management issue for mineral resources agencies.

Abandoned mines are currently closed by either backfilling, sealing with concrete or blasting. Through the effective use of mine gates, abandoned mines can be safely sealed while allowing bat populations unimpeded access. Unfortunately, mine closures have occurred without sufficient consideration of bats and their habitat, due to an inadequate knowledge of bats, their habitat requirements and effective survey techniques.

America has realised the devastation of bat habitat that has occurred and now has begun a vigorous campaign to educate the relevant organisations in all US states.

My own experience with this issue started when an abandoned mine west of the Blue Mountains was resumed into National Park. The relevant mining corporation was concerned about the public safety aspects of this mine and was still keen to close it with traditional methods. The Review of Environmental Factors (REF) for this mine stated that it was 'not considered suitable habitat for bats'. As the Ranger for the area is a friend, I suggested that we go and stand outside the mine at dusk and see if any bats emerged. Needless to say lots of bats flew out of the mine !! I went back to the mine a few nights later with a bat detector and detected the Large Bent-wing Bat (*Miniopterus schreibersii*) and the Eastern Horseshoe Bat (*Rhinolophus megaphyllus*). To cut a long story short, the mine is now gated and the bats continue to live there.

While recognising that mine closure and rehabilitation is desirable from a public safety and aesthetic viewpoint, it is essential to acknowledge that these mines now provide important habitat for bat species and that thorough survey procedures and bat-friendly mine closures be implemented.

I feel that the Australasian Bat Society has the potential to have an important role in conserving abandoned mines for bats by liaising with, assisting and educating the organisations involved in mine closures on an Australia-wide basis. A register of abandoned mines that are utilised by bats could be established in each state and monitored by members.



## STATE ROUNDUPS:

### QUEENSLAND:

#### Les Hall

University Of Queensland

David Rounsvell from the Queensland Department of the Environment (QDE) has formed a bat recovery team for Queensland and several meetings have taken place. The first species to be considered is the Grey-headed Flying Fox, and members for this species recovery team will include a wide range of local people involved with flying foxes as well as co-opted members from NSW.

Professor Robert Barclay, a well known bat researcher from the University of Calgary, Canada, is spending a years study leave at the University of Queensland (till June 1998). Robert is interested in calcium balance in flying foxes and will be working with Les Hall and Patrina Birt. Robert will also be looking at factors influencing roost selection in the microchiroptera, and will do some telemetry work on White-striped Free-tail and Yellow-bellied Sheath-tail-bats with Martin Rhodes.

Jack Pettigrew from the Vision Touch and Hearing Research Centre continues his interest in the diphyletic origin of bats, and has been doing some optical imaging of flying fox brains.

Patrina Birt is well into her PhD project on the ecology of Little Red Flying Foxes and has been following radio-collared bats in central Queensland. Patrina is also collecting nectar and pollen samples. A paper on some of Patrina's work on megachiropteran tongues will soon appear in AJZ.

The Queensland DPI has three PhD students working on various projects involving viruses in flying foxes. The team is led by Dr Peter Young. Hume Field is researching the epidemiology and natural history of Equine Morbillivirus in flying foxes and is attempting to answer such questions as how common is the virus, how is it transmitted, how long has it been in Australia, and does it occur in other animals apart from flying foxes? Kim Halpin is looking at the molecular biology of bat viruses and has just spent two weeks at the Australian Animal Health Laboratories, CSIRO, Geelong. Janine Barrett has just commenced a study on the pathology associated with infection in flying foxes.

The two Martins are nearing the completion of their PhDs. The topic of Martin Rhodes' thesis was the foraging ecology of the insectivorous bat community in southeast Queensland, and several papers by Martin recently appeared in *Australian Zoologist*. Martin Schulz has been working on the ecology of the Golden-tipped Bat, and also has a series of papers appearing on this bat, *Murina florium*, and several other bat related topics, in various stages of publication.

Nikki Marcus has commenced her PhD on the behaviour of the Black Flying Fox. Nikki will be intergrating her work with that of the DPI team. Nikki is also interested in public education and the use of flying foxes as display animals.

Linda Reinhold is doing her BSc Honours on *Miniopterus* taxonomy and genetics. Her work has opened a proverbial can of worms in relation to identifying species from northern Australia and New Guinea. Terry Reardon is helping out with genetic analysis and providing specimens he collected in New Guinea. Linda was able to borrow four specimens from the type locality (Hungary) from the National Wildlife Collection, CSIRO, Canberra, for comparison.

Nancy Irwin, who graduated from the University of Aberdeen, is doing her PhD on the ecology and genetics of *Nyctimene* in New Guinea. Nancy is enrolled at the University of Queensland, but will spend much of her time working in New Guinea.

Taj Abdullah from the University of Malaysia, Kuching, Sarawak, is at the University of Queensland for a year doing the genetic analysis of wing puncture samples from *Cynopterus brachyotis*, collected in Borneo and Southeast Asia. Taj has completed his ecological studies on *Cynopterus* in Borneo, and he and Les Hall have a number of papers on Borneo bats in various stages of production.

In the Queensland Department of Natural Resources (Forestry), Maritza De Oliveira continues her work on producing a call library for Anabat detectors as well as her studies on forest bats. A paper on the use of Anabat in the D'Aguillar Range is about to be submitted. Adrian Borsboom (DNR) has been producing data sheets on threatened, rare, and endangered plant and animal species for forestry managers. Five bat species have been done in this series by Adrian and Les Hall.

Bruce Thompson is now at QDE at Toowoomba. Bruce has a bat project in the Bunya Mountains and has become involved in the gating of old mines. Recently, Bruce successfully designed and tested a bat-friendly gate which was used to permanently close a coal mine near Bundaberg. This was an important step in recognising this problem with old mines. There is a paper about the importance of abandoned mines for bats, written by Les Hall, Greg Richards, Norm MacKenzie and Nick Dunlop, published in the recent book produced by the Centre of Conservation Biology, titled "Conservation Outside Nature Reserves".

Ian Gynther and David Stewart (QDE) are working on the Regional Forest Assessment survey. With the help of Martin Schulz and David Hannah they have provided a lot of new bat records for Queensland forests and have changed a few traditional ideas about some species. Ian, Les Hall and Martin Rhodes are writing up the results of five years trapping of bats in Brisbane Forest Park.



## **CRA's & RFA's - OR, SOME NOTES ON PROGRESS TOWARDS A NATIONAL FOREST RESERVE SYSTEM**

**Peggy Eby**

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Since 1992 the Commonwealth and State and Territory governments have been working towards resolving ongoing conflicts over land use in the forests of Australia. One part of this joint initiative is the establishment of a national forest reserve system. The national system is being planned and negotiated at a regional level, and the background information for reserve nominations is being gathered through Comprehensive Regional Assessments (CRAs) of the environmental, economic, social, heritage and Aboriginal values of Australia's forests. Various members of the ABS have been working behind the scenes to ensure the conservation and management needs of bats are being considered in the CRAs - so that they will ultimately be considered in the reserve system. Most recently, in NSW Brad Law, Doug Mills and Harry Parnaby have made recommendations for reserve areas for bats in the Eden Forest Region - the final reserves for this region are being negotiated now! While in Queensland, the newly-formed Threatened Bat Network is forming recovery teams to represent threatened species in that state in local CRAs.

The Queensland Threatened Species Network is an open forum which brings together expertise from various interested parties to work toward effective conservation action for bats. The group (which includes many ABS members) has held a series of meetings over the past few months in which species recovery teams were formed for Spectacled and Grey-headed Flying-foxes and research and management priorities for bats in Queensland were debated. One member of the group, Bruce Thomson, designed, built and installed bat gates for mines which have been approved by the Queensland Dept of Mines and Energy!!! Great stuff!

The TBN publishes a newsletter. Anyone interested in joining the mailing list should contact:

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## REQUESTS FOR INFORMATION:

### **CALL DIALECTS IN THE COMMON BENTWING-BAT *MINIOPTERUS SCHREIBERSII* - ANABAT CALL FILES FROM THE AUSTRALASIAN REGION WANTED.**

#### **Lawrie Conole**

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Information I have collected in the form of Anabat call sequence files suggests that the calls of the Common Bentwing-bat *Miniopterus schreibersii* in eastern Australia fall into two broad dialectal groups, or phonotypes.

For want of a better description, the "southwestern dialect" from southeastern South Australia and southwestern Victoria is composed of steep pulses and is consistently higher in average frequency (48-50 kHz) than the flatter, lower frequency calls of the "eastern dialect" (43-46 kHz) found from eastern Victoria through to north Queensland. I have some calls from the Top End population, recorded at Kapalga by Maritza de Oliveira, but would welcome other Top End calls.

Since pointing out the existence of these phonotypes to a few other bat workers, the distinction in Victoria at least has been confirmed by Simon Jolly and Cath Caddle. Belinda Cardinal from Deakin University has attempted to discern genetic differences between the phonotypes, by collecting wing punches for DNA analysis at the main maternity sites in Victoria and South Australia (see last newsletter), and should be reporting her findings soon.

I am now interested in analysing *M. schreibersii* calls from throughout the species entire range in Australia, to see if there are just two phonotypes, or perhaps a whole series of regional variations associated with the main maternity sites. Several bat workers (Terry Reardon, Ken Sanderson, Maritza de Oliveira, Greg Richards, Cath Caddle, Alex Kutt, Linda Reinhold) have already generously provided me with Anabat call files of *M. schreibersii* from South Australia, eastern Victoria, New South Wales, Queensland and the Northern Territory. Further calls from central, north and far north Queensland, and the Top End of the Northern Territory and Western Australia would be very useful. Any from New Guinea or southeast Asia would obviously be of interest too!

To be suitable for comparison to the calls I already have, the recordings should if possible be of free flying bats outside the roost, as clean as possible of noise, and positively identified as *M. schreibersii*. All contributions will be fully acknowledged in any resulting publication.

As alluded to elsewhere in this newsletter, the taxonomy of northern Australian and New Guinea *Miniopterus* is complex (see Linda Reinhold's thesis summary in this issue). My preliminary analysis shows that the call characteristics of Northern Territory *M. schreibersii* cluster loosely on the periphery of the Queensland group, but both are distinct from the South Australian/western Victorian group. It will be interesting to see if this reflects relationships observed in the genetic and morphometric analyses

## **BIBLIOGRAPHY OF THE MEGACHIROPTERA**

#### **Rick Spaulding**

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I have a request of bat researchers. While doing a literature search for another project I realized that I had accumulated quite a reference collection for *Pteropus*, and Megachiroptera in general. With that seed planted, I have begun compiling a bibliography of the Megachiroptera of the world. So far I have approx. 700 actual physical copies of references and an additional 1,500 citations to be entered and categorized according to keywords in a computerized bibliographic database.

To this end I ask for your help. I would greatly appreciate any references that anyone might have relating to Megachiroptera. Any reference will do: government reports, journal papers, popular magazine articles (e.g., Natural History), books and book chapters, symposia and proceedings, etc. I will not include abstracts from meetings but am

including foreign language articles. An actual copy or reprint would be preferred as I can then enter keywords into my database and check the lit cited; but even a list of references would be most helpful.

I hope to make the bibliography available by publishing it, putting up a web page, or just plain distributing it on my own. I envision it being arranged by genus (*Acerodon*, *Haplonycteris*, *Myonycteris*, *Pteropus*, *Rousettus*, etc.) and subdivided into key topics such as diseases and parasites, taxonomy, conservation and management, genetics, ecology, diet, physiology, reproduction, etc. Any ideas or suggestions regarding publishing, format, etc. would also be greatly appreciated.

Reference lists or suggestions can be sent via the email address below. Reprints or copies of articles and hard copy reference lists would be greatly appreciated and can be sent to the mailing address below.

Thanks for your time and consideration and I hope to hear from you.



## CONTRIBUTIONS:

### CURRENT RESEARCH ON AUSTRALIAN BAT LYSSAVIRUS AND EQUINE MORBILLIVIRUS

**Ken McColl<sup>1</sup>, Hume Field<sup>2</sup> & Kim Halpin<sup>2</sup>**

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<sup>2</sup>Queensland DPI-Animal Research Institute (ARI), Locked Bag 4, Moorooka, Qld, 4105

In September, 1994, equine morbillivirus (EMV) was discovered in Australia, and, shortly after, in May, 1996, Australian bat lyssavirus (ABL) was also identified. Both viruses are known to be zoonotic in that they have each been responsible for at least one human death. While EMV is also known to have killed horses and experimental cats and guinea pigs, other terrestrial mammals that could be potential targets of ABL have not yet been identified. In addition, each virus is capable of infecting bats and, in the case of ABL, of killing bats. However, there is a dearth of information on the geographical distribution of the diseases in Australian bats, the number of species of bats that are affected, and the role of bats in maintaining each disease. The aim of this report is to provide some of the most recent data generated at AAHL and ARI that addresses these issues, and to briefly mention current research that is being conducted on ABL and EMV at each organization.

#### ***Australian bat lyssavirus***

*CSIRO-Australian Animal Health Laboratory*

Since the index case of ABL was discovered in a Black Flying-fox *Pteropus alecto* at Ballina, NSW in May 1996, Ross Lunt, Peter Hooper and Allan Gould have confirmed a further 35 cases in bats (including retrospective cases from stored material at James Cook University, Townsville). Viral antigen has been found in: 15 Little Red Flying-fox *P. scapulatus*, 8 *P. alecto*, 1 Grey-headed Flying-fox *P. poliocephalus*, 1 Spectacled Flying-fox *P. conspicillatus*, 4 Yellow-bellied Sheath-tail-bat *Saccolaimus flaviventris*, 2 unidentified flying foxes, and 5 unidentified insectivorous bats. In addition, 13 of 81 (16%) bats have been shown to have antibodies to ABL. Unfortunately, we have been unable to identify a source of bat sera that have been collected and stored over many years; access to such a collection would provide the opportunity to look for evidence of antibodies to ABL, which, in turn, might provide some indication of how long this virus has been present in Australian bats.

ABL has been identified through much of the range of fruit bats in Australia, ie, in bats collected from Darwin, from almost the entire east coast of Australia, and from inland as far as Dubbo. The absence of cases from the remaining range of fruit bats may simply be because it has not been looked for in those areas. It is not possible to state the prevalence of infection in fruit bats. However, when the disease was first described and AAHL was doing all the testing, 18 positive cases were found out of 300 bats collected from around the nation. Since regional screening of bats has been introduced, Barry Rodwell at ARI has found 26 positive cases out of 897 bats that have been examined (approximately 400 fruit bats, and the remainder insectivorous bats). While these figures may suggest a prevalence of infection of 3-6% in Australian bats, we should not be tempted to over-interpret these prevalence data. There are many biases inherent in the current data. For example, it is possible that only easily accessible animals have been collected, ie, those close to suburbia, those that are sick and injured, or those that are obviously behaving abnormally. There is a clear need for a statistically-sound, prospective survey of various species and geographical populations of flying foxes. Until these studies are conducted, the proportion of a particular species in a particular region that is affected can only be estimated (eg, although it is possible that < 6% of all bats are positive for the virus, 4/4 *S. flaviventris* that Barry has examined have proven positive!).

Apart from the diagnostic and monitoring service on bats, wildlife, domestic animals and humans, research work on ABL continues at AAHL. Ross Lunt is attempting to develop robust, more specific tests for ABL (currently rabies reagents are used to identify virus and viral antibodies), and, as part of this project, he is collaborating with Allan Gould who is aiming to produce synthetic viral proteins that can be used for the specific diagnosis of ABL. Allan is also using molecular biological methods to compare gene sequences between ABL isolates from different species of bats, from archival samples of bats, and from bats collected from different regions of Australia. Not only may this assist him to develop better diagnostic methods, but it may also provide us with some indication of when ABL first appeared in Australian bats. In collaboration with Peter Daniels, Allan also aims to identify if ABL is present in bats from south-east Asia. Ken McColl is beginning pathogenesis studies on ABL in bats, ie, how does the disease develop in bats; when and from where is virus excreted in bats; is death inevitable in bats; how does the onset of clinical signs correlate with excretion of virus; etc. He will also be testing the susceptibility of other species, such as dogs and cats, to ABL, and he will be examining the value of rabies vaccines in protecting bats from infection with ABL.

*Queensland DPI-Animal Research Institute (ARI)*

ARI's lyssavirus research has two directions. Diagnostic work by Barry Rodwell and his team is continuing on animals presented by National Parks & Wildlife Services, carer groups, and the general public. Barry's lab is now performing

ABL fluorescent antibody tests on brain impression smears, rather than this being done at AAHL. All lyssavirus isolation work is still done at AAHL however.

Hume Field at ARI is also carrying out epidemiological/natural history investigations in known ABL-infected species, trying to find all the pieces of the ABL-in-Australia jigsaw, and fit the pieces together! Hume is also screening other bat species for evidence of infection.

### ***Equine morbillivirus***

#### Queensland DPI-Animal Research Institute (ARI)

Equine morbillivirus/bat paramyxovirus (BPV) research is taking place on three fronts at ARI. Kim Halpin is looking at the molecular biology of the bat virus isolate and making comparisons with the equine isolates. Hume Field is also looking at the epidemiology/natural history of this virus in flying foxes, attempting to answer such questions as how common is the virus, how is it transmitted, how long has it been in Australia, does it occur in species other than flying foxes. Soon to commence, Janine Barrett will be looking at the pathology associated with infection in flying foxes.

#### ARI compares EMV and BPV isolates

Kim recently spent three weeks at AAHL. The purpose of the visit was to allow Kim to evaluate the degree of similarity between equine morbillivirus, isolated from horses in 1994, and ARI's bat paramyxovirus, isolated from flying foxes in 1996. Clarifying the relationship between EMV and bat paramyxovirus is of primary importance, particularly with regard to the possible renaming of both EMV and BPV. Kim has now sequenced over 60% of the entire genome of the bat isolate. She has found no significant differences with the EMV horse isolate genome. Likewise, when comparing the proteins which constitute these viruses, the two appeared identical. These findings continue to support our contention that the virus known as EMV and BPV are one and the same.

#### First NSW isolate of BPV made at ARI

In July, both NSW and Qld Departments of Primary Industry were informed by the ARI research team about the isolation of paramyxovirus from a NSW neonate flying fox. Though antibodies had previously been found (indicating past exposure to infection), this is the first time virus has been found in NSW. A neonatal grey headed flying fox was found on the ground on 7/10/96 in bushland at North Ryde. Placenta was still attached. Animal survived in care until 9/10/96 pm. The body was refrigerated where it stayed until shipment to the ARI, Brisbane on 18/10/96. It was post mortemed on the afternoon of 18/10/96 and notes were made that its carcass was relatively fresh. Following inoculation of tissue homogenates in cells, virus was detected. This isolate then underwent numerous tests to confirm its identification. Samples from the kidney, liver and lung returned positive results by immunofluorescence, PCR and electron microscopy.

This brings the total number of ARI bat paramyxovirus isolates to five, the other four all being from the Brisbane area. The virus has been isolated in black, grey-headed and little red flying foxes.

#### ARI analyzes orphan flying fox data

Hume is presently undertaking an analysis of preliminary data to see if variables such as species, age, and location affect the prevalence of BPV infection in flying foxes. Some of these data are from a collaborative serological survey of orphans undertaken by ARI with carer groups in south-east Queensland - primarily ONARR (Orphan Native Animal Rear & Release) and also Noah's Ark. Over 120 black and grey-headed orphans were microchipped and blood sampled by us at creching earlier this year.

Our preliminary results from the orphan survey indicate that a significantly higher proportion of orphans have antibodies to EMV than do adults. At this stage, we are not able to say whether the orphan antibodies are 'maternal' (a result of some previous infection in the mother, and passed to the baby via the placenta or colostrum), or if they are a result of early active infection in the orphan. None of the orphans had virus in their blood at the time of testing.

This season, we aim to collect data on the proportion of pregnant females with antibodies, and, in collaboration again with carer groups, we plan to repeat our serological survey of orphans in south-east Queensland. Sincere thanks to rearers for their interest and cooperation.

#### ARI team finds antibodies to EMV in Papua New Guinea (PNG) bats

We have found antibodies to EMV in two PNG species... *Pteropus neohibernicus* (Bismarck fruit bat), and *Dobsonia moluccense* (Bare-backed fruit bat). *D. moluccense* also occurs in eastern Cape York peninsula, but no Australian samples have been tested because of the species rare status here. This work was done in collaboration with John Mackenzie from the University of Queensland (Dept of Microbiology) and Moses Bokari from the Institute of Medical Research at Goroka in PNG.

#### CSIRO-Australian Animal Health Laboratory

At AAHL, Bryan Eaton is using the biohazard level 4 facilities, where researchers wear protective "space suits", to grow and purify EMV. Purified virus is needed to characterise both the genome and the proteins of the virus. Lin-Fa Wang has recently determined the complete nucleotide sequence of the EMV genome. It's length of over 18,300 nucleotides is staggering, considering that the genome size of all other known members of the Paramyxovirus family is only approximately 16,000 nucleotides. The order of genes along the EMV genome is the same as that for morbilliviruses but

comparison of the nucleotide sequence of individual genes indicates that EMV differs significantly from other morbilliviruses. The virus is almost certainly the first representative of a new group of viruses in the Paramyxovirus family. Knowledge of the complete nucleotide sequence of the EMV genome indicates that the name equine morbillivirus is inappropriate, as is the name bat paramyxovirus, and it is suggested that the virus be called Hendra virus (HeV), after the Brisbane suburb where it was first isolated.

Lin-Fa has also generated a panel of antisera to individual EMV (HeV) proteins, and John White is making monoclonal antibodies to virus proteins. Both polyclonal and monoclonal antibodies will be used to develop new diagnostic tests and to study virus structure and replication in cells in culture and in infected animals. Current methods to titre EMV and detect neutralising antibody require at least 3 or 4 days. Gary Cramieri has developed a rapid method to assay EMV (HeV) within 24 hours. The assay makes use of antiserum made to a portion of one of the virus proteins which was made in bacteria by Lin-Fa.

Mark Williamson and Peter Hooper have shown that EMV replicates in the endothelial cells of susceptible animals, such as cats, horses and guinea pigs, infected in AAHL's high security animal facility. Endothelial cells line blood vessels. To characterise the infection of endothelial cells, Bryan and Mark are examining the interaction between EMV and these cells in order to determine if the virus enters the cells at the surface lining the blood vessel or from the cell surface which is in contact with the underlying tissues. This will provide information on how EMV causes infection and spreads throughout the body during disease.

The authors wish to thank Dr Bryan Eaton, AAHL, for his contribution to this short review.



# OUTLINE AND RATIONALE OF A STUDY OF ROOST PREFERENCES AND FORAGING AREAS OF THE EASTERN FOREST BAT (*VESPADELUS PUMILUS*) ON THE MID-NORTH COAST OF NSW.

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A basic need for the effective management of bats and other fauna in areas of timber harvesting is a good understanding of their habitat requirements. In recent years intensive survey work has revealed much about the distribution of many bat species, however the ability of this group to move throughout the landscape means that distributional records provide little ecological information on the two critical resources used by bats (roosts and foraging areas) and thus are of little help in formulating prescriptions for the protection of the group.

Radio-tracking studies on insectivorous forest bats (see Law 1996 for a review) have been more effective in filling these gaps, but at present only a handful of studies have been published. All have been undertaken in cooler forests of southern Australia and thus we do not know the extent to which results can be extrapolated to areas such as northern NSW or southern Queensland. In addition, only roost preferences have been determined. We should not say *only* as this valuable information has revealed that recent regrowth forest provides poor roosting habitat and that some species of bats selectively roost in large, mature trees that typically grow in gullies (Lunney et al., 1988; Taylor and Savva, 1988). This has significant implications since it suggests that riparian buffer strips, primarily retained for protection of water quality and aquatic habitats, may provide an effective method for protecting bat roosting habitat. However, the effectiveness of this prescription for bats is yet to be tested and it is unknown how common this roosting pattern is amongst a wider range of bat species. For instance, most studies have been restricted to bats of a medium body size (6-10g). Anecdotally, smaller species (*Vespadelus*) are thought to be more flexible, using a variety of roost types including crevices beneath bark.

The past effort on determining roost preferences has meant very little is known about foraging areas for most species of Australian bats. Because of the difficulty of studying foraging bats it is not surprising that the deceptively simple question, to what extent do bats forage in regrowth forest, has not been adequately answered. However, this is a key question for management as Recher *et al.* (1987) suggested that retained reserves will not ensure the viability of populations in the long term if adjacent areas of logged forest do not provide suitable habitat. Given the current emphasis on protecting riparian areas it is also important to investigate whether bats are most active in these locations.

In an effort to address the issues of the extent to which bats forage in regrowth forest and how roosting preferences in northern NSW differ from those in the south, we undertook a radio-tracking study on the Eastern Forest Bat *Vespadelus pumilus*. Previously *V. pumilus* was known as the Little Cave Eptesicus, however a recent taxonomic revision of the genus separated the cave-dwelling species of Western Australia from the species (*V. pumilus*) in the east. Little is known of the roost preferences or biology of *V. pumilus*, although it is thought to prefer moist forests (Parnaby 1995). Its distribution now ranges along the east coast from just north of Sydney to scattered populations in northern Australia. It weighs just 4-5 g and forages for small insects below the level of the canopy.

We radio-tracked *V. pumilus* over four tracking sessions between April 1995 and April 1997. Roost preferences and foraging areas of bats were determined at two times of the year. Firstly, during the maternity season (late spring) when females congregate and then just prior to the onset of winter when hibernation and breeding occurs and thermoregulatory requirements are likely to be different. Two sites, matched for their similarity in forest types (moist Flooded Gum and Blackbutt), were chosen to contrast habitat use by these bats under different disturbance regimes. The sites were located in Lorne State Forest within the Kendall-Cooperook ESM (Ecologically Sustainable Management) study area on the mid-north coast of NSW. Lorne Flora Reserve (LFR), a 182 ha reserve, has experienced only minimal disturbance from light selective logging in the past and is surrounded by eucalypt plantations and regrowth. Swan's Crossing, 3.1 km from LFR, is primarily a mix of regrowth forest and eucalypt plantation established in the early 1970s on land previously run as a dairy farm. Eucalypt hollows are scarce at Swan's Crossing, but abundant at LFR. Rainforest in steep gullies at Swan's Crossing supports some hollows.

Roost preferences have been investigated according to tree species, diameter and height by comparing trees used by radio-tagged bats with trees in randomly located plots. Random plots were stratified by topographical position to examine how hollow availability varies between gullies and ridges. Aspect and topographical location were also recorded for roost trees. Foraging data were collected by simultaneously triangulating locations of bats. The error involved in using this technique on flying bats is somewhat large, in the order of + 100m, however it is not prohibitive if relating movements to the broad spatial scale of disturbance histories in our study areas. More precise information on relative activity levels in gullies versus ridges was collected with remotely deployed bat detectors (Anabat). Paired ridge/gully sampling avoided the problem of nightly differences in bat activity.

We tracked a total of 38 *V. pumilus*, 8-10 in each session. We are busily analysing this data and expect answers to our study aims shortly. Briefly, females formed maternity colonies during spring, while males usually roosted solitarily. Hollows within trunks or branches were the most frequently used roost type. Bats caught on the boundary of Lorne Flora Reserve showed a strong preference for roosting in mature forest, however bats at Swan's Crossing did not have this option. In this intensively managed forest they were able to find roosts in a variety of locations including hollows in remnant rainforest trees within a gully, occasional remnant eucalypt stags and understorey *Acacia* and *Allocasuarina*. Foraging areas were relatively small and were in the vicinity of trap locations and roost trees. Detailed analysis of these results will help to reveal how habitat use varies between these two areas of different disturbance histories and what management recommendations will help to conserve the species within a program of timber harvesting.

### Acknowledgements

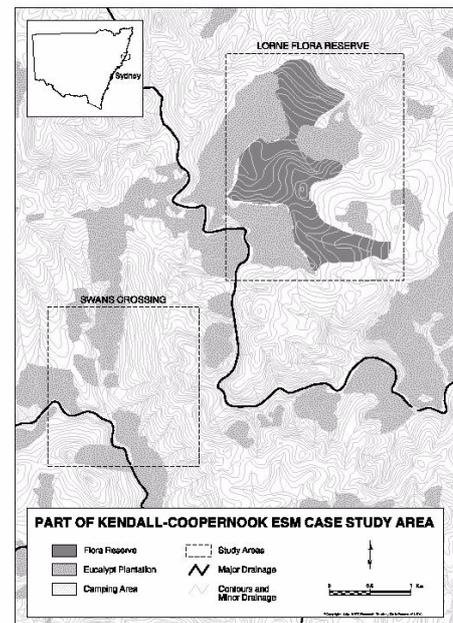
Many thanks to Alison Towerton for preparation of the GIS study area map.

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Fig 1: Two radio-tracking study areas, Lorne Flora Reserve and Swan's Crossing, within part of State Forests of NSW Kendall-Cooperook ESM (Ecologically Sustainable Management) Case Study Area. Distribution of plantations, mature forest (Flora Reserve) and regrowth (unshaded) are shown.



## TOUGH TIMES FOR FLYING-FOXES IN THE TOP END

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### Introduction and summary

Flying-foxes have had a torrid 12 months in the Northern Territory. Late last year they were identified as carriers of a Lyssavirus known to be fatal to humans (Tidemann *et al.* 1997). This may have resulted in the persecution of some colonies, although there is no proof of this. During the first half of 1997 flying-foxes were under great stress as indicated by a change in the pattern of occupation of some colonies, the poor body condition of trapped animals, the record number of animals collected by the Parks and Wildlife Commission, and the adoption of daytime foraging by adult animals. The 1996/97 wet season was the wettest on record and this damaged roosting vegetation and probably affected food availability.

### Lyssavirus

Only one Northern Territory bat, a Little Red Flying-fox, has been found to carry Australian Bat Lyssavirus (Tidemann *et al.* 1997), although 71 were tested between October 1996 and June 1997. Of the bats tested, 44 were Black Flying-foxes, 5 were Little Red Flying-foxes, and 22 were "other species". However, the true prevalence of the virus in the Northern Territory (or elsewhere in Australia) remains unknown. The bats tested so far have been biased towards sick animals, which may lead to an overestimate of the occurrence of the virus in the wild population. A systematic sampling of the wild population is the only way to gauge the potential threat to public health.

The response to Lyssavirus by the government agencies of the Northern Territory was pragmatic, although ad hoc. The Parks and Wildlife Commission (PWC) revoked the permits of researchers and rehabilitators who worked with the flying-foxes until they had been vaccinated against Lyssavirus and at the same time organised to have their own staff vaccinated. Staff from the Department of Primary Industries and Fisheries (DPIF) were also vaccinated and collected tissue samples for testing from animals provided by the PWC in the normal course their work (ie. no active program of collection was implemented). Aboriginal people, many of which continue to eat large numbers of flying-foxes (Vardon *et al.* 1997), were advised of the potential health risk through the distribution of a leaflet. The leaflet urged people to take care when hunting and to thoroughly cook flying-foxes.

### Hungry, skinny and dead flying-foxes

A variety of information suggests that flying-foxes were experiencing a food shortage in early 1997. All mainland Australian flying-foxes are normally nocturnal foragers. However, beginning in mid-March 1997 some Black Flying-foxes were observed flying in the late afternoon (5 PM onwards) in a variety of locations around Darwin (M. Vardon and C. Trewin, pers. obs). This behaviour has not been seen or reported in the previous three years.

A colony of flying-foxes at Rapid Creek in suburban Darwin has been monitored via exit counts and ground transects since July 1994. At the colony, the mean exit time in April and May 1997 was 6:28 PM (N=4) and 6:18 (N=4) respectively, which is around 30 minutes early than in the previous two years: the earliest recorded departure was 6:16pm in May 1997 (M. Vardon and C. Trewin, unpublished).

Harp trapping (Tidemann and Loughland 1993) has occurred on the Mary River in 1992, 1996 and 1997. Of the animals caught, the mean body condition (weight/forearm) of adult animals (adult = forearm > 170 mm) trapped in May 1997 was 3.73 significantly lower than those trapped in the same month in 1992 (4.01) (unpaired t-test, DF=109, p<0.003). No animals were trapped in May 1996.

The PWC collected more flying-foxes in March 1997 than in other month for which records exist (Table 1). Many of these animals were in very poor condition: one adult female was only 400g (forearm 173.5mm)(A. Janmaat, unpublished). Some of these animals were behaving aggressively and they were thought likely to have Lyssavirus. Tests for the virus were negative and it is possible that this behaviour was induced by starvation.

The availability of native foods suitable for flying-foxes is thought to have been lower in 1997 than in other years, although hard data on this lacking. In the Darwin region native figs were not as profuse as last year (Christine Bach<sup>1</sup>, pers. com.), while the flowerings of bloodwoods were poor (Franklin<sup>2</sup>, pers. com.). These observations may be related to the record level rain falling in the Darwin region over the 1996-97 wet season.

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<sup>2</sup> Scientist, Parks and Wildlife Commission

When rainfall data (Table 2) and flying-fox collection records (Table 1) are viewed together, there is some support for this notion. Both the 1991/92 and 1996/97 wet seasons received above average rainfall, and the number of flying-foxes collected in these years was very high when compared to other years. However, rainfall in the 1994/95 wet season was also high but the number of animals collected was not large. Thus the amount of wet season rainfall does not in itself explain the observed results. It may be that the timing of rain is as important as the amount of it. Other factors may also be involved.

### **Disruption to colonies**

Several colonies in the Northern Territory have been under observation for around 3 years. For three of these regular patterns seemed evident, but were disturbed in 1997.

In the past two years Black Flying-foxes have arrived at Adelaide River Township towards the end of February. This did not happen in 1997. Many of the bamboo clumps used for roosting were flattened by floodwaters, which were, judging by the height of debris, at least 12 meters above the usual river height. As well as this damage, access to the colony was made easier for people as water swept away much of the understorey and fallen branches. Aboriginal people were camped near the area, and had lit cooking fires beneath where the colony normally occurs. Deliberate actions by local people to deter flying-foxes from the area cannot be discounted.

For the colony on the Mary River, in May this year the colony numbered less than 2,000 animals, which is well down on 1996 when more than 15,000 were in residence (M. Vardon, unpublished). Systematic estimates of the population were not made for the years 1992-1995 but PWC staff based in the area believe the colony to be the smallest they have ever seen it.

The flying-fox colony at Rapid Creek is mostly made-up of Black Flying-foxes although Little Red Flying-foxes appear sporadically. The pattern of occupation in 1997 has been different from that seen other years (M. Vardon and C. Trewin, unpublished). In 1995 and 1996 June has been the time when numbers are at their lowest (around 500) but in 1997 more than 2,000 were present. Many of these were Little Red Flying-foxes which, prior to 1997 had not been recorded in the colony between April-October. It was also the first time suckling young of the Little Red Flying-fox were observed in the colony. Also small groups, and even solitary animals, have been reported roosting in a number of locations in the Darwin (M. Vardon, C. Trewin and W. Bergan unpublished). Rapid Creek was also subject to flooding, with water levels such that the tops of the trees used for roosting would have been only a few metres above the water for a short period of time (<day).

### **Conclusion**

Early in 1997 flying-foxes were suffering a natural food shortage that has probably: altered the distribution and size of some colonies; limited the survival of pups born, and; increased rates of mortality in older animals. The timing and amount of rainfall are proposed as the underlying cause of the food shortage. At present there is no indication that Lyssavirus has caused appreciable levels of harm to bats or people in the Northern Territory. However, there is a risk of persecution of flying-foxes by people fearful of the diseases they may carry.

### **Acknowledgment**

This article was improved by comments from Chris Tidemann (Australian National University) and Dave Hird (PWC).

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**Table 1.** Number of flying-foxes collected by the Parks and Wildlife Commission of the Northern Territory. Source: PWC (unpublished records)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot.
1989	-	-	-	-	-	-	-	-	-	-	-	3	-
1990	-	-	-	-	-	-	-	-	2	2	0	2	-
1991	0	6	19	4	3	4	5	9	2	0	3	4	59
1992	1	3	0	0	0	2	0	0	0	1	1	1	9
1993	2	0	1	0	2	1	1	5	2	0	1	0	15
1994	0	2	1	1	0	1	0	0	1	0	0	0	6
1995	0	4	2	1	5	0	7	2	3	5	1	2	32
1996	0	3	0	2	1	0	0	7	5	3	2	1	20
1997	3	9	25	14	4								

**Table 2.** Rainfall (mm) at Darwin Airport 1989-1997. Source: Bureau of Meteorology, Darwin.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1989	267.8	161.8	573.8	184.6	4.0	1.8	0.0	0.0	0.0	25.0	40.2	221.4
1990	712.4	152.8	219.4	151.0	59.6	1.2	0.0	0.0	0.0	6.0	158.8	289.6
1991	922.2	578.2	185.0	77.6	0.8	0.0	0.2	0.0	0.2	15.6	177.0	18.8
1992	318.6	129.8	162.6	215.8	1.2	0.2	0.0	0.2	5.4	148.4	185.0	240.2
1993	494.8	271.2	168.4	8.8	16.8	0.0	0.0	3.0	14.2	32.4	90.6	468.8
1994	277.6	435.0	368.0	19.8	17.8	0.4	0.0	0.0	0.0	34.6	66.2	361.2
1995	940.4	249.4	600.8	129.0	44.6	0.6	0.0	7.2	5.8	59.4	219.8	198.4
1996	292.4	274.0	272.0	137.4	0.0	0.0	0.0	1.0	0.6	130.0	108.6	653.2
1997	712.4	434.0	501.4	1.2	124.8	0.0	-	-	-	-	-	-
Mean <sup>1</sup>	431.1	344.0	351.7	97.8	22.1	1.3	1.1	6.2	16.4	71.7	141.1	242.8

<sup>1</sup>mean derived from all available data (1941-1997)



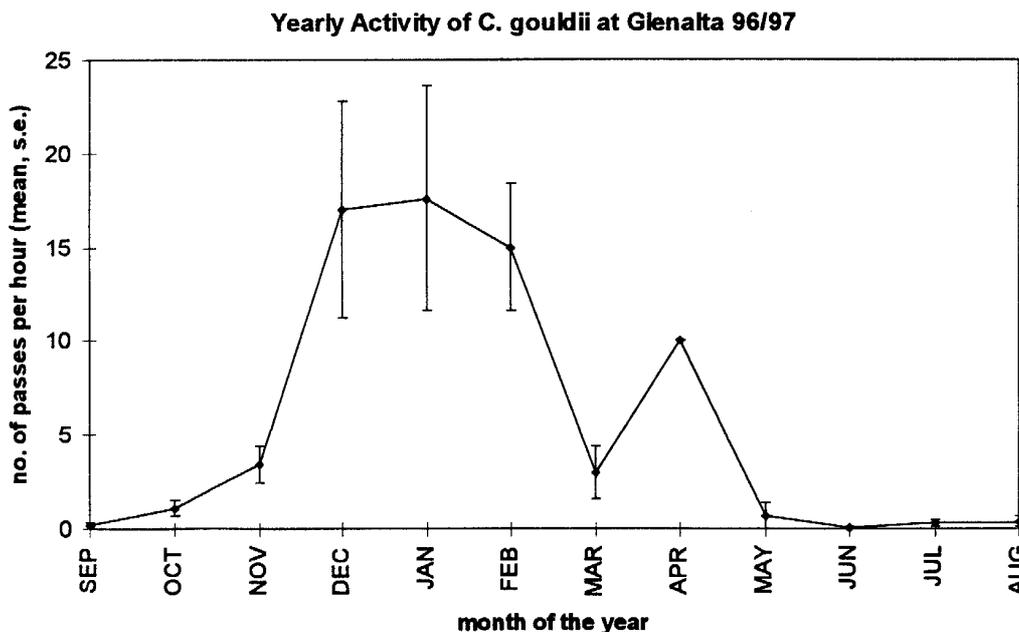
## A BACKYARD SURVEY OF BATS AT GLENALTA, SOUTH AUSTRALIA, MARCH 1996 - MARCH 1997.

**Ken Sanderson**

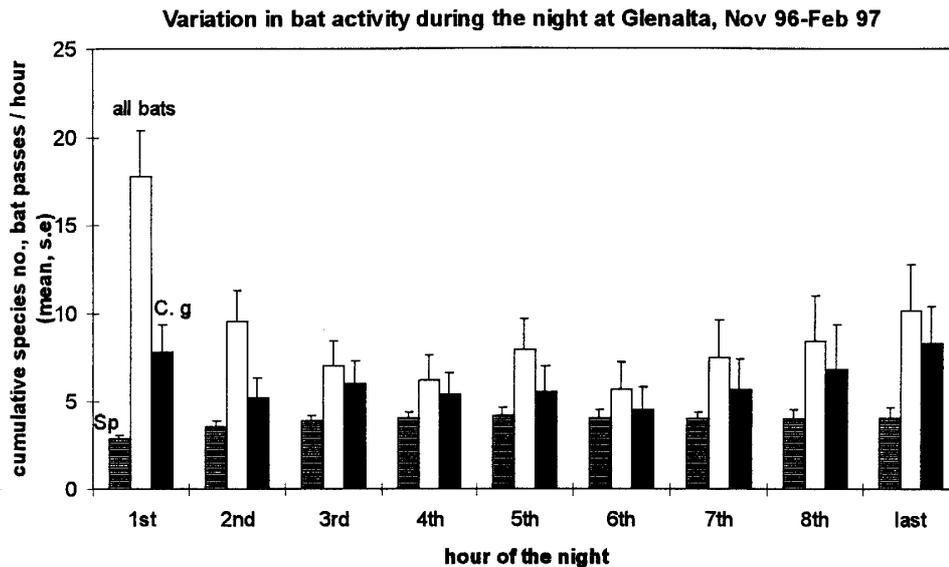
School of Biological Sciences  
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From March 1996 to March 1997, I used the Anabat system to survey bats in my backyard at Glenalta (35° 01'S 138° 38'E), South Australia, which is across the road from the western edge of Belair National Park, and is in the suburb of Adelaide with the highest level of green cover. There were 79 recording sessions, including 54 evening sessions (113.6 h total, session range 0.2-4.75 h, mean length 2.1 h), 9 morning sessions (7.4 h total, session range 0.2-1.7 h, mean length 0.8 h), and 16 overnight sessions from November 1996 to March 1997 (117.1 h total, session range 2.67-10.0 h, mean length 7.3 h), with 1-10 recording sessions per month.

The call data base was 1,521 calls, including 1,053 from Gould's Wattled Bat *Chalinolobus gouldii*, 143 from the Large Forest Bat *Vespadelus darlingtoni*, 243 from the White-striped Freetail-bat *Nyctinomus australis*, 52 from the Southern Freetail-bat *Mormopterus planiceps*, and small numbers (2-13) from the Chocolate Wattled Bat *C. morio*, Southern Forest Bat *V. regulus*, Little Forest Bat *V. vulturinus* and Yellow-bellied Sheath-tail-bat *Saccolaimus flaviventris*. Bat activity was not uniform through the year: *C. gouldii* were mostly inactive in the cooler months, and the activity of other species were also reduced during the cooler months. The number of bat passes of all species were 9.2/h for the period October to March and 1.2/h for the period April to September.



Bat activity was sampled overnight on 16 occasions from November 1996 to February 1997, which allowed for analysis of bat activity every hour through the night. During this period there were 8-9 hours of bat activity in the evening, beginning and ending at about civil twilight. Activity of *C. gouldii* measured as bat detector passes/hour, did not vary a lot during the night. Total bat activity was greatest in the first hour, at more than twice the level of *C. gouldii* activity, and from the third hour onwards was only a little more than the level of *C. gouldii* activity.



Similar sorts of recordings were made at Playford Lake, Belair National Park, about 600 m distant, where the activity of *C. gouldii* was about the same, but the dominant bat species was *V. darlingtoni* with 76% of calls recorded in a total for all species of 2.522 calls.



## PREDATION WITHIN HARP TRAPS

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In 1996, State Forests of NSW (SF NSW) in consultation with NSW National Parks and Wildlife Service (NPWS) formulated a set of Conservation Protocols protocols to address the off reserve management of rare flora and fauna species in State Forests. The Conservation Protocols are designed to complement the creation of a Comprehensive, Adequate and Representative Reserve system by ensuring SF NSW achieve best forest management practice through Ecologically Sustainable Forest Management (ESFM). As part of this process SF NSW must undertake surveys for rare flora, diurnal and nocturnal birds, frogs, arboreal marsupials and microchiropteran bats.

The methods used to survey for microbats include harp trapping and the physical inspection of potential roost sites such as hollow trees, caves, tunnels and disused mine shafts. Where potential Large-footed Myotis *Myotis adversus* or Golden-tipped Bat *Kerivoula papuensis* habitat exists, two harp traps per 200ha are set for a minimum of two consecutive nights. The traps must be set across creeks in appropriate flyways, avoiding windy, cold and rainy weather conditions. The setting of harp traps and inspections of likely roosts is performed by an experienced person. In recent years, there has been an increasing need for both professional and field staff to be trained and experienced in flora and fauna survey. All SF NSW staff conducting microbat surveys have received formal specialised training in microbat survey techniques.

During a recent pre-harvesting survey of Boonanghi State Forest in the Kempsey District several dead microbats were found in a harp trap. The trap was located within an ephemeral gully with water restricted to isolated pools scattered about 20m apart. It was set across the gully several metres above a pool of water about an hour before dusk on a warm July afternoon and situated to utilise the natural flyway created by overhanging vegetation. Black weed mat was positioned around and underneath the trap to funnel bats into the harp trap and increase the chance of captures. The matting and surrounding vegetation was located such that it actually touched the bag and frame of the trap.

On the following morning the trap was checked and found to contain seven individuals from the genus *Vespadelus*. All the animals in the trap had been killed. Four individuals had more than three quarters of their body consumed. One individual was almost totally consumed apart from its wings. The remaining three specimens were relatively intact apart from bites to the head and body.

Fatalities in harp traps are recognised as being an uncommon occurrence (Lumsden 1989; Wallis & Lumsden 1993). Previous fatalities have recognised Bush Rat *Rattus fuscipes* as the main culprit (Lumsden, 1989; Wallis and Lumsden, 1993). In the Boonanghi instance, a positive identification of the culprit could not be established due to a lack of scat evidence. The only evidence of the predator was the presence of two exit holes in the trap. Both holes were located in the extreme upper corners of the canvas bag, and measured 9 x 12 mm and 12 x 13 mm respectively. These exit holes are smaller than those found by Lumsden & Wallis (1993) and would suggest a predator much smaller than *Rattus fuscipes*. Several small carnivores have been recorded in this or surrounding forest areas including the Brown Antechinus *Antechinus stuartii* and the Brush-tailed Phascogale *Phascogale tapoatafa*. Schulz & Meggs (1986), in a survey undertaken in East Gippsland in Victoria, believed the likely predator of bats killed in a harp trap during April 1986 to be the Brown Antechinus. Schulz & Meggs (1986) also note that there were four bats left alive in the same trap.

Bats are thought to be safe once captured in the canvas bag of the harp trap, but overhanging vegetation on ephemeral streams has the potential to provide a means of access by predators to the trap. There is potential for an increased incidence of bat fatalities in harp traps as a result of more survey in narrow streams. Workers locating traps in such narrow fly ways should be very aware of the possibility that predators can and will access traps via overhanging vegetation and associated trap components.

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## ANALYSIS OF ANABAT FILES

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Since publishing my thoughts on Anabat file analysis in this newsletter last year (Jolly, 1996) there have been a number of developments. The mathematical models for echolocation pulses have been refined. Pulses of all curvatures can be accurately described with an equation of the form:

$$\text{frequency} \propto \text{time}^P$$

Figure 1 shows a range of different pulses from different species and their fitted models. The exponent (P) provides a useful index of how curved the pulse is. An exponent of 1 (no time transformation) models linear pulses. Pulses bent as strongly as those in the call of the eastern forest bat are not common, but you can see that a model with an exponent of 8 fits these data very well.

There have also been developments in software for the extraction of call attributes from Anabat files. Chris Corben's Analook (Version 3.5) is now generally available (Caddle & Lumsden, 1997) and I have released a program called Analyse. A screen-shot of this program is shown in Figure 2. I am happy to e-mail a copy of Analyse to interested Anabat users.

For more information on:

- mathematical models of echolocation pulses
- software to extract call attributes
- discriminant analysis to separate the calls of different species

Anabat users should refer to the Web site - Analysis of Anabat files (<http://www.ozemail.com.au/~jollys/>)

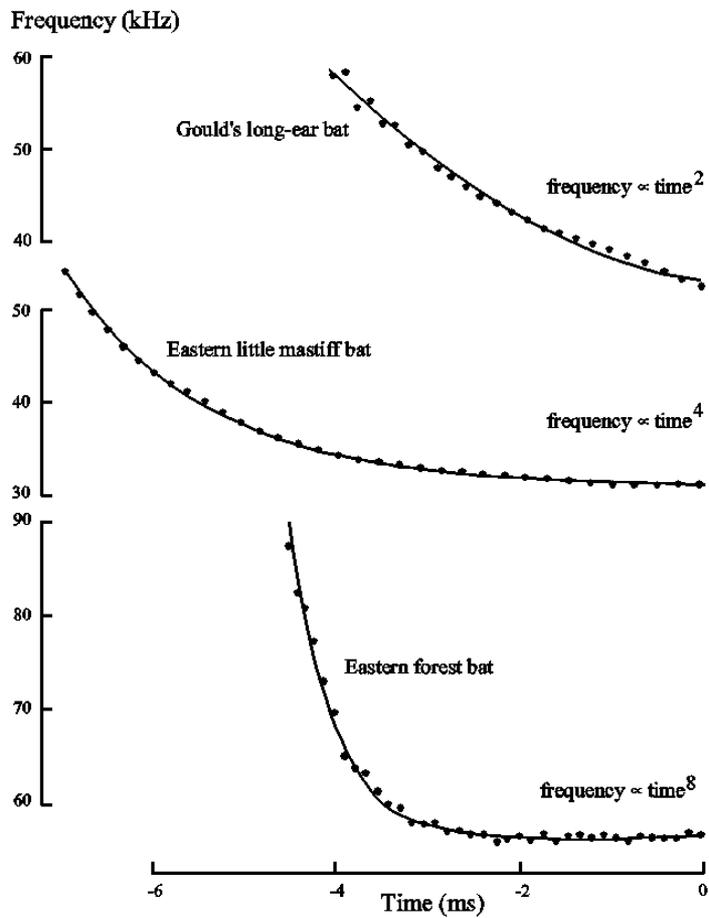
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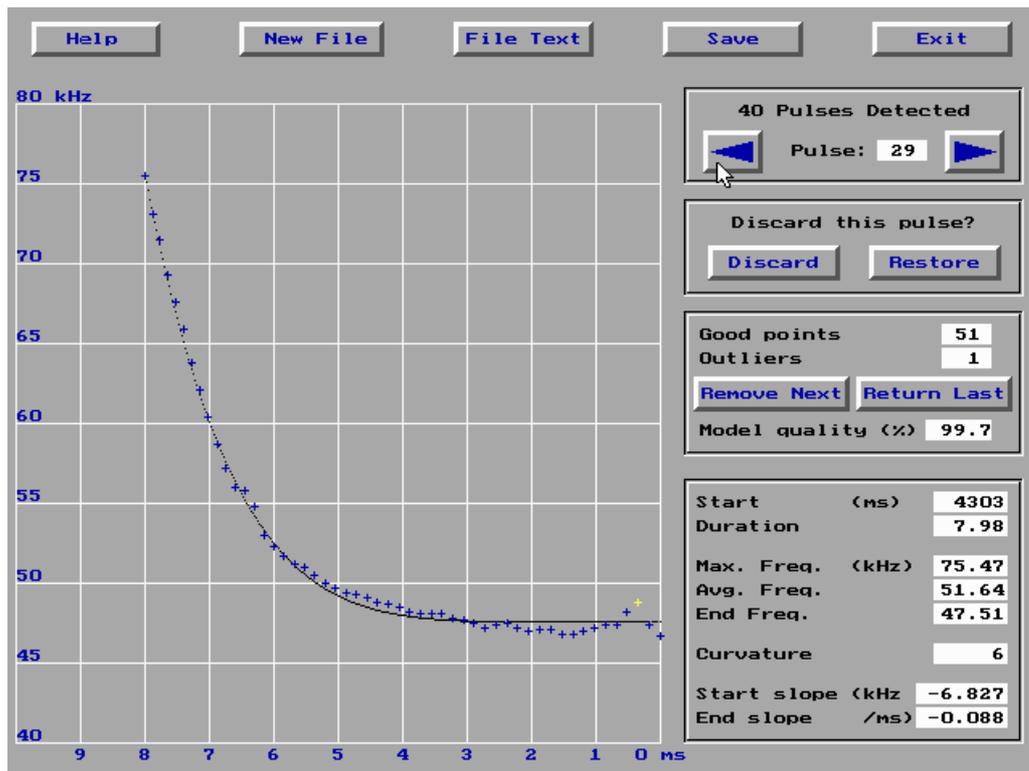
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**Figure 1.** Echolocation pulses with different curvatures and their fitted models.

**Figure 2.** Screen shot of Analyse, a program to extract call attributes from Anabat files.





## ACCIDENTAL IMPORTATION OF A NEW BAT SPECIES FOR NEW ZEALAND

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In September 1997 a bat was discovered by Air New Zealand engineering staff at Christchurch airport as they were unpacking aircraft parts in a container which had come from Australia. We haven't heard from where exactly yet. The bat was tiny, but dead!

I have tentatively identified the dead bat as a Little Forest Bat (*Vespadelus vulturinus*) but am consulting with Australian colleagues in an effort to confirm the identification. The pelage is grey with tips much lighter in colour (very pale grey-brown). Most of the underside fur has gone so its hard to compare with the dorsal side, but under the chin is much paler (white tipped) compared with the dorsal fur. It appears to be an adult (fully fused wing joints). The forearm is very short (27.3 mm (left), 28.0 mm (right)). It is dried out but the head and body length is about 43 mm, and tail (curled up so virtually impossible to measure) about 25+ mm. Ear length is c.6.5 (again a bit curled up). The ear is thin-skinned and light grey. The tragus is paler than the ear and the wings grey.

This will be the third recorded instance of an exotic bat being accidentally imported to New Zealand. The other examples were a Japanese Pipistrelle (*Pipistrellus javanicus abramus*) in 1981 and Lesser Long-eared Bat (*Nyctophilus geoffroyi*) in 1983.



## THESIS SUMMARIES:

## **SPERM STORAGE, SPERM FERTILITY, TORPOR AND SPERM COMPETITION IN MICROCHIROPTERAN BATS (PhD thesis, University of Western Australia).**

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Microchiropteran bats have a number of reproductive peculiarities. Most notable is the prolonged storage of spermatozoa by males and females. It has been argued that sperm storage may promote sperm competition. Bats are predicted to experience sperm competition because aspects of their reproductive biology, particularly prolonged sperm storage and the male habit of copulating with torpid females, potentially allow ejaculates from different males to occupy a female's reproductive tract concurrently. This thesis investigates aspects of the reproductive biology and physiology of several Australian bats and uses this information together with published data to investigate the evolutionary consequences of sperm competition in microchiropteran bats.

Sperm storage was documented for females and males of several Australian bat species, one of which roosted alone during the breeding season. As with most other sperm-storing bats, those studied here could be euthermic or torpid. Furthermore, the sperm stored by two of the study species was shown to retain its fertility within the female tract for at least 30-93 days, whereas the spermatozoa stored by males remained viable after six to seven months storage, and data indicate female fertility may be enhanced by multi-male insemination. Mixed paternity within litters was not documented but some males were more successful during sperm competition. This effect was independent of mating order. Finally, the risk of sperm competition appeared to have exerted selective pressure on spermatogenesis across microchiropteran bat.

In conclusion, the reproductive biology of the bats studied here is typical of microchiropteran bats inhabiting temperate latitudes. This study documents the fertility of spermatozoa stored by Australian bats for the first time, and provides the first evidence of an evolutionary response to the risk of sperm competition across the Microchiroptera. It also presents methods that will enable sperm competition in bats to be further investigated, and an adaptive context in which aspects of bat reproduction can be interpreted.

## **UNRAVELLING THE TAXONOMY OF BENT-WINGED BATS (*MINIOPTERUS*) IN NORTHERN AUSTRALIA AND NEW GUINEA (honours thesis, University of Queensland).**

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The genus *Miniopterus* (bent-winged bats) splits into several species and subspecies in south-east Asia. There are six species in New Guinea, two of which occur in Australia. The literature is fraught with disagreement and confusion as to geographic variation and speciation within the genus. Since the beginning of this year, I have been researching the extent of variation between the different species of *Miniopterus* in New Guinea, and within *M. schreibersii* across northern Australia.

I have used literature records and my own data to develop a key which differentiates most species within New Guinea. Multivariate analysis of morphometric data shows that *M. tristis*, *M. magnater* and *M. schreibersii* are all easily distinct from each other, and from a cluster formed by *M. medius*, *M. pusillus* (*macrocneme*) and *M. australis*. The smaller species comprising this group do not fall into discrete groups as do the larger species, and their separation seems artificial. Allozyme electrophoresis (conducted by Terry Reardon) and mtDNA analysis (supervised by Marcia Lara) should resolve if there really are three species within this cluster of smaller bats.

Within Australia, the taxonomy is much simpler. The *M. schreibersii* we have in Queensland exhibit slight geographic variation, and everywhere are obviously distinct from *M. australis*. When only *M. schreibersii* are run through a morphometric analysis, specimens from New Guinea, Queensland and the Northern Territory each form a distinct cluster, about equidistant from each other. Hungarian specimens lie on the periphery of the Northern Territory cluster. Within the Northern Territory, there are different colour forms, from very dark in Kakadu to a pale desert-coloured

form at Mt Tolmer, yet they are morphometrically identical. Such divergence in colour is usually only seen over a great geographic distance, and warrants closer inspection of genetic movement between Northern Territory populations.

Preliminary genetic results reveal a slight difference between *M.schreibersii (oriana)* from the Northern Territory and *M.schreibersii (blepotis)* from Queensland. Unfortunately, I do not have access to genetic samples of *M.schreibersii* from New Guinea to test its relatedness to the two north Australian groups. Genetic analysis is as yet incomplete, but this research should result in a phylogenetic tree of *Miniopterus* in this region by the end of the year.

This research is being supervised by Craig Moritz and Les Hall. Many thanks to the Australian, CSIRO Wildlife, South Australian and Queensland Museums for access to specimens.



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Compiled by Grant Baverstock <[gbaverstock@geelongcity.vic.gov.au](mailto:gbaverstock@geelongcity.vic.gov.au)>

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## BAT T-SHIRTS FOR SALE

Two designs:

- Dusky Leafnosed-bat *Hipposideros ater* perched on a rock face (as seen at the Naracoorte bat conference), colour black, sizes L and XL, price \$22
- Three Flying-foxes (*Pteropus*) in different postures in eucalypt branches, colour unbleached cotton, sizes M and L, price \$17.

Prices include postage within Australia.

If interested call Angela on (07) 3374 2771, or write to P.O. Box 510, Indooroopilly 4068, Queensland, AUSTRALIA.



## BOOK REVIEW

*“Do bats really drink blood? How fast can bats fly? Are they related to birds? What are the largest and smallest bats? Why do they live in colonies? ...”*. Answers to these and other perennials such as “Why do bats hang upside down?” are all tackled in this excellent book of the Smithsonian Institution’s new *Smithsonian Answer Book* series. The only other one of the series so far available here is on another much maligned animal group, the spiders, and CSIRO Publishing has licenced them both from the Smithsonian in the USA for publication in Australia.

This series is significant for at least a couple of reasons. One is that it heralds a new direction in museums’ attempts to disseminate information, and answer those frequently asked questions (FAQs), in a proactive manner. The other is that it deals with animal groups that have had some bad PR in the past (bats and spiders).

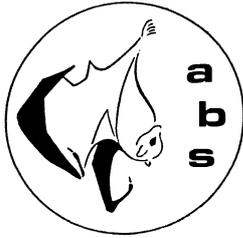
**Don E. Wilson (1997) Bats In Question.  
The Smithsonian Answer Book.  
(CSIRO Publishing: Melbourne).  
ISBN 0-643-06027-8, 168 pp, soft cover,  
colour photographs by Merlin D Tuttle**

At the Museum of Victoria where I work, curators and collection managers receive thousands of public enquiries each year, and a great proportion of these are the same question repeated many times - “Will my leg drop off if I get bitten by a White-tailed Spider?”, “I’ve got bats in my roof. Will they get stuck in my hair?”. A series like this one will enable some members of the public to find answers to their general questions by visiting a local library, while others can be helped by non-specialist staff in a front desk or resource centre setting in a museum. Of course, specialist and detailed questions, or those about Australian bats or spiders, will still need to be addressed by an expert.

The bat book is arranged simply, and is structured in such a way as to be easily navigated by non-experts. It is also richly

illustrated with some of Merlin Tuttle’s best photographs. The rogues’ gallery on pages 74-77 is particularly brilliant, with head & shoulder portraits of bats from many of the known families, giving an excellent introduction to the biodiversity represented by the world’s megabats and microbats. There are many great action shots of bats foraging, including some familiar American examples such as the cover shot of a Pallid Bat *Antrozous pallidus* carrying a scorpion in its mouth. Quite a few Australian bats, particularly Megachiroptera, are featured too, though the book inevitably has a preponderance of American examples.

**Lawrie Conole**



# THE AUSTRALASIAN BAT SOCIETY

## MEMBERSHIP APPLICATION FORM

The Australasian Bat Society was enthusiastically conceived at the 4th Australian Bat Research Conference (Brisbane 1991) and was formalised in the following year. The ABS unites people with a common interest in this unique fauna, whether positive or negative. Whether they be researchers, naturalists, foster-carers or fruitgrowers, 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. Arranging a biennial meeting (with research proceedings) is another role of the ABS.

Communication is promoted through a bi-annual newsletter, where research news and notes, simple snippets or vexatious viewpoints are expounded. The newsletter takes over from our past communication efforts, *Macroderma* and its predecessor *Australian Bat Research News*. Should a conservation 'emergency' arise, members are advised through a 1-2 page news sheet

Subscription rates vary from \$20.00 to \$50.00. Further information or membership can be obtained from the ABS Secretary Jillian Snell, GPO BOX 5047, SYDNEY NSW 2001 (Fax 02 9267 5363, Ph 02 9264 1800) or Greg Richards, P.O. BOX 778. DICKSON, ACT 2602. (Fax and Phone +61 6 253 2050).

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### MEMBERSHIP APPLICATION FOR THE AUSTRALASIAN BAT SOCIETY

I wish to become a member of the Australasian Bat Society during the 1996 - 1997 financial year

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

Address:.....

.....

.....

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

Email address: .....

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

**Standard (\$A30)**

**Student (\$A20)**

**Institutions (\$A50)**

**Overseas (\$A40)**

**Overseas Institutions (\$A60)**

Signed: .....

Please forward a cheque or money order In Australian currency to the ABS Secretary (address above).