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# The Australasian Bat Society Newsletter

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**– Instructions for contributors –**

The *Australasian Bat Society Newsletter* will accept contributions under one of the following two sections: Research Papers, and all other articles or notes. There are two deadlines each year: **31<sup>st</sup> March** for the April issue, and **31<sup>st</sup> October** for the November issue. The Editor reserves the right to hold over contributions for subsequent issues of the *Newsletter*, and meeting the deadline is not a guarantee of immediate publication.

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

For consistency, the following guidelines should be followed:

- Emailed electronic copy of manuscripts or articles, sent as an attachment, is the preferred method of submission. Manuscripts can also be sent on 3½" floppy disk, preferably in IBM format. **Please use the Microsoft Word template if you can (available from the editor).** Faxed and hard copy manuscripts will be accepted but reluctantly! Please send all submissions to the *Newsletter* Editor at the email or postal address below.
- Electronic copy should be in 11 point Arial font, left and right justified with 16 mm left and right margins. Please use Microsoft Word; any version is acceptable.
- Manuscripts should be submitted in clear, concise English and free from typographical and spelling errors. Please leave two spaces after each sentence.
- Research Papers should include: Title; Names and addresses of authors; Abstract (approx. 200 words); Introduction; Materials and methods; Results; Discussion; and References. References should conform to the Harvard System (author-date; see recent *Newsletter* issues for examples).
- Technical notes, News, Notes, Notices, Art etc should include a Title; Names and addresses of authors. References should conform to the Harvard System (author-date).
- All pages, figures and tables should be consecutively numbered and correct orientation must be used throughout. Metric units and SI units should be used wherever possible.
- Some black and white photographs can be reproduced in the *Newsletter* after scanning and digital editing (consult the Editor for advice). Diagrams and figures should be submitted as 'Camera ready' copy, sized to fit on an A4 page, or electronically as TIFF, JPEG or BMP image files. Tables should be in a format suitable for reproduction on a single page.
- Research Papers and Notes will be refereed, and specialist opinion will be sought in some cases for other types of articles. Editorial amendments may be suggested, and articles will generally undergo some minor editing to conform to the *Newsletter*.
- Please contact the *Newsletter* Editor if you need help or advice.

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**– Editorial –**

**A (not so short) note from the new editor....**

Hello everyone,  
I'd like to begin my role as the new editor of the ABS *Newsletter* by thanking Kyle Armstrong for all this hard work in this role to date. I certainly have some very well polished shoes to fill. Fortunately for me my first ABS editorial is easy to write as I am currently on a round-the-world trip that is incorporating more than a little battiness. So this will be an editorial in pictures, enjoy!

From the 19 – 23 August the balmy city of Merida on the Yucatan Peninsula, Mexico, hosted the 14<sup>th</sup> International Bat Research Conference combined with the 37<sup>th</sup> North American Society for Bat Research meeting. See pages 18 and 20 for Lisa Evan's and Topa Petit's say on what was a great conference in the face of much adversity! To their credit, the wonderful Mexican organisers chose to go ahead with the conference despite the imminence of Hurricane Dean, a category 5 hurricane predicted to bear down on Merida during the conference.



Thanks to the sensationalism of the U.S. media, many of the American contingent (amongst others), chose to stay at home. However, for the rest of us the anticipation grew, and most of the Aussies were quite excited by the prospect of cows circling past our windows. However, despite the numerous precautions taken by the City of Merida (including a ban on the sale of liquor!), Dean passed through Merida without as much as a huff, although other regions of the Yucatan were less fortunate (see article from a Canadian Newspaper on page 21).



Bubble wrapped sculptures on the streets in preparation for Hurricane Dean, Mexico.



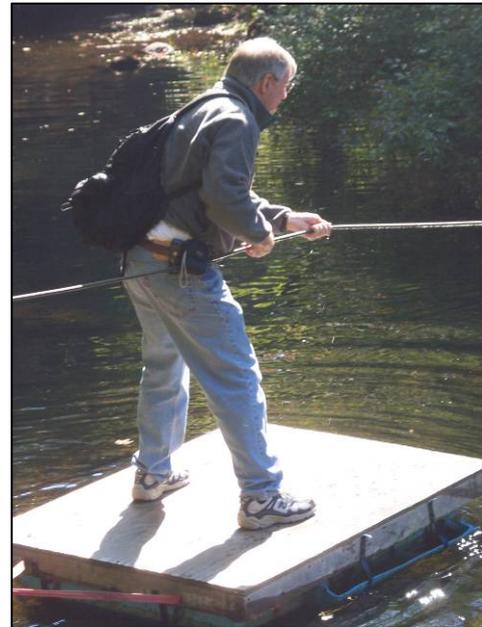
Chris Grant, myself and Lisa Evans appreciating the ancient Mayan culture throughout the Yucatan, Mexico.

From Mexico, my bat odyssey took me to Boston where I met up with Tom Kunz and several of his graduate students. On a weekend field camp to New Hampshire I captured my first little brown bat *Myotis lucifugus* in mist nets set around a barn. We continuously caught bats despite 15-20 noisy 2<sup>nd</sup> year students milling around the nets. This camp also ingratiated me into the not-so-nice world of bot-fly larvae, disproportionately large dipteran larvae that implant themselves near the genitalia of small native rodents, VERY disgusting!



Giant bot-fly larvae in a white-footed deer mouse.

My next visit was to the Robert Barclay lab in Calgary, where I was hosted by Robert, his family and his lab group. Two silver-haired bats (*Lasionycteris noctivagans*) named Rasputin and Alexandria kept us all busy devouring several meal worms, crickets and a mix of cat and baby food each day.



Tom Kunz demonstrates precarious creek crossings as well teaching his students bat trapping.

Unfortunately the wild bats in this part of the world are currently either hibernating or have migrated south. However, I was lucky to be able to spend some time in the field with a group of Rocky Mountain big-horn sheep (*Ovis canadensis canadensis*) researchers. In between many hours of watching sheep and collecting their poo, I was VERY lucky to have three AMAZING wildlife experiences in the Rocky Mountains. Firstly I saw a prairie falcon (*Falco mexicanus*) attack a northern flicker (*Colaptes auratus*, a type of woodpecker), which was accompanied by the most amazing 'whooshing' noise as the falcon attacked directly over my head. Secondly, while perched on a cliff face staring at sheep a shadow passed over me and I looked up into the eye of a bald eagle (*Haliaeetus leucocephalus*). Then on the following day I was only 15 m away from a group of female sheep with two lambs when we spotted a cougar (= mountain lion *Felis concolor*) seconds before it successfully attacked the group and took down the lamb right in front of us!



Robert Barclay enjoys the view in Kaninaskis Country, Rocky Mountains, Canada.



Male big-horn sheep relax at Sandy McNab, Rocky Mountains, Canada.



Cougar footprint at Sheep River Provincial Park, Rocky Mountains.



Mark Brigham shows me how it's done on the Curling lane, Regina, Canada.

Finally, I have arrived in Regina, Saskatchewan, where I have been enjoying the wonderful hospitality of Mark Brigham, his family and the lab group here at the University of Regina. I have survived two of Regina's cultural experiences: curling and ice hockey, both of which are MUCH harder than they look! I temporarily switched from holiday to work mode to present a seminar to the Biology Department on my PhD work. For both myself and also Damian Milne, the long haul of thesis writing is finally over and you can check out our thesis' abstracts on pages 23-25.

The content of this edition of the ABS newsletter matches the overseas theme of my own travels. We have a great reflection on 12 months of travelling in Australia written by Keiko and Yushi Osawa, bat researchers from Japan (page 15). There is also a more concerning piece on the conservation of bats in Curaçao written by Topa Petit (page 13), along with some more quirky and unusual articles on bat hair and fungus (page 26) and an article discussing Mexican free-tail bats and the West Nile virus story (page 26). Closer to home, a new paper soon to be published reports on severe heat stress events and their affects on Australian flying foxes (page 7), Ken Sanderson details his adventures bat trapping in the Flinders Ranges (page 8), Martin Schulz and Kylie Madden provide observations of daytime flight (page 10) and Mary Crichton describes twin captive births (page 11).

Thank you to everyone that has provided contributions for the current newsletter. Check out the photo on page 29 and try your hand at coming up with an entertaining caption to accompany the picture. I'll select a few of the wittiest contributions and print them in the next edition. Lastly, I've compiled a veritable wealth of recent literature for you all, check it out on the back pages.

Enjoy your WARM Christmas,

**Susan Campbell**  
**Newsletter Editor**

*Front cover:* Common Long-tongued Bat *Glossophaga soricina* (Phyllostomidae, Glossophaginae) feeding on fruit juice after being caught in the Merida Botanic Gardens, Mexico during the International Bat Research Conference.



## **– President's Report –**

Well can you believe it, nearly Christmas already?

It's been an exciting year for the ABS, the highlight for me was the Symposium on the Biology and Conservation of Australasian Bats held in Sydney earlier this year, once again I want to thank the organisers for such a wonderful event. It should be noted that their involvement hasn't stopped there, there is now the reviewing and editing of the research papers submitted for publication in a book based on presentations and posters from the symposium to be published by the Royal Zoological Society of NSW. Fingers crossed, the book should be available next year.

I would also like to take this opportunity to thank all the members of the executive committee and extended committee for their input throughout the year, it can be difficult juggling work, family and ABS committee responsibilities. We (ABS) are very fortunate that we have people who willingly offer their services to the ABS. We are fortunate that we have a diverse range of people on the executive which represent the full sector of our members. I would also like to thank ABS members for the continuing support of the society, without you there isn't an ABS. It's my experience that the ABS is one of the most dynamic and member focused organisation I have been involved with. Whilst on the subject of members, don't forget memberships are due in the New Year.

Remember to note the 2008 ABS conference dates in your calendar (25-29 March 2008), it is only a few months away. Charles Sturt University in Thurgoona (NSW) has kindly offered to host the ABS conference. Thank you to our local ABS executive member Craig Grabham for encouraging CSU to be our host.

You may recall that the ABS ratified the Anabat Survey Standards, these standards are now being disseminated by various people on a state by state basis, but we also need the help of the ABS members. Those members that undertake bat call analysis can best promote the standards by ensuring that they apply the standards in the course of their work. The standards can be found on our website.

Finally, I wish all members and their families a safe, joyous and prosperous Christmas and New Year, may Santa bring you lots of goodies.

**P.S.** I'll be on the New South Wales coast (Mollymook) over the Christmas break: anyone know of the batting hot spots in the area?

**Rob Gration**  
**ABS President**



– Research Notes –

## Climate change and the effects of temperature extremes on Australian flying-foxes

[Abstract of a soon to be published paper].

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Little is known about the effects of temperature extremes on natural systems. This is of increasing concern now that climate models predict dramatic increases in the intensity, duration and frequency of such extremes. Here we examine the effects of temperature extremes on behaviour and demography of vulnerable wild flying-foxes (*Pteropus* spp.). On 12 January 2002 in New South Wales, Australia, temperatures exceeding 42 °C killed over 3,500 individuals in 9 mixed-species colonies. In one colony we recorded a predictable sequence of thermoregulatory behaviours (wing-fanning, shade-seeking, panting, saliva-spreading), and witnessed how 5-6% of bats died from hyperthermia. Mortality was greater among the tropical black flying-fox, *Pteropus alecto* (10-13%) than the temperate grey-headed flying-fox, *P. poliocephalus* (<1%), and young and adult females were more affected than adult males (young: 23-49%; females: 10-15%; males: <3%). Since 1994, over 30,000 flying-foxes (including at least 24,500 *P. poliocephalus*) were killed during 19 similar events. Although *P. alecto* was relatively less affected, it is currently expanding its range into *P. poliocephalus* more variable temperature envelope, which increases the likelihood of die-offs in this species. Temperature extremes are important additional threats to Australian flying-foxes and the ecosystem services they provide, and we recommend close monitoring of colonies where temperatures exceeding 42.0 °C are predicted. The effects of temperature extremes on flying-foxes highlight the complex implications of climate change for behaviour, demography, and species survival. Mitigation of such effects on natural systems should be an important consideration in future conservation strategies.

Key words: Global change, heat waves, fruitbats, Chiroptera.

*Ed: We currently have a poor understanding of the kinds of effects that temperature extremes can have on natural systems. There are also few precedents of studies investigating mass mortality from extreme heat events in the international literature. This paper, soon to be published in Proceedings of the Royal Society, reports on the mortality inflicted upon both grey-headed flying fox and black flying-fox colonies in northern NSW during an extreme heat event in January of 2002. The authors report the effects of temperature (often >42°C) on the thermoregulatory behaviour and selective mortality in the mixed-species colonies. Juveniles and breeding females were the most susceptible to mortality at temperatures >42°C, and the two flying-fox species also suffered different rates of mortality. Extreme heat events are not restricted to northern Australia, and the authors report on past mass die-off events as far south as Melbourne, Victoria. The findings presented in this paper are an important contribution to current climate change research and theory, and the asymmetric response of the two species suggests that responses of closely linked communities to climate change will be quite complex.*



## **Bats at Bagalowie in the Flinders Ranges**

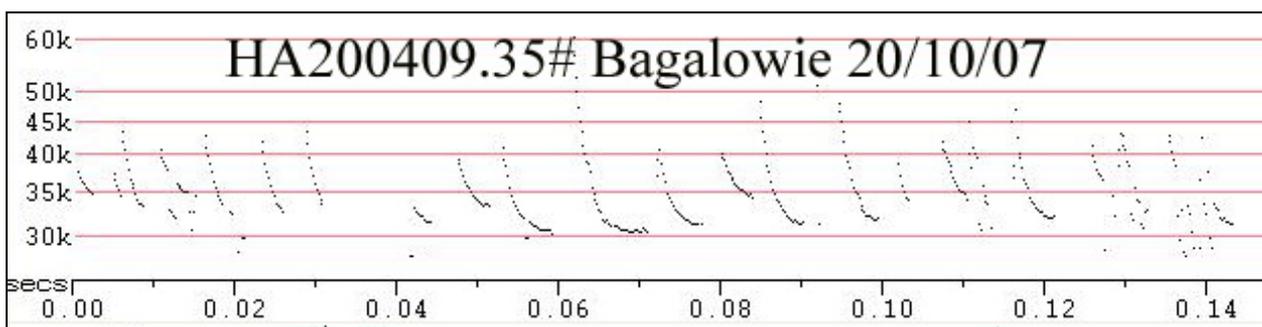
**Clare Buswell and Ken Sanderson**

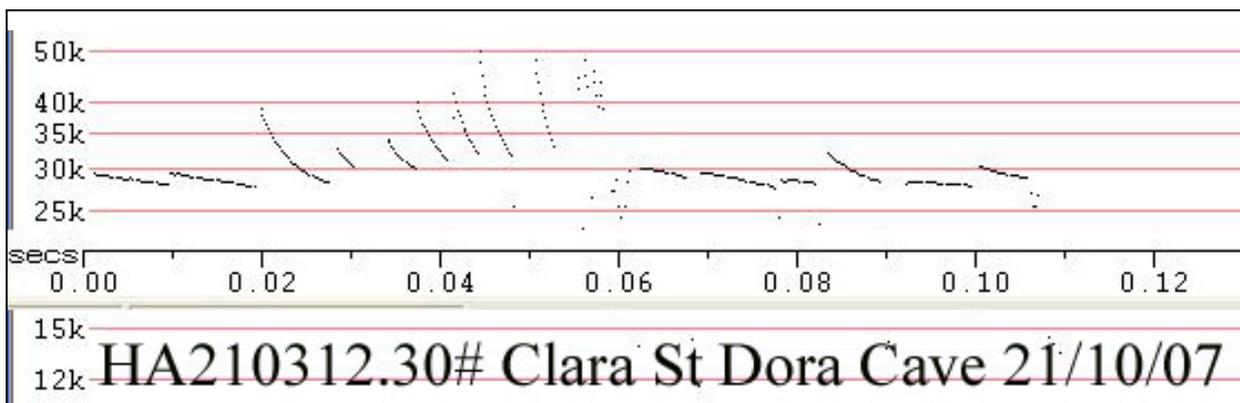
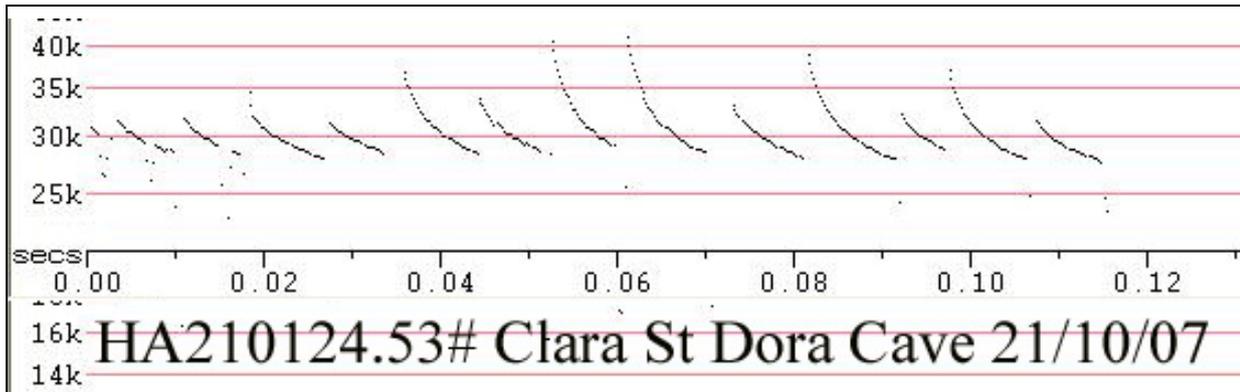
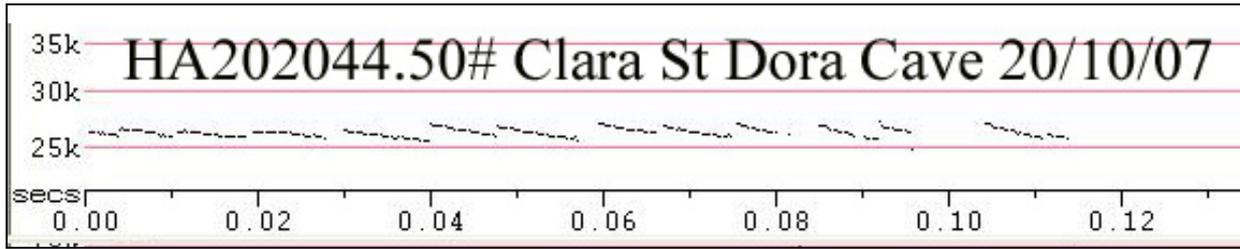
*School of Biological Sciences, Flinders University, GPO Box 2100, Adelaide, South Australia 5001.  
Email: Ken.Sanderson@flinders.edu.au*

Clare and Heiko and a bunch of other cavers from Flinders University took a set of bat detecting gear with them in October when they went caving at Bagalowie in the Flinders Ranges, SA (32° 10' S, 138° 53' E). Ken did the analysis of the 400+ calls recorded on 2 nights. The Friday night (19/10/07) the caving party was at Bagalowie Hut and put the bat detector out about 9:15 pm. The night was mild (22°C) and bat activity was continuous until about half an hour before sunrise, with 125 calls recorded, about half from Gould's wattled bats, and smaller numbers of calls from chocolate wattled bats, lesser long-eared bats, and freetail bats (*Mormopterus*), and one or two calls from forest bats (*Vespadelus*) and white-striped freetail bats. The countryside in the area is shown in the picture below.



The Saturday night (20/10/07) was a little warmer (27°C) and the bat detector was out all night at the shaft of Clara St Dora Cave, with bat activity again continuous through the night, with 309 calls recorded, over 200 from freetail bats (*Mormopterus*), and smaller numbers of calls from Gould's wattled bats, white-striped freetail bats, lesser long-eared bats and forest bats. Daytime temperature on the Sunday got to 38°C. Examples of calls recorded at Bagalowie and Clara St Dora Cave are shown below, the first one identified as Gould's wattled bat, and the next three as freetail bats.





This brief survey of the Bagalowie region of the Flinders Ranges shows evidence for a reasonable amount of bat fauna, some likely resident in Clara St Dora Cave.



## **Diurnal activity in the Gould's Wattled Bat *Chalinolobus gouldii***

**Martin Schulz and Kylie Madden**

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Diurnal activity in microchiropteran bats is rarely reported in Australia, other than where individuals have been disturbed at a roost. In this note we present observations of diurnal foraging behaviour in the Gould's wattled bat *Chalinolobus gouldii* (identity confirmed with Anabat) in late April 2007 from the northern suburbs of Wollongong, central New South Wales.

1. *Location:* Sharkeys Beach, Coaldale. *Grid Reference:* 34°17'39", 150°56'35"

*Date:* 25/4/07. *Civil Twilight Time:* 1745 hrs

*Conditions:* North-east wind (10 knots), cloud cover 4/8, mild (19°C).

*First Sighting:* 1710 hrs (35 minutes before Civil Twilight): One individual observed foraging around the foliage of several Norfolk Island pines *Araucaria heterophylla* between 4 and 15 m above the ground. At this time it was full daylight with various diurnal bird species active.

*Subsequent Sightings:* 1715 to 1800 hrs: Up to five individuals were observed foraging around the foliage of Norfolk Island pines. No noticeable swarms of insects were observed flying about these pines. These bats rarely flew over adjacent houses or primary dunes vegetated with predominantly marram grass *Ammophila arenaria* and hairy spinifex *Spinifex hirsutus*. No diurnal birds were seen interacting with these bats, including potential predators, such as the pied currawong *Strepera graculina* and Australian magpie *Gymnorhina tibicen* that were active at the same time in the Norfolk Island pines.

2. *Location:* Woonona Beach, Woonona. *Grid Reference:* 34°21'01", 150°55'11"

*Date:* 28/4/07. *Civil Twilight Time:* 1745 hrs

*Conditions:* Still, cloud cover 8/8, mild (20°C), humid with approaching thunderstorm.

*First Sighting:* 1650 hrs (55 minutes before Civil Twilight): on arriving at the beach approximately five individuals were seen flying and foraging approximately 1 to 5 m above the dunes vegetated with low coastal scrub and no trees.

*Subsequent Sightings:* Gradually more and more bats were observed flying low (mostly about 1 m off the ground) over the dunes until by 1715 hrs (30 minutes prior to Civil Twilight) it was estimated that hundreds of individuals were observed flying and hawking insects along a 500 m length of primary and secondary dunes. None were seen flying over nearby houses and much lower activity was observed over the adjacent beach and surf zone. The bats were actively flying around people and dogs present in the area. This behaviour continued until it was too dark to see the flying bats. During this time the air was thick with swarming flies. Similar to the Sharkeys Beach observations although a variety of diurnal birds were actively feeding (e.g. common starling *Sturnus vulgaris*, willie wagtail *Rhipidura leucophrys* and welcome swallow *Hirundo neoxena*) no attempts at predation, harassment or other interactions were witnessed.

The above late afternoon observations at Woonona Beach are highly unusual. For example, this was demonstrated by no bats observed prior to Civil Twilight on 52 evenings between 2 September 2006 and 1 June 2007.

These observations raise the question: why were these bats foraging in full daylight when potential diurnal bird predators were active? The observations at Woonona Beach suggested that such activity was related to the large amount of insect activity that made foraging worthwhile despite potentially increased predation risk from diurnal birds. However, this raises a number of other questions:

- a) Adjacent to Woonona Beach apart from a small number of Norfolk Island pines there are no trees within 1 km to support roosts of such numbers of bats. Where had these bats come from?
- b) How far had they travelled in broad daylight?
- c) How did they know about the swarming of insects at the beach to make it worth the risk of travelling and feeding in broad daylight?

- d) Is such diurnal behaviour the result of stress, such as related to the reduced insect numbers associated with the prevailing dry conditions? Or alternately is such diurnal activity the result of individuals that are migrating through the area or have moved coastwards as a result of extreme drought conditions in inland New South Wales?



## **Twin Gould's Wattled Bats *Chalinolobus gouldii* in good care**

**Mary Crichton**

*Bat carer, South Australia. Email: crichto@bigpond.net.au*

How fortunate are we in South Australia! Six weeks ago, we received a female Gould's Wattled Bat *Chalinolobus gouldii* into care. She was found hanging from a crane in Outer Harbour! She was duly handed into the nearest Veterinary Clinic who contacted us. No external breaks were evident. She seemed in quite good condition, and weighed a very healthy 21 g. Several days later, whilst feeding her, she started to give birth to twins! Two amazing male pups!

Mum has been taking supplementary feeding three times a day since the birth, eating large quantities of insects. She has been given warm water drinks before feeds (up to 10 ml per day!). Mum and pups were initially housed in our Bat Rehabilitation Box, with heat, humidity, and lots of snuggling cloths to hide under.



One of the young Gould's Wattled Bats

Five weeks after birth, Mum and pups are progressing nicely we feel. Recent weighing indicated Mum to be 20 g with pups being at 12 g each. They all now reside in our outside flight enclosure which allows insects to come inside without letting our bats out!. This was a challenge for us due to the fact that we needed to do it right. They have three large River Red Gums *Eucalyptus camaldulensis* in pots (courtesy of our Council) to try to mimic a more natural habitat. They have a specifically-made structure/frame to hang their bat box, hanging pillow cases, pouches, and tiny drink containers. Lighting is provided for a period of time each night inside the enclosure to attract more insects. Loose bark and a little mulch is provided in one corner only so we can still locate Mum and pups should they remain on the ground from dawn onwards.

We have had many questions to ask from all these wonderful carers throughout the ABS and Bat Conservation International. For example, does the mother need to be flown whilst she is raising her young or can this wait until pups are ready to fly as well (so that Mum can retain her energy and condition while lactating); when and how do we wean the young; can we supply enough insects for them in their flight enclosure; will the young learn to fly properly; will they gain sufficient weight, as well as poor mum? If they are on the ground, do we constantly disturb them to put them high up; does mother need pups put back with her at 5 weeks when they are found roosting on their own? .... SO MUCH TO LEARN!! .....

Our aim will be to release all three back into the wild as soon as we can see that all three are strong fliers. We hope that what we have achieved is a positive outcome for Mum and pups and that they are going to be "wild" enough not to be taken by predators.

We have some fabulous photographs and video footage of the birth (a little unclear though) and other activities over the first three weeks of the twins' lives.

Once again, a big thank you to all of you who have assisted us through this amazing challenge.



## **A Little Forest Bat *Vespadelus vulturnus* with warts!**

**Lindy Lumsden**

Arthur Rylah Institute, 123 Brown St., Heidelberg, VIC 3084. Email: [Lindy.Lumsden@dse.vic.gov.au](mailto:Lindy.Lumsden@dse.vic.gov.au)

A Little Forest Bat *Vespadelus vulturnus* was recently brought into care which had warty growths on the soles of both feet. These were larger than the feet itself and had distorted the shape of the toes. This resulted in the bat having difficulty gripping onto anything. Examination by vets at Healesville Sanctuary indicated they were warts. The vet very neatly cut them off, and sent them for further examination. I will report on the full findings later, but thought I would show some photos here and see if anyone else had observed growths like this. In many years of catching bats this is the first time I have seen warty feet!



**– Reports and Viewpoints –**

## **The importance of bats to Curaçao**

**Dr. Topa Petit**

*Honours Program Director, Biodiversity, Environment and Park Management, The University of South Australia. Email: sophie.petit@unisa.edu.au*

My 2007 study leave took me back to the island of Curaçao, Netherlands Antilles (July-August 2007). There I realised with horror that the cacti that I had been studying for years had all been cut down. The Landhuis (plantation house) at which I worked, managed by a government organisation, had also been renovated and all the bats that used to be in the attic had been "removed". My research trip turned into an emergency conservation one and I wrote documents and gave talks to alert not only the public, but also government organisations, about the significance of bats and cacti to the island. Below is an example of one of the documents produced.

### **Biology of the bats**

Eight species of bats occur on Curaçao. All are from the sub-order Microchiroptera; flying foxes do not occur on the American continent. The bats of Curaçao belong to three ecological groups: insectivorous bats, nectar-feeding bats, and one species of fishing bat. Most bats live in caves and crevices, although some may also use tree roosts. In addition, two species have been observed in buildings on the island; others may occasionally use buildings as well. Sick bats, like any other sick wild animal, should not be handled, but bats do not attack people. They forage at night using their vision, smell, and a wonderful sonar system called echolocation. We cannot hear the sounds they make because the range of frequencies is not audible to humans; the sounds are reflected off surfaces (obstacles, prey such as mosquitoes); bats hear them and can find their way even in total darkness.

Our bats have only one young (pup) per year; because they are mammals, mothers feed their pups milk until the young are old enough to forage on their own. Family ties may remain strong even after the young become independent. Most species are very sensitive to disturbance, and they consist of only a few dozen or a few hundred individuals on the island. Bats are also affected by pollution and the removal of vegetation.

### **Importance of bats to Curaçao**

Insectivorous bats include *Mormoops megalophylla intermedia* (the ghost-faced bat), *Natalus tumidirostris* (the funnel-eared bat), *Molossus molossus pygmaeus* (the velvety free-tailed bat or Pallas's mastiff bat), *Myotis nesopolus nesopolus* (Curaçao myotis), and *Pteronotus davyii* (the naked-back bat). None of the populations is larger than a few hundred individuals, yet these insectivorous bats are very important to Curaçao. They capture insect pests such as flies, mosquitoes, and certain moths that are agricultural pests. Certain bat species can capture their own weight in insects each night and eat several hundred small insects in one hour. Although the heaviest of those bats weighs less than 30 g, each bat still represents the elimination of a significant number of pests. The species most likely to be found in a building is *Molossus*; one specimen was hit by a car in 2007, the only one seen in years. If a roost is found, please contact CARMABI; the bat's special feature is to have a tail.

Curaçao has two species of nectar-feeding bats, belonging to the group of leaf-nosed bats: *Glossophaga longirostris elongata* (long-tongued bat) and *Leptonycteris curasoae curasoae* (long-nosed bat), which gets its name from the island. These bats also consume ripe fruits when they are available and disperse the seeds when the seeds are small enough to be ingested. Their role in the pollination of plants of significance, such as datu and kadushi, but also the calabash tree and agaves, among others, make them vital contributors to biodiversity on Curaçao. By allowing the formation of fruits on datu and kadushi, the bats make accessible resources that many animals use during the dry season. Only *Glossophaga* is found in buildings. *Leptonycteris* has strict hot cave requirements and is also very shy.

The fishing bat, *Noctilio leporinus* (greater bulldog bat), is the largest on the island, weighing about 60 g. Its feeding techniques are remarkable and well worth observing: it captures small fish at the surface of the water using echolocation; it also eats insects in flight and other terrestrial animals like small crabs and scorpions. The bat's ecological functions include the creation of a habitat for other creatures in its coastal roosts. *Artibeus jamaicensis*, a fruit-eating bat, has not been seen since 1947 on Curaçao. It is likely that the two specimens captured were vagrant and that the species no longer occurs on the island.

### **Conservation issues**

Bats constitute the largest native group of mammals by number of species for Curaçao, but their distribution and numbers have been declining over the last century. Based on their physical characteristics, several subspecies have been determined to be endemic to Curaçao (they occur only here). We are left with a few hundred individuals for the most abundant species; such low numbers are very alarming and the risk of extinction is not only real, but high. Bats are extremely sensitive to pesticides and other forms of pollution, so that contaminated insects or other food sources may poison them. Roost disturbance is also likely to be a factor affecting the survival of bats; bats have tiny stores of energy and disturbances not only stress them out but also deplete their energy. Critically, the removal of native vegetation is very detrimental to bats. Not only are tree roosts destroyed, but the habitat in which specific insects live is destroyed as well. Finally, the destruction of cacti affects not only the general biodiversity of Curaçao, but also *Glossophaga* and *Leptonycteris*, bats that depend on the nectar of cactus flowers for survival.

### **What can we do?**

If bats must be removed from a building, it is necessary to give them the opportunity to leave during the night. Blocking all bat entrances should be done at night, when all bats are gone, and at a time when pups are not present. Information is available at: <http://batcall.csu.edu.au/abs/absmain.htm> and <http://www.batcon.org/home/index.asp?idPage=51&idSubPage=47>; the eviction may take a little patience. Exclusion should use a one-way device that allows the bats to leave but not to re-enter. Other methods are not ethical and will cause stress and pain to the bats, and are also likely to kill many. It has been reported that wind chimes placed at night in the buildings may encourage the bats to find another place to live. It is important to promote the retention of the native vegetation of Curaçao and to minimise disturbance to caves and other roosting sites. Bats are very precious to Curaçao and responsible for many good deeds, from which we benefit. Public education about bats is everyone's responsibility; when you know, pass it on. The legal protection of bats should also be supported.



## **Japanese Bat Watchers went to Australia**

**Keiko Osawa and Yushi Osawa**

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The authors enjoying a traditional Australian mode of travel with their caravan.

**The best thing about Australia is thousands of flying-foxes as we have only a small flying fox population in Japan.**

At the beginning of our trip we stayed in Sydney for a month, preparing for the one year trip. In spare moments we visited a grey-headed flying-fox camp in the Royal Botanic Gardens. When we visited it in January 2002 the gardens were trying to expel the bats with noise, smell and lights. We were relieved to see that they were still there. In the evening we saw bats flying against the Opera House and skyscrapers. In Japan we can find flying-foxes in roadside trees in Naha (population 310 000), but it is marvellous to see such a large colony in a city of 4 million people.

**In northern Queensland we visited three bat facilities.**

In late August we went to the bat house at Cape Tribulation. This was the second time we visited the house. When we visited it in 1999 we took a picture of a little red flying-fox that was rescued and we used that picture in our book. Compared to that time we found the forest surrounding the bat house had been restored.

We stayed at Pteropus Guesthouse of Tolga Bat Hospital in late September. It was before the tick paralysis season but still about 100 flying-foxes were kept there. We would have volunteered there but because we changed our itinerary we didn't have time to stay for long. So we had only a bit of bat care experience, peeling bananas, making them into smoothies and threading apples with wire for their dinner. We were surprised to see the flying-foxes feeding on leaves. In Japan leaves are an important part of flying-fox's food because it is a little too cold to supply year-round fruit and nectar, but that was the first time that we saw flying-foxes eating leaves outside of Japan.

We also visited the Bat Reach at Kuranda in early October. The place was busy and crowded with many tourists coming and going as it was near to the Kuranda market and the visitor centre. Miss Tully was talking about bats and bat conservation with a non-releasable spectacled flying-fox hanging from her arm.

Back in Japan, there are some wildlife rescue facilities but we have not heard of any facilities which show non-releasable animals for public education. So we were impressed by those facilities in Queensland and believe this helps to dispel negative views of bats.

**In Brisbane we joined the Batty Boat Cruise organized by the Wildlife Preservation Society of Queensland on November 5<sup>th</sup>**

Neptune left from Mowbray Park in downtown Brisbane at 5 pm. The boat was almost fully occupied with sixty something participants. Most of them didn't seem to be bat people. We are amazed that this kind of event can attract enough participants every year. Some members from Bat Rescue Inc. were on board, telling people about their activities, answering bat questions and selling gifts. Listening to commentary by a nature writer Tim Low we cruised the Brisbane River. We were just in time to see the evening "fly out" of the bats at Indooroopilly Island. We had seen the bat departure from the river bank before, but it goes without saying that to watch them on the boat was far better.

**Bats seemed to live in peace in an alternative camp**

When we came to Melbourne in 2002, there was a grey-headed flying-fox colony at the Fern Gully in the Royal Botanic Gardens and the gardens were trying to evict them because of their smell and damage to the plants. Then we heard they were relocated. This time we saw them at Yarra Bend Park. The park was well facilitated with a bat viewing platform, flying-fox wetland walk and signboards. We saw some people enjoying the evening "fly out" with wine. Although it was regrettable that they were not allowed to stay in the Botanic Gardens we were pleased to see them living here in peace. This place seems to be good for the bats as it is not close to a boat house, a kiosk or residential areas. Once we paddled a rent-a-canoe to the site. We got muscular pain but it was worth it because the camp view from the river was awesome. Friction between people and wildlife is also abundant in Japan; often ending up in culling. Japan is 20 times smaller than Australia, so it would be difficult to find such an alternative site. We are impressed that they were successfully relocated in Melbourne.

**We also visited two microbat sites.**

In February 2007 we visited Naracoorte Cave National Park to see the southern bent-winged bats. A bat tour took us to the Televue Centre. A ranger talked about the bats' hibernation, reproductive cycle and so on while she was operating remote-controlled infrared video cameras in the bat cave. The resolution was so good that we could see the bats clearly. We wondered why we had to join the tour to see the bats through video cameras as we had expected a fixed camera televising a specific spot. But we were satisfied with this televised tour as the resolution and the talk were so good that it was like a real cave tour. We think this is an epoch-making idea for striking a balance between tourism and conservation of the bats.

We also went to Cutta Cutta Caves in the Northern Territory to see a maternity roost of the ghost bat. We loved seeing the largest microbat in the world. Although their breeding season had finished and the colony had already moved to deeper areas of the cave where the tour couldn't go, fortunately five young bats came back to the entrance and we saw their large eyes and ears from a short distance. In order not to disturb the bats the ranger used her flashlight for only a short time, so we joined the tour twice to take a picture and the second time we also caught a glimpse of the orange leaf-nosed bat.



Enjoying a guided tour of the Naracoorte Caves, South Australia.

We have also been to many more wildlife spots that we didn't write about here. In total we saw 53 species of wild mammals, countless species of wild birds and also many reptiles and amphibians. Nevertheless, Australia is too large and varied for a one year trip so we had to leave many things unseen. We had only a quick trip through Western Australia and the Northern Territory and we haven't been to Tasmania. In the near future we will definitely come back to Australia.



## Reports from the XIV International Bat Research Conference and 37<sup>th</sup> North American Society for Bat Research meeting

### Celebration of all things Mexican

**Lisa Evans and Susan Campbell**

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Never (well not since we started attending them 5 – 7 yrs ago) has a conference begun with such drama, such turmoil, so many mojitos and such bad Spanish on our behalf. Hurricane Dean threatened – category 5 heading straight for Merida! Just to ensure the terror of the situation is fully understood by readers, the hurricane scale only goes to 5! On the streets of Merida, statues were elaborately wrapped in bubble wrap, windows taped, entire shelves of booze were plastic wrapped to prevent drunken rioting (and perhaps to ensure that there was a plentiful supply for the survivors to celebrate their continued existence!). Many batty big-wigs stayed safely in their respective countries, not willing to put themselves on the front lines of bat research! But, we are proud to say, that the Australasian contingent was standing firm – “Bring it on!” was the cry as we gathered hurricane supplies from Walmart and consumed most of them in one evening relaxing by our hotel pool.



Festive tourist transport on the sunny streets of Merida, Yucatan, Mexico.

The conference organisers shared our passion (convenient really) and chose to proceed with the show (after much deliberation and many, many emails). The first day of talks began in earnest, hurricane updates were posted prominently next to friendly Mexican delegates selling conference t-shirts. We are proud to say that there were many students presenting, a whole day of talks in two concurrent sessions. Dean would not deter them – the future of bat research is strong my friends.

Day 2 of the conference was D-day (D being for Dean in this case). He was due to explode onto the coast at 0400 hrs, so we went to bed awaiting the mighty roar and wondering if we would be able to make it to excellent symposia planned for the next day. With dawn however (at least for us), came disappointment. Dean had swung south and blown himself out on the border with Belize. So, with the adrenalin fading, and our families back home breathing collective sighs of relief (*ed: I'm not even sure the news of Dean made it to my family in Benalla, ignorance was bliss for them!*), we headed to the conference battling little more than a light breeze. However, Dean's wrath managed to infiltrate the conference by other, more sinister means, leaving gaping holes in the conference proceedings and the ensuing chaos was to test us all. Mornings began with a check of the new schedule, making the appropriate changes in our book of abstracts, scrubbing out, changing names, filling holes, changing times, lucky for us the hosts like to get stuck into the cakes and coffee before the talks begin. Unfortunately it was then a long 4 hr slog to the lunch break, another test for the weary delegate. Thankfully there were some excellent researchers presenting some most excellent results.

There were 130 poster presentations scheduled, a starting day of student talks, a final day of 'General sessions' and in-between we were treated to symposia on: Environmental Education; Bats and Emerging Infectious Diseases (Rabies); Phylogeography from Genes to Organisms; Blossom and Bats – Evolution and Ecology of Bat Pollination Systems; Bat Vocalisations and Applications of Echolocation Surveys for Inventorying Bats; Ecology and Conservation of Bats in Agroecosystems; Bat Conservation Efforts in Latin America; Social Organisation and Bat Mating Systems; Wind Energy; Global

Conservation of Bats; and finally, the Adaptability and Functional Significance of Echolocation Behaviour in Bats.

Most of us were able to attend a bat netting night in the local botanic gardens, where a few scattered branches on the ground were all to indicate that a hurricane had passed through. The bat activity and diversity was phenomenal, certainly an eye-opener for those of us used to the relatively slow pace of temperate forest trapping! But the paparazzi were definitely out in force (*ed: see Topa's article below*) and at times the combination of extreme bat, and bat-researcher, activity proved a little over-whelming for the local organisers (not to mention the bats).



A Little Yellow-shouldered Bat *Sturnira lilium* (Phyllostomidae) trapped in the Merida Botanic Gardens.

So, we come to the end of the last day, and as at the end of each day, we finished it with mojitos, margaritas, tequila and dos equis (2X beer, a darn sight better than QLD's 4X, so whatever ingredient the 'X' stands for, the less the better!). Tonight though, we would take the celebrations up a notch with the conference dinner at a traditional Hacienda (grand old homestead converted to a restaurant). This was the Mexican organising committee's chance to reward their brave hurricane surviving colleagues, and they did this with gusto! Bottomless tequila glasses, la cucaracha blaring from trumpets played by men in sombreros, fabulous Mexican food and a salsa band that ensured there was dancing well into the morning. So ended a conference that will forever remain in the consciousness of those who willingly risked their lives in pursuit of bat research, conservation, education, scientific communication and of course; the highest quality tequila.



## A timely reminder

### Dr. Topa Petit

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The 14th International Bat Conference took place in Merida, Mexico, in August 2007. A few Aussies and Kiwis attended among the 300 to 350 people there. In spite of our promised imminent destruction by a hurricane, not one hair on our head was displaced. The hurricane instead pelted a few poor communities further south on the Yucatan Peninsula, which were described as “what-a-relief-nobody-lives-there” kind of areas by US news.

During a visit there I was interested to see that the traditional palm roofs, if a little ruffled, were still mostly standing their ground, whereas the metal roofs had travelled extensively across the landscape. The conference, in luxurious accommodation, was quite successful, and big stars braved the non-hurricane to attend, including Otto von Helversen. Presentations in three rooms were unfortunately not always coordinated and I missed too many of the fascinating research talks. The conference dinner was mostly a tequila affair with self-congratulations expressing great relief at having beaten the hurricane.

Some of us went on conference tours including one where we scared poor flamingos as the big rich gringos we were, ate in an old hacienda, visited Maya ruins, and visited part of an amazingly large cave with many bats and much history. The local guide wearing thongs (while the rest of us could hardly remain standing in our elaborate footwear) knew little about bats and we tried to teach him a few facts so that he could understand what a great treasure he was looking after. I was very unimpressed with the greedy behaviour of some fellow bat biologists who wanted a photo of each bat captured, and which resulted in one bat with a broken wing after they mugged it. We need to remember that we are biologists, that we are dealing with fragile wild animals, that we have responsibility for the ethical handling of the animals, and that the world will go on if we don't handle a bat that others are handling and if we don't get a photo. For goodness' sake. Finally, I note that Merida, if it is far from being my favourite town in the world, boasts the best coconut ice cream (and Lindy agrees!). Apart for these few tragedies, it was wonderful to meet old colleagues again and catch up with international bat news.



Traditional Mexican fare at the conference dinner.



## **Newspaper article on Hurricane Dean**

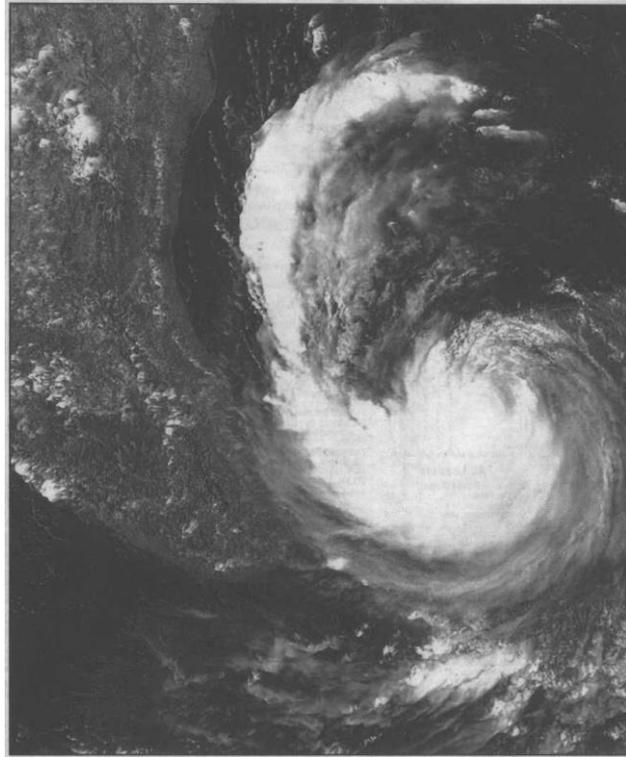
**Reprinted from the Regina (Saskatchewan Canada) Leader-Post**

### **Mexicans survive Dean's wrath**

CHETUMAL, Mexico (Reuters) – Hurricane Dean flooded streets and toppled trees across Mexico's Yucatan Peninsula Tuesday but it left famous Caribbean beach resorts mostly intact before taking aim at Gulf of Mexico oil platforms. There were no early reports of deaths or serious damage in Mexico from the storm, a potentially disastrous Category 5 hurricane which lashed beach resorts on the "Mayan Riviera" where thousands of tourists had crammed into shelters. "We escaped. It was very light," said Miguel Crux, 29, a hotel receptionist in the resort of Playa del Carmen.

Water surged down a main street at thigh level in Chetumal, a city of about 150,000 people near where Dean made landfall. Broken trees and street lights lay strewn around. Dean had killed 11 people elsewhere on its rampage through the Caribbean.

It passed quickly over the Yucatan and was downgraded to a Category 1 storm but forecasters warned that roaring winds and rain would likely pick up again as Dean headed toward Mexico's offshore oil platforms in the southern Gulf of Mexico. State oil company Pemex has closed and evacuated more than 400 oil and gas wells, meaning lost production of 2.65 million barrels of crude per day.



Satellite image of Hurricane Dean.

President Felipe Calderon said no deaths were reported. Mexico's response to hurricanes has improved in recent years as emergency services regularly stage rehearsals and the population is well informed about disaster prevention. Hotels and other buildings in resorts like Playa del Carmen and Cancun, devastated by Hurricane Wilma in 2005, escaped major damage this time. Tens of thousands of tourists fled Cancun over the weekend before Dean crashed into the area, famous for its white beaches, crystal clear waters and Mayan ruins at Chichen Itza. But storm surge and high waves may have swept away parts of Cancun's beach, residents and a local official said. The beach was rebuilt with new sand brought in from further out in the Caribbean after Wilma pummelled it. Chetumal was left without power when the hurricane's sustained winds of 165 miles per hour and gusts of up to 200 m.p.h knocked over dozens of power poles and trees in the early hours of Tuesday. The aluminium roofs of some houses were blown off. Dean swiped Jamaica at the weekend with fierce winds and pelting rain, killing two people and taking the storm death toll to 11. Haiti was worst hit with four people dead. Dean is likely to cost insurers up to \$1.5 billion with the majority of claims coming from damage caused in Jamaica, disaster-modelling firm Risk Management Solution said. Heavy rain drenched Belize, a former British colony that is home to some 250,000 people and a famous barrier reef. Sugar cane fields were flattened in the north of the country but there were no deaths reported. "Frankly, it was less severe than we expected. We're very happy that the damage has been contained. We know how to organise for hurricanes and there are more houses now built to withstand these forceful winds," said Robert Leslie, the government's cabinet secretary.

Category 5 hurricanes are rare but there were four in 2005, including Katrina which devastated New Orleans. Hurricane Wilma two years ago washed away whole beaches in Mexico, killing seven people and causing \$2.6 billion in damages. Poor local residents with badly built homes are often the worst hit by hurricanes. Calderon cut short a visit to Canada, where he met U.S. President Bush and Canadian Prime Minister Stephen Harper, to oversee the emergency effort.



## **Papers submitted to the XIV IBRC and 37<sup>th</sup> NASBR by Australasian delegates**

(ed: sincere apologies if I've left anyone off this list)

### **SPOKEN PRESENTATIONS**

- Susan Campbell. "Behavioural ecology and conservation of Australia's only trawling bat, the large-footed myotis: a review."
- Andrea Dekrout and Stuart Parsons. "'One Sex in The City (?)' – indications of an extreme sex bias in the use of city habitats by bats in Hamilton New Zealand and the ecology of Long-tailed bats at the urban-rural interface."
- Anja Divljan, Kerry Parry-Jones and Glenda M. Wardle. "Demography Down Under – A study of population age structure and effects of mortality sources on Grey-headed Flying-fox populations."
- Lisa Nicole Evans, Lindy Lumsden, Ian Beveridge and Graeme Coulson. "The behavioural responses of microbats to their ectoparasites."
- Clare Louise Hourigan. "Patterns of bat biodiversity occurring within residential, parkland and remnant bushland habitats within the urban landscape of Brisbane, Australia."
- Lindy Lumsden, Martin Schulz, David James, Raquel Ashton and David Middleton. "Rapid decline and imminent extinction of the Christmas Island Pipistrelle, *Pipistrellus murrayi*."
- Sandrine Martinez, Suzanne Hand and Scott A. Hocknull. "Late Pleistocene morphological variation of the Australian ghost bat, *Macroderma gigas* (Microchiroptera: Megadermatidae) at Mt Etna, Australia."
- Colin O'Donnell and Jane Sedgeley. "Conservation management of New Zealand bats: a review of the Department of Conservation recovery programme, 1995 – 2007."
- Kerryn Parry-Jones, Anja Divljan and Glenda Wardle. "Conservation lessons from the Grey-headed Flying-fox, *Pteropus poliocephalus*, a persecuted species that didn't go extinct in the 1930s!"
- Stuart Parsons, John W. Hermanson and Daniel K. Riskin. "Linkage of echolocation call production and limb movement during flight and quadrupedal locomotion in a terrestrially agile bat (*Mystacina tuberculata*)."
- Sophie Petit, Anna Rojer and Leon Pors. "Threats to the bats of Curaçao (Netherlands Antilles) and factors influencing the evaluation of their status."
- April Reside and Ara Monadjem. "The influence of riparian vegetation on the distribution and abundance of bats in an African savanna."
- Annette T. Scanlon, Sophie Petit and Terry Reardon. "Effects of season, weather, moonlight and insect activity on bat activity in the city of Adelaide, South Australia."
- Louise A. Shilton, Peter J Latch, Adam Mckeown, Petina Pert and David A. Westcott. "Large-scale re-distribution of Spectacled Flying Foxes (*Pteropus conspicillatus*) after severe Tropical Cyclone Larry."
- Bruce Thomson and Jenny Ovenden. "The genetic structure of a population of the Chocolate Wattled Bat, *Chalinolobus morio* in south-eastern Queensland, Australia. Preliminary results from mtDNA analysis."

### **POSTERS**

- Andrea Dekrout. "Monitoring long-tailed bat (*Chalinolobus tuberculatus*) populations: 'One poo will do'."
- Jennifer G. Parsons, Andi Cairns, Simon K.A. Robson, Christopher N. Johnson, Louise A. Shilton and David A. Westcott. "Dietary variation in spectacled flying foxes (*Pteropus conspicillatus*) of the Australian Wet Tropics."
- Jennifer G. Parsons, Simon K.A. Robson, David Blair, Jon Luly and Louise Shilton. "Aerial Photography and digital imaging: New techniques for monitoring problematic flying fox camps."



THESIS ABSTRACTS

**Habitat relationships, activity patterns and feeding ecology of insectivorous bats of the Top End of Australia.**

**Damian J. Milne**

**PhD thesis (July 2006)**

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The wet-dry tropics of the Northern Territory (the Top End) has a diverse microbat fauna. It supports 28 of Australia's 65 species, including one endemic species (*Taphozous kapalgensis*), both of Australia's monotypic genera (*Rhinonicteris* and *Macroderma*) and two species considered to be rare or endangered (*Saccolaimus saccolaimus* and *Hipposideros diadema*). However, most aspects of the ecology of this fauna are poorly known. The aim of this study was to investigate the composition of microbat assemblages; describe the habitat relationships of the microbat fauna at both the community and species levels; assess microbat activity patterns at several temporal scales; and to conduct a dietary analysis of the microbats of the Top End.

Robust methods for sampling bats are still being developed and tested. Based on recordings derived from the Anabat II detector, I compared the results of surveys where I changed the orientation of the detector, the type of recording media, and static versus active hand-held recording. Detector orientation did not significantly affect any survey results, more call passes were identified from digital recordings and more species were detected using hand-held recordings. I also derived species-accumulation curves for the Top End microbats and provide guidelines for minimum sampling effort in future studies.

Patterns in the composition of assemblages of microbat species sampled during the late dry season (the 'build-up') in the Top End were assessed against a range of environmental factors as well as four *a priori* defined habitat types (riparian, escarpments, coastal and woodlands). In general, species assemblages were not clearly defined and the number of significant environmental associations was relatively few. The most distinct species assemblages were strongly associated with topographic and climatic variables. There were also limited associations with vegetation structure, fire and local roost potential but no associations with insects or water availability. Total species diversity at sample sites was associated with distance to rivers and rainfall.

Generalised linear modelling (GLM) was used to develop habitat models for 25 of the 28 microbat species of the Top End. Based on these models, a geographic information system (GIS) was used to derive probability of occurrence maps for each species. Almost all of the models identified a unique combination of environmental variables, and the resulting probability of occurrence maps revealed a variety of patterns of predicted distribution. Annual rainfall and habitat complexity were identified as significant variables in the majority of the models. All of the spatial models were combined to derive a probability map of species richness of microchiropteran bats in the Top End. This map shows greatest species richness in the north-west and north-central parts of the study area.

Temporal patterns of microbat activity and species richness were assessed at four scales: hourly, nightly, monthly and yearly, in relation to biotic (insect availability) and abiotic features in the environment. At the hourly scale, bat activity was highest in the first hour after dusk and declined throughout the night. Hourly bat activity was most closely associated with temperature. At the nightly scale there were significant associations between bat activity, moon light and temperature as well as a complex association with both moon phase and time of night. At the monthly scale bat activity increased dramatically in October which was possibly triggered by a combination of changing climatic factors that occur at this time of year in the Top End. At the yearly scale there was no overall difference in bat activity between years ( $n = 4$ ) and no associations with climatic variables.

The dietary composition for 23 of the 28 Top End microbat species was described by identifying the prey remains collected from stomachs and faecal pellets to the lowest possible taxonomic level (usually order or lower). Dietary analysis revealed that most species consumed a variety of orders indicating that Top End microbats have generalist dietary requirements and/or opportunistic foraging habits. However, the dietary compositions for *H. diadema*, *H. stenotis*, *Mormopterus loriae*, *Nyctophilus geoffroyi*, *N. bifax* and *T. kapalgensis* contained only one or two insect orders suggesting these species may have more specialised diets. Microbats in the 'Uncluttered' foraging guild consumed proportionally more insects belonging to the orders Orthoptera and Coleoptera whereas the 'Background clutter' and 'Highly cluttered' foraging guilds consumed proportionally more Lepidoptera.

This study has greatly increased our understanding of some aspects of the ecology of microbats in the Australian wet-dry tropics. I make a number of recommendations for the conservation management and future research of Top End microbat fauna, most notably to investigate the association between microbat diversity and riparian areas, conduct further microbat surveys throughout the region to redress the still meagre number of records, and initiate targeted monitoring programs for microbats.



## **Ecological specialisation and conservation biology of the Large-footed Myotis *Myotis macropus*.**

**Susan Campbell**

**PhD thesis (June 2007)**

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Ecological specialists are species that exhibit adaptations for specific habitat variables, and consequently show greater fidelity to a particular environment. Consequently, specialist species are inherently more vulnerable to extinction threats compared to generalist species that are defined by less stringent habitat requirements.

The genus *Myotis* represents one of the most diverse and successful radiations among mammals, with about 90 species distributed worldwide. However, the Large-footed Myotis *M. macropus* is the only representative of this genus in Australia. Like several other members of the genus, *M. macropus* is specifically adapted for collecting prey directly from, and immediately above, water. These 'trawling' *Myotis* bats do not represent a monophyletic group; rather several species from a vast geographic area have converged on common morphology and behaviour that reflects their aquatic mode of foraging. Consequences of this convergence are that as a group, trawling *Myotis* bats worldwide face similar threats to their persistence in modified landscapes.

Throughout Victoria, *M. macropus* is rare and patchily distributed along coastal and inland waterways. During 2002 I selected sites on an inland river, inland lake and two coastal regions where the species had previously been recorded. I subsequently spent the southern summers from 2002 to 2005 in the field investigating the extent of ecological specialisation and local adaptation in *M. macropus* populations in response to different habitat characteristics.

I observed bats foraging at each site by adhering chemiluminescent tags to their ventral surface. Foraging behaviour was remarkably consistent; regardless of habitat type, individuals spent 88 % of foraging time over water, typically within 45 cm of the water surface. Trawling behaviour was frequently recorded at all sites, and bats contacted the water surface on average four times per minute during foraging bouts. There was no evidence of ontogenetic effects on foraging behaviour. Similarly, foraging behaviour was consistent among different life-history stages, although pregnant females tended to contact the water surface twice as frequently as non-reproductive females, suggesting an increase in feeding rate associated with the increased energetic demands of pregnancy. Reflecting this

consistent aquatic foraging behaviour, faecal pellets collected from *M. macropus* individuals at each site contained predominantly (62 %) aquatic prey, and 7 % (by volume) of the diet consisted of fish. Variation in the species diet among sites largely reflected variation in the availability of prey at each site, estimated from light-trap and sieve net samples taken concurrently throughout the study.

The feeding ecology of *M. macropus* was clearly dependent on the availability of relatively smooth, uncluttered water surfaces. However, bats also exhibit exacting habitat requirements during the day, spending over half of their lives within day roosts. To determine whether the species nocturnal reliance on riparian habitats was also reflected in their choice of day roosting habitat, I used radiotelemetry at the inland lake site to locate 17 *M. macropus* day roosts from spring to autumn during 2003 to 2005. All of the roosts located during this study were within 100 m of permanent water. The roost trees and cavities selected by *M. macropus* at the inland lake site differed from matched available trees and cavities only with respect to the smaller entrance area of roost tree cavities relative to available cavities. Interestingly, day roosts were located in both tree cavities and also within crevices between large basalt blocks in a tunnel. Both roost types provided thermal microclimates that were warmer at night and cooler during the day than ambient conditions, however temperatures inside the tunnel crevice roost, whilst more stable, were typically 0.5 – 3 °C cooler than inside tree roost cavities. Maternity roosts were located in both roost types, suggesting that the thermoregulatory strategies of breeding individuals inside the tunnel crevice may differ from tree roosting conspecifics in order to optimise juvenile growth and development. Alternatively, the absence of aerial predation inside the tunnel provides a safer maternity roost environment, and consequently individuals may trade-off of a warmer roost environment for decreased predation at the roost site.

Populations of specialist species may be restricted to fragments of preferred habitats and exhibit poor dispersal capability outside of these isolated habitat patches. These populations may consequently exhibit decreased genetic variability via genetic drift and loss of heterozygosity. Having established substantial ecological specialisation for *M. macropus* with respect to both feeding and roosting ecology, I used population genetics to investigate the potential consequences of specialist behaviour for this species. Only two of the 18 existing *Myotis* nuclear microsatellite markers amplified reliably and were polymorphic when tested on *M. macropus* DNA extracted from wing-tissue. Therefore, I designed five additional species specific nuclear microsatellite markers and genotyped 176 individuals from six populations. One locus was excluded from subsequent analyses as it violated Hardy-Weinberg assumptions in multiple populations. However, based on genotypes at the six remaining loci, overall mean allelic diversity was high (range 5.5 – 7.0) and the observed heterozygosity was also high and evenly distributed among populations (range 0.629 – 0.885). However, global  $F_{ST}$  was also high ( $0.121 \pm 0.028$ ) and pairwise  $F_{ST}$  values ranged from 0.0210 – 0.3119, reflecting significant population genetic structure. Significant population structure was detected between populations on the same inland river that were only 14 km apart, and significant isolation-by-distance was detected for females. In addition, the population sampled at Glenelg was genetically distinct from all other sampled populations, and five private alleles were detected in the other coastal population on Rotamah.

The significant genetic structure of *M. macropus* populations in Victoria suggests that there is limited movement of individuals through the landscape. The majority of riparian habitat in Victoria occurs on private land, and is in moderate to poor condition. Despite the capacity for flight, the degradation and loss of this habitat appears to restrict the movement of *M. macropus* through the landscape. On a larger scale, riparian habitats are currently threatened by human settlements worldwide. Riparian sites are particularly susceptible to changes to flow rates (e.g. diversions for agriculture) and to various forms of pollution (e.g. runoff from agricultural, industrial and urban sources). In addition to these immediate threats, over a longer (but increasingly imminent) temporal scale, the availability and abundance of riparian sites will be altered by climate change, and these changes will be particularly pronounced in arid countries such as Australia. The findings from this project highlight the need for ongoing restoration and protection of existing riparian habitats. In addition, the cooperation of land owners in management plans is required to ensure that rehabilitation of riparian sites on private land is successful and that the connectivity of riparian sites throughout a predominantly agricultural landscape is restored.



**QUIRKY ARTICLES**

## **An ecological control for West Nile Virus**

As local health officials in Texas prepare for the start of summer and the associated risks of mosquitoes carrying West Nile Virus, members of the Frio Nature Conservancy (FNC) are tracking Mexican free-tailed bats (*Tadarida brasiliensis*) as they make their feeding runs from Concan, Texas to the Coastal Bend about 200 miles away. The Frio team is following the Hill Country bats to study their feeding habits, which could prove to be the first line of defence against West Nile. Just a few hundred yards away from the Frio River, 12 million bats will depart Frio Cave for their nightly hunt. John Schuehle, director of the FNC, believes the bats may provide one solution to the problem. His team specialises in bat and mosquito research. Something in the bats' bodies, specifically their spleens, allows them to eat mosquitoes infected with the West Nile virus and not become infected themselves. Schuehle said the proof is in the droppings bat leave behind in the cave. When the bats leave Frio Cave, the team tracks them using radar imaging, similar to the Doppler radar system in use by meteorologists. They can apply the same technology to track mosquitoes the bats are hunting. FNC has used the radar data to build a map that pinpoints where mosquitoes infected with West Nile are breeding. Their hope is that local health departments can use the information to clean out mosquito hot spots in addition to spraying the surrounding neighbourhood.

Reprinted from NSS News, August 2007

## **Bat Hair Inhibits Athlete's Foot Fungus**

Submitted by **Prof. William F. Wood**

*Dept. of Chemistry, Humboldt State University, California, U.S.A. Email: wfw2@humboldt.edu*

Mexican free-tailed bats are one of the most successful mammalian species in the world. They inhabit most of the temperate and tropical areas in the Western Hemisphere. These bats roost in colonies that can be as large as several million individuals in places like Carlsbad Caverns in New Mexico. In other places, they form colonies of a few dozen individuals.

These bat colonies are noted for their distinctive musk-like odour. William Wood and Joseph Szewczak of Humboldt State University identified the chemicals that produce this scent and their results are reported in the September issue of *Biochemical Systematics and Ecology* (volume 35, pp 566-568). These researchers carefully removed a few milligrams of hair from each bat and then identified the compounds responsible for the strong odour.

The major compound they identified is known to inhibit the fungus that causes athlete's foot in humans. This fungus infects many different mammals besides humans. In bat hair, the concentration of this compound, non-anal, was six times stronger than needed to stem the growth of this fungus. This substance also inhibits the growth of the pathogenic skin yeast that has been implicated in causing human dandruff. Two other substances in bat hair, heptanal and octanal, also have antifungal activity. Unfortunately, there is little likelihood of these chemicals being used on humans, since no one would want to smell like a musky bat colony.

Besides protecting the bats from fungi, the three active substances in bat hair have been shown to be effective tick and mosquito repellents. The protective effects of these chemicals may be why these bats can roost in such large colonies. Without this chemical protection, disease and/or external parasites might disable bats in large colonies.



## **CONSERVATION FEATURE**

*(Ed: The Wildlife and Conservation Research Group at the University of Melbourne consists of academic staff, postgraduate and undergraduate students studying the ecology and conservation of Australian vertebrates. I am a member of this group and in addition to our studies, we have an active interest in local and national conservation issues. The construction of the Gunns Pulp Mill is a highly significant environmental, social and political issue that has undergone alarmingly poor and inadequate Environmental Impact Assessment. I decided to publish this letter, drafted by Jessica Feder with the assistance of the Research Group, to alert ABS readers to the impact this development will likely have on the Tasmanian chiropteran fauna. Perhaps we could consider drafting a similar letter on behalf of the ABS?).*

Wildlife and Conservation Research Group  
Department of Zoology  
University of Melbourne VIC 3010

The Hon Malcolm Turnbull  
Minister for the Environment and Water Resources  
PO Box 1840  
Bondi Junction NSW 1355

Dear Minister Turnbull

### **Re: Recommendation to conditionally approve the Gunns Pulp Mill**

Your recent recommendation to conditionally approve the construction and operation of a chemical pulp mill by Gunns Ltd at Bell Bay Tasmania has raised concern in terms of how adequately the conditions will serve to protect threatened species and other matters of national environmental significance.

Please respond to each of our concerns outlined below.

#### **1. Lack of independent monitoring of threatened species**

How can the Minister guarantee the reliability of the monitoring of threatened species as required by the conditions? The conditions stipulate that Gunns Ltd must undertake monitoring. Under certain conditions monitoring information may lead to a shut-down in construction. A direct conflict of interest exists. Instead an independent body should be charged with the responsibility to undertake monitoring and reporting.

#### **2. Measurable outcomes for response strategies missing from the conditions**

How can the Minister guarantee the adequacy of response strategies that will be implemented by Gunns if trigger levels or maximum limits are reached? The conditions do not stipulate *measurable* outcomes for response strategies. The conditions only require Gunns to respond when trigger levels and maximum limits are reached. In the absence of explicit measurable outcomes for the response strategies, we are concerned that responses by Gunns may be inadequate.

#### **3. Site location for effluent outfall in Bass Strait potentially harmful to Australian fur seals and fisheries**

Dioxins have been found to lower birth rate and pup survival, and increase the incidence of premature births in seals<sup>1</sup>. The proposed site for the effluent outfall is located just 15 km from an Australian fur seal colony. In addition, the outfall is in the southern Bass Strait "stagnation zone" which has flushing times of up six months<sup>2</sup>. Consequently there is the potential for build-up of toxins in the environment, as well as the contamination of the eastern Bass Strait commercial fisheries. A safer location for the outfall would be southern, western or eastern Tasmania. Further, chemical contamination is listed as a

threatening process for Australian seals in Environment Australia's report *The Action Plan for Australian Seals*<sup>3</sup>. Can you guarantee that the effluent outfall at its current planned location will not impact detrimentally on Australian fur seals?

#### **4. Conditions to ensure protection of old growth forests and native forests missing**

The pulp mill construction is just one part of the equation – in order to protect matters of national environmental significance there must be guarantees that the *operation* of the pulp mill will not have a detrimental impact on nationally-listed threatened species. Conditional approval must include conditions that protect threatened species that rely on Australia's old growth forests *and* native forests that will supply the timber for the pulp mill if matters of national environmental significance are to be protected by the conditions. Why are there no conditions to protect national matters of environmental significance that may be impacted upon by Gunns operations to *supply* timber for the pulp mill?

#### **5. Decision to recommend approval made before environmental assessment completed**

As Minister for the Environment and Water Resources it is your responsibility to have an understanding of the impact on marine environment ecosystems before a decision to approve can be made. However, the effluent modeling has not been completed and you have already given conditional approval for the construction of the pulp mill. Why have you made a decision before knowing what the environmental impact will be? Is this not a breach of the Environment Protection and Biodiversity Conservation Act?

We look forward to your response and hope that you can clarify our concerns.

Sincerely,

Jessica Feder on behalf of  
Wildlife and Conservation Research Group  
Department of Zoology, University of Melbourne.

<sup>1</sup> Atkinson, S. (1997). *Reproductive biology of seals*. *Reviews of Reproduction* **2**, 175-194.

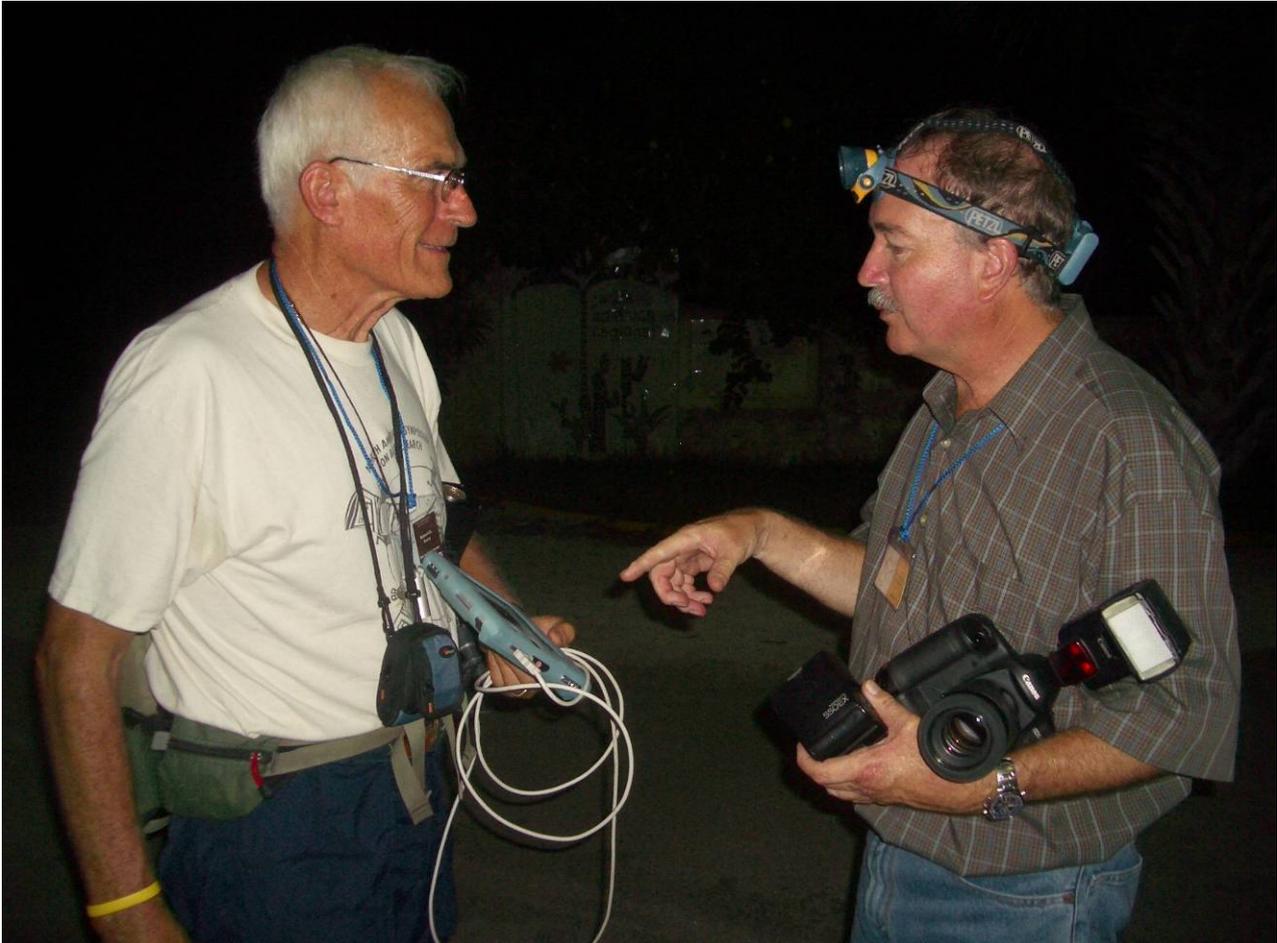
<sup>2</sup> Sanderly, P.A., Kämpf, J. (2005) *Winter-spring flushing of Bass Strait, South-eastern Australia: a numerical modeling study*. *Estuarine Coastal Shelf Science* **63**, 23-32.

<sup>3</sup> Shaughnesy, P.D. (1999). *The Action Plan for Australian Seals*, Environment Australia, Canberra, 62pp.



**– Gadgets and Techniques –**

*Ed: We didn't have any contributions to this section for this edition, be sure to send me anything you would like printed in the next issue. On the topic of gadgets though, check out the photo below of Bruce Thomson and Bob Berry at the conference in Mexico and email me ([s.campbell@zoology.unimelb.edu.au](mailto:s.campbell@zoology.unimelb.edu.au)) what you think the accompanying caption should be. The most 'appropriate' caption(s) will be printed in the next edition.*



Insert the caption you would like to accompany this picture here...



**– News and Announcements –**

## **13<sup>th</sup> Australasian Bat Society Conference**

By now you all should have received your 'Call for Registration and Papers' and the 'Registration Form' documents for the next conference, either in the mail, or electronically if you requested to receive your ABS notifications by email. The forms are also on the ABS website (<http://abs.ausbats.org.au>).

Dates: Wednesday 26<sup>th</sup> to Friday 29<sup>th</sup> March 2008, with the Welcoming Function on the evening of Tuesday 25<sup>th</sup> and a field trip on the Friday night.

Venue: Thurgoona Campus, Charles Sturt University, Albury NSW, to be held in the new ecologically sustainable and environmentally friendly buildings.

Registration dates: early registration (where you get a discount) are due 11 January, with standard registration and abstracts due on 8 February 2008.

Please send in your registration forms as soon as possible. If you have any questions please contact us.

We hope to see you all there – it should be a great conference.

### **Craig Grabham and Lindy Lumsden Conference organisers**

Contact details:

#### **Craig Grabham**

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#### **Lindy Lumsden**

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Phone: 03 9450 8694



## **ABS Stickers**

As a way of promoting bat conservation, we're making up a bumper sticker and we're trying to think of a suitable message to print on the sticker. Got any suggestions ?!?!

It can be any kind of message you like; serious, funny, abstract or straight to the point, it just has to be relatively short and have something to do, of course, about BATS (or the ABS). For the more artistically inclined, feel free to try some graphics instead!

So put your thinking caps on and send your suggestions to the Membership Secretary, Damian Milne ([damian.milne@nt.gov.au](mailto:damian.milne@nt.gov.au) or 08 89955016) or the ABS listserver.

We'll short-list the most effective/creative contributions and print them in the newsletter and then select the best one to go on the sticker. We plan to print them up next year and send one to all members, as well as having some extra available for promotional purposes.



**– Recent Literature –**

**Compiled by Susan Campbell from ISI Web of Science.**

April 2007 - early November 2007

**Roosting Ecology**

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- Chaverri, G., O. E. Quiros, et al. (2007). "Ecological correlates of roost fidelity in the tent-making bat *Artibeus watsoni*." Ethology **113**(6): 598-605.
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- Limpert, D. L., D. L. Birch, et al. (2007). "Tree selection and landscape analysis of eastern red bat day roosts." Journal of Wildlife Management **71**(2): 478-486.
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**Foraging Behaviour**

- Arbuthnott, D. and R. M. Brigham (2007). "The influence of a local temperature inversion on the foraging behaviour of big brown bats, *Eptesicus fuscus*." Acta Chiropterologica **9**(1): 193-201.
- Bartonicka, T., Z. Rehak, et al. (2007). "Can pipistrelles, *Pipistrellus pipistrellus* (Schreber, 1774) and *Pipistrellus pygmaeus* (Leach, 1825), foraging in a group, change parameters of their signals?" Journal of Zoology **272**(2): 194-201.
- Boyles, J. G. and J. J. Storm (2007). "Avoidance of predator chemical cues by bats: an experimental assessment." Behaviour **144**: 1019-1032.
- Henry, M., J. M. Pons, et al. (2007). "Foraging behaviour of a frugivorous bat helps bridge landscape connectivity and ecological processes in a fragmented rainforest." Journal of Animal Ecology **76**(4): 801-813.
- Piechowski, D. (2007). "Bat visits and changes in floral nectar during anthesis of *Parkia pendula* (Mimosaceae)." Phyton-Annales Rei Botanicae **46**(2): 203-204.
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- Tang, Z. H., L. X. Sheng, et al. (2007). "Fruit-feeding behaviour and use of olfactory cues by the fruit bat *Rousettus leschenaulti*: an experimental study." Acta Theriologica **52**(3): 285-290.
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**Diet studies**

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- Rakotoarivelo, A. A., N. Ranaivoson, et al. (2007). "Seasonal food habits of five sympatric forest microchiropterans in western Madagascar." Journal of Mammalogy **88**(4): 959-966.
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- Thabah, A., G. Li, et al. (2007). "Diet, echolocation calls, and phylogenetic affinities of the great evening bat (*Ia io*; Vespertilionidae): Another carnivorous bat." Journal of Mammalogy **88**(3): 728-735.
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### **Echolocation and flight**

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- Bullen, R. D. and N. L. McKenzie (2007). "Bat wing airfoil and planform structures relating to aerodynamic cleanliness." Australian Journal of Zoology **55**(4): 237-247.
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- Knornschild, M., O. Von Helversen, et al. (2007). "Twin siblings sound alike: isolation call variation in the noctule bat, *Nyctalus noctula*." Animal Behaviour **74**: 1055-1063.
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