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: **10th March** for the April issue, and **10th October** for the November issue. The Editor reserves the right to hold over contributions for subsequent issues of the *Newsletter*, and meeting the deadline is not a guarantee of immediate publication.

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

For consistency, the following guidelines should be followed:

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

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– Editorial –

Hi everyone,

Welcome to the not so early 2016 edition of our ABS *Newsletter*.

A huge congratulation to our Treasurer, Robert Bender, for his herculean effort in having the ABS successfully entered onto the Register of Environmental Organisations as of 27 April 2016. **Donations made to the ABS are now eligible for tax deduction.**

Thanks to some terrific photos taken by Tim Pearson at the conference, I thought I would take this opportunity to introduce you all to our incoming executive. Your exec is there to help steer the ABS along the right path towards achieving our constitutional goals.

Welcome to Justin Welbergen (below) who graciously raised his hand to accept the presidency from our outgoing, hard-working, president Kyle Armstrong. Thank you so very much Kyle for all your heart, soul and sweat you have poured into the presidency role over the last four years.

Welcome to Moni Rhodes, seen below cautiously accepting the role of 1st Vice President from Lisa Cawthen, conference organiser extraordinaire and out-going 1st VP. Even Martin is certain that Moni will fill the role with flare, skill and vivacity!

Welcome to the secretary role Pia Lentini, seen below wisely accepting wistful hand-over advice from out-going secretary Brad Law.

Thank you to Lindy for staying on in her role as 2nd Vice President. Aside from her wealth of bat knowledge, Lindy's presence on the continuing exec provides continuity and well respected input that will be invaluable for the new exec members.

I am also staying on in role as *Newsletter* Editor, and Damian is continuing as Membership Officer.

Enjoy this (very late) edition of the *Newsletter.*

Susan Campbell
ABS *Newsletter* Editor.

Cover image: Mel Hills created this logo especially for the 17th ABS conference held recently in Hobart. Mel is a local Tasmanian artist who delights in sharing her joy of the surrounding landscapes and wildlife she encounters. Anyone who witnessed how quickly and skilfully Mel worked on her bat images at the conference will attest to her unique and impressive skills.

– From the Presidents –

– From the out-going President –

As I hand over to our new POTABS, I would like to say a final thank you to everyone who supported the society, and myself in the role of president, over the past four years. It has been both personally and professionally rewarding, a terrific learning experience, and I have enjoyed talking with everyone. Most of all though, it has been a great pleasure to be at the centre of a society that I have a great affection for. I wish Justin all the best in his new role, and to seeing everyone again at the next Big Bat Thing. Save the Bats!

Kyle Armstrong

– From the in-coming President –

As the newly elected president of the Australasian Bat Society, I would like to extend our heartfelt gratitude to our outgoing President. Kyle has put a lot of himself into our society, and due to the tireless efforts of him and the other (extended) executives the ABS is now in wonderful shape. Chapeau!!

The 17th ABS Conference was a tremendous success thanks largely to our indefatigable organisers. It showed the ABS at its best —a veritable kaleidoscope of talents and expertise with broad interests in the ecology, conservation and management of our weird and wonderful bats. Congratulations to Terry Reardon with his well-earned Life Membership, and a big thank you to everyone who contributed and attended!

Since the conference, the ABS has continued to work hard to promote the conservation of our bats. It made several high-profile submissions, including comments (drafted by Kyle with input from a broad contingent of ABS members) to the Threatened Species Scientific Committee on its listing re-assessments for *Hipposideros semoni*, *Rhinolophus robertsi*, and *Saccolaimus saccolaimus*, and a comment (led by Peggy Eby, Brad Law and Dan Lunney; p. 23) to the NSW Government on changes to vegetation management contained in its draft bills and codes. It is a true privilege to have such great in-house expertise that we can engage government at these levels.

Much of our recent time and efforts have also been dedicated to responding to emerging flying-fox issues. In response the proposed dispersal from Batemans Bay, the ABS Flying-Fox Subcommittee mounted a campaign that included, comments on the Batemans Bay Flying-Fox Camp Draft Dispersal Plan (p. 19), a press release (p. 17), a Conversation article (p. 22), many interviews in the media; and expert advice to the Environmental Defenders Office NSW.

We still have many challenges before us (what else is new?). To address these the new executive now meets on a monthly basis, and has taken on a suite of new initiatives. Thanks in a large part to Maree Treadwell, we now have a strong profile in the social media sphere, and Nicola Hanrahan and Heidi Kolkert have kindly agreed to take over from her as Social Media Officers. Leroy Gonsalves has been working hard on streamlining our website, to great visual effect. Our capacity remains limited, however, and we are always looking for more help. In particular, I invite you to contact me if you are interested in becoming our next Conservation Officer or Fundraising Officer, as both positions are currently unfilled.

It is wonderful to have the opportunity to contribute at the centre of our friendly and inclusive society, and I look forward to working with all of you in representing the ABS in its many pursuits. As POTABS I will combine a consultative approach with a sunny disposition and my commitment to you is that I will do my utmost to help promote the conservation of all bats in Australasia!

Justin Welbergen

– Australasian Bat Society Inc. Business and Reports –

AUSTRALASIAN BAT SOCIETY, INC.

ABN: 75 120 155 626

AUSTRALASIAN BAT SOCIETY, INC. ANNUAL GENERAL MEETING MINUTES 2016, HOBART

[1 April 2016]

1. Welcome and apologies

Welcome (Kyle Armstrong)

Apologies: Tony Mitchell, Louise Saunders, Nancy Pallin.

2. Acceptance of Minutes of last FAGM meeting – August 2015 (Melbourne)

Published in the ABS Newsletter Issue 45. Acceptance of Minutes –
Moved: Lindy Lumsden.
Seconded: Eridani Mulder.

3. Business arising from FAGM minutes

- Possibility of hosting the 2019 International Bat Research Conference in Australia – this was considered unlikely as the 2016 conference is being held in the Southern Hemisphere so the next one would be more likely to be held in the Northern Hemisphere;
- Bat Facts factsheets to be updated – especially bats and diseases – the need for these updates was noted and to be considered at the next Executive meeting;
- Progress of Flying Fox Subcommittee (see report by Lisa Cawthen).

4. Reports

4.1. President's Report – Kyle Armstrong

The President of the ABS occupies a conspicuous role, so there is an ever-present danger of the misattribution of acknowledgement. I will not be renominated for this role, so I would like to take the opportunity of my final address to express my overwhelming gratitude to all the people that have supported the society in some way, including simply by attending our events, and of course those that have supported my role. I have always been surprised at how much goes on behind the scenes, and while some of it may never be known, it has not gone unappreciated. I have a great affection for the ABS, and I know that other people have put into the society because they feel the same way. We have a great little community, and while we have lofty aspirations that we always seem to be striving for, we actually do achieve a great amount—and I think it is important to reflect on our achievements.

There are many people to thank, so there is also a danger of missing someone out. But I would like to thank the rest of the executive team and the extended executive family for supporting me both personally and professionally through their own society roles in the past two years, and over the past four years for that matter. Our First Vice President Lisa was always there to back me up when

I faltered or disappeared and took care of many things behind the scenes, including organising this great conference, managing the Flying-fox Subcommittee and helping with other aspects of our communications including the website. Our Second Vice President Lindy Lumsden has always been there for advice in general and about the conference, helping with the *Newsletter* and also with our FAGM. Our Secretary Brad Law has keep us on track with our various meetings, agenda and minutes and helped with advice on many issues. Robert Bender has been an outstanding Treasurer—keeping on top of everything and constantly updating us and suggesting ways to improve things, including his efforts to register us as a charity and obtain tax deductibility status. Our *Newsletter* Editor, Susan Campbell, who we are very lucky to have with us at this conference, has continued to produce our great ABS *Newsletter*, which takes a lot of effort, and which Susan has given her sustained attention over many years and issues now (18 issues?). Our Membership Officer Damian Milne has kept our membership records in his usual meticulous fashion and continually improved the memberships process that culminated in the new Memberships Portal, which was also his initiative. Maree Treadwell Kerr has put in enormous amounts of her time as Bat Night Coordinator, but also with social media, which she attends to on a daily basis and as co-convener of the Flying-fox Subcommittee. Louise Saunders has also helped with her usual great passion as co-convener of the Flying-fox Subcommittee, working with many other people such as Steve Amesbury, Carol Booth, Nick Edards, Nancy Pallin, Peggy Eby—and many others. Thanks also to Pia Lentini, Leroy Gonsalves, Julie Broken-Brow, and all the members of the extended executive, and everyone else whom I cannot name here today.

So, I will end this address by saying that it has been wonderful to come to Tasmania to meet all my bat friends again at one of our world-famously friendly conferences, and I look forward to continuing to see you all around!

A vote of thanks was put forward by Terry Reardon for Kyle's outstanding contribution as ABS President and the motion was endorsed unanimously.

4.2. 1st Vice President's report – Lisa Cawthen

I have been primarily working with providing support to the Flying-fox Subcommittee and organising the 2016 conference and AGM. I have also been involved in assessing the conservation grant applications and maintaining ABS communications in the absence of a Communications Officer (e.g. Facebook, email and website). One of my aims over the last year has been to finalise the ABS Communications Plan started by our Communications Officer as I believe this will help support the work the ABS undertakes, particularly from the Flying-fox Subcommittee and bat night organisers.

4.3. 2nd Vice President's report – Lindy Lumsden

My role as 2nd Vice President is to ensure the biennial conference occurs and runs smoothly, providing continuity between conferences and contributing to the organisation of the conference where needed. This year I didn't need to help and just provided a bit of advice here and there, as the Tasmanian conference organising team, lead by Lisa Cawthen, had everything fantastically under control. Thanks Lisa, Cathy Dorling, Andy Spate, Kirsty Dixon and Anke Frank for organising a wonderful conference.

During the year, I also helped Susan, the *Newsletter* Editor, with the final stages of newsletter production in proof reading, printing and posting, and assist Robert, the Treasurer, with financial activities.

4.4. Treasurer's Report for year to 31 December 2015 – Robert Bender

Income

This was a non-conference year so as usual income ($22,959) was much smaller than in the previous conference year, much larger than the 2013 non-conference year ($12,527), though slightly smaller than the 2011 non-conference year ($24,691). $14,360 was from membership, boosted by the new facility of Paypal, and $1,052 from interest on bank accounts as most of the ABS money was held in an interest-bearing account since January 2013. Plus Susan Lamb kindly donated the fee for her Canberra flying-fox count, several conference sponsors sent in their money just before year's end, and there were some generous donations from sales of the Flying Fox calendar and the Queensland Wildlife Artists Society.

Expenditure

Two newsletter editions were published. ABS has a public liability and officer protection insurance policy, which cost $1,835, and $1,479 was spent on upgrading the ABS website. For the third year bank interest exceeded all banking and money transfer costs. GST cost $550 for the year.

Surplus

Income exceeded expenses by $7,677. The surplus is 33.4% of the year's income, so ABS spent $0.67 for each $1 in income. Accumulated surpluses now total $80,473 since 1999, so 9.2% of that total came from this year.

Assets

Total assets were about $55,000 for three years, leaped up to $68,271 in 2014, then to $76,857 in 2015. The various bank accounts grew in total balance by $8,586 over the year. Much of this was due to the growth in membership and the donations.

Since balance date

Conference income has totalled $38,298 to 28 March, less $24,140 paid on pre-conference costs, so the surplus was then $14,158, with some costs yet to be paid.

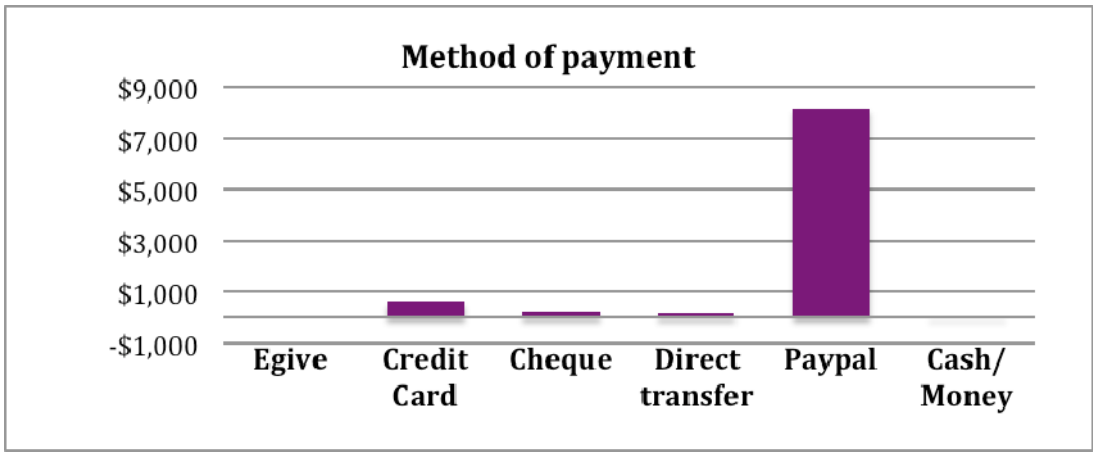
GST for 2015 will grow by $133 for the last quarter, with the net result for 2014 of ABS having gained $215 from GST refunded. For the first half of 2015, GST has cost $377, which is healthy as it means GST received from membership exceeded GST paid for ABS operating costs.

The Java software programmers decided early in 2015 to abandon 32-bit Java for Macintosh computers and shift to 64-bit, which is incompatible with Taxation Office BAS software, so apparently thousands of little NGOs and small businesses with Macs were unable to complete their December quarter BAS until early March. By April this problem was solved with a 32-bit Java for Macs made available and the GST for the March quarter was paid in May. June quarter GST was paid early in July.

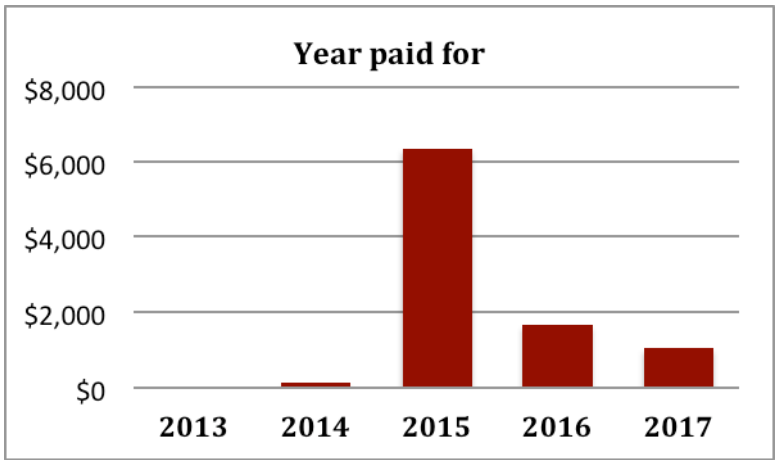
Paypal has become the major facility for renewing membership, yielding $4,960 to 28 March, being 90% of member subscriptions received this year. It was also used by members to contribute $412 in donations.

Combined bank accounts total $97,057, up $20,200 since the end of 2015. The seasonal pattern is that membership floods in during the March quarter and spending on newsletters and other items starts later in the year, so the account balances rise rapidly to March, then declines just as rapidly. It is different in conference years. Three people paid their conference fees in December and a further $33,000 has flowed in over the March quarter. The biggest cost by far is the conference dinner, at $17,040, all paid last week. Two members received conservations grants this year – Toni Mitchell's paid just before the end of 2015 and Julie Broken-Brow's in February.

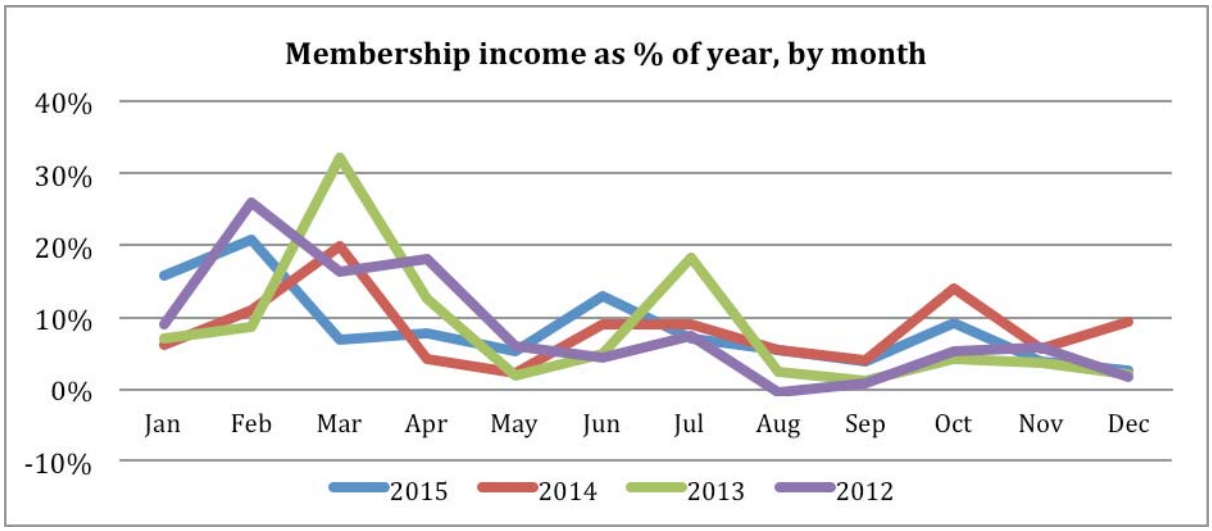
In 2015 year nearly all members paid subs using Paypal. In 2014 it was mainly credit card.



Most members pay for just the currrent year. A few pay for 2 or 3 years.



Membership money flows in quite fast early in the year, then slows down, with a little spike at the end of the financial year.



TREASURERS REPORT FOR THE PERIOD ENDING				31 December 2015		
	$	% of		**Conferences**		
Income		income		Income	$3,950.00	
Membership: Paypal	$11,205.45	46.3%		Costs	$2,129.00	
Membership subscription	$3,218.33	13.3%		Net result	$1,821.00	
Conference sponsorships	$2,500.00	10.3%				
Conference registrations	$1,450.00	6.0%		**Membership**		
Flying Fox survey	$2,272.00	9.4%		Income - subscriptions	$14,423.78	
Donations	$2,216.00	9.2%		Costs	$0.00	
Interest: Online Saver	$1,051.80	4.3%		Net result	$14,423.78	
Advertising	$275.00	1.1%				
TOTAL INCOME	$24,188.58	100.0%		**Bank accounts**		
				Cash inflow	$1,051.80	
Expenditure				Cash outflow	$648.62	
Living with bats brochure	$2,820.00	-11.7%		Net result	$403.18	
Newsletter (production & postage)	$2,749.53	-11.4%				
ABS Conference 2016 costs	$2,129.00	-8.8%		**Summary**		
Insurance (public liability)	$1,835.25	-7.6%		Membership	$14,423.78	59.6%
ABS conservation fund grants	$1,600.00	-6.6%		ABS grants received	$2,272.00	9.4%
Website	$1,479.30	-6.1%		Conferences	$1,821.00	7.5%
FAGM costs	$765.80	-3.2%		Donations	$2,216.00	9.2%
Auditor's fee	$660.00	-2.7%		Bank accounts	$403.18	1.7%
Adelaide Batcare	$650.00	-2.7%		Advertising	$275.00	1.1%
Paypal fees	$352.45	-1.5%		Printing brochures	$2,820.00	-11.7%
Merchant Fees (Credit Card Facilities - BTA)	$176.17	-0.7%		Newsletter	$2,749.53	-11.4%
Bank fees (Bus Trans Acct)	$120.00	-0.5%		Insurance	$1,835.25	-7.6%
TOTAL EXPENDITURE	$15,337.50	-63.4%		ABS conservation fund	$1,600.00	-6.6%
Surplus	$8,851.08	36.6%		Website	$1,479.30	-6.1%
				FAGM costs	$765.80	-3.2%
GST Refunded from ATO				Auditor's fee	$660.00	-2.7%
GST Paid to ATO	$550.00			Adelaide Batcare	$650.00	-7.3%
Net result	$550.00			Net result	$8,851.08	31.9%

Assets at 31 December	**2014**	**2015**	**Difference**
ABS Online Saver	$61,894.26	$62,946.06	$1,051.80
ABS Business Transaction Acct.	$6,209.56	$13,773.96	$7,564.40
ABS Gift Fund	$166.68	$136.68	$30.00
TOTAL ASSETS	**$68,270.50**	**$76,856.70**	**$8,586.20**

Donations			
Pipeline calendars	$1,665.00	75.1%	
Queensland Wildlife Artists	$500.00	22.6%	
M. Turton: Bat night	$51.00	2.3%	
	$2,216.00		

4.5. Membership Officer's Report – Damian Milne

The total number of ABS members at the end of 2015 was 426, which was an increase of 29 members on the previous year (Fig.1). This is now the eleventh straight year in a row that the membership has increased. In 2015, there were 76 new ABS members and 47 members who either voluntarily resigned their membership, or their membership expired (i.e. had not paid their ABS membership fees for more than two years). Already this year, 44 new members have joined the ABS, which means the trend in growth in the ABS will continue in 2016.

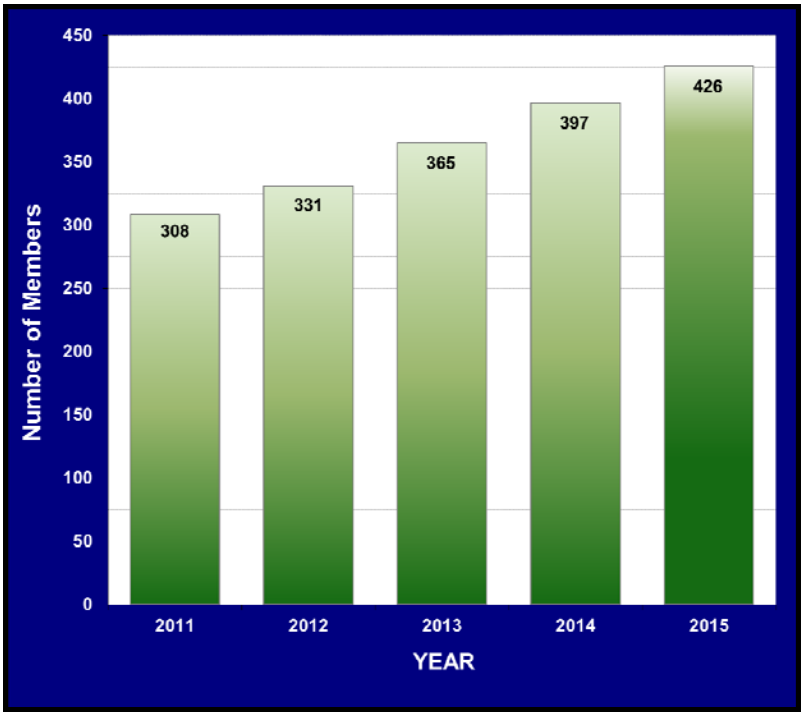


Figure 1. Total number of ABS members in 2015, and comparison against previous years.

The number of members who were overdue on their membership payments for either one or two years continued to increase slightly in 2015 (Figure 2). However as a proportion of the total number of members, these numbers remain more or less consistent with 2014.

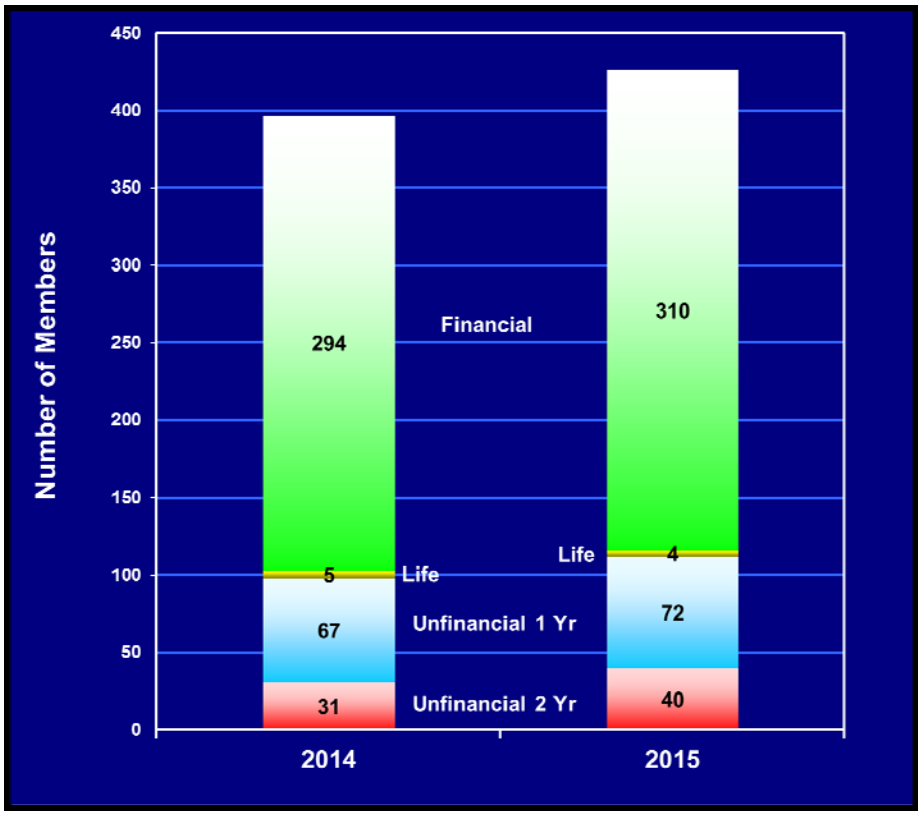


Figure 2. Financial make up of ABS members in the year ending 2015 compared to 2014.

4.6. Secretary's Report – Brad Law

As Secretary I organized three executive meetings since the August 2015 FAGM - November 2015, February 2016 and March 2016. The AGM was held as planned as part of the 17th Australasian Bat Society Conference. After four enjoyable years as Secretary I felt it was time to stand down to allow some fresh ideas and input into the Executive. My time on the Executive has been personally a very a valuable experience. I saw first-hand the efforts made by the Executive to not just keep the society relevant, but to continue to grow it into an ever more vibrant society. I appreciate the opportunity I have had to be part of this great team and wish that I had more time to devote to its many worthwhile causes.

4.7. Newsletter Editor's report - Susan Campbell

It is wonderful to be present in person again at an ABS meeting. For many years now as Editor for the ABS I have been unashamedly feeding my passion for bats vicariously through all of you – through the stories, research and images that you share with the *Newsletter*. So thank you all.

The next edition of the *Newsletter* will contain all of the abstracts from the Hobart 2016 conference, as a reminder to all our members on what a great and productive conference we have held. As always, I encourage all our members to be proactive in contacting the editor with suggestions for material for the *Newsletter*. Doing so early ensures that we have a bumper edition ready to hit the press on time.

The *Newsletter* continues to be produced twice a year "early" and "late". I'd like to extend my thanks to Lindy who always does an excellent job with a final edit before sending the *Newsletter* to press. Thanks also to Sheryn Brodie who has compiled the extensive current literature section for recent *Newsletters* and to Amanda Lo Cacio who has recently offered to undertake this task. As a

student I always found the ABS *Newsletter* recent literature section very helpful, I hope that this is still the case and that members find it a valuable resource.

Like all positions on the current executive, the role of Editor is up for nomination. If anyone is keen, please come and chat with me, I am happy to continue on in the role but I also welcome some fresh help to ensure the *Newsletter* is a fresh and enjoyable read.

4.8. Bat night Coordinator's Report (Maree Treadwell-Kerr)

Australasian Bat Night is an annual bat themed program of community events coordinated by Australasian Bat Society aiming to raise awareness of bats and educate and engage the public. It was created in 2012 with ten events. 2015 saw over 50 events in every state and territory and New Zealand. At the time of the conference 40 events were registered for 2016 (it is now 62). It was based on European Bat Night but differs in that bat events take place over 3 months in autumn rather than one week.

It is very much a partnership program and has been developing networks among local councils, schools, bat care and other wildlife groups, field naturalists, land care groups and so on. Late each year, invitations are sent out to these groups and individuals who express interest. Many of these groups promote the bat night program to their networks. Registered events are posted onto the ABS website on the Bat Night page and details can be seen by clicking on a state, territory or country on the map on Find a Bat Night page. A national media statement is released and individual events are publicised on social media. This year, a number of radio interviews have been held with local organisers and local papers advertise and report events. Events are also advertised by the local organisers. Formats include simple bat walks to full bat festivals.

Most events are sold out if numbers are limited, often within a couple of hours of posting. Others attract 100s of attendees. 450 people came to the Blue Mountains Bat Night this year. Many of these are repeat attendees but there are also new people each year. It is likely that this year over 3,000 people have attended a Bat Night.

Bat Night program would not be possible without the local organisers and ABS members many of whom do a number of talks each Bat Night season.

Bat Nights are becoming increasingly popular and requests for speakers exceed our supply. There are also concerns with maintaining quality and ensuring correct information is given at events. Bat box projects are increasingly popular and these create their own quality concerns.

Some of these concerns can be dealt with supplying Bat Facts to each group, creation of sample presentations that can be adapted for specific events, compiling a reference library of bat photos, partnerships with other organisations for delivery of presentations, training speakers and creation of a team to help administer the Bat Night program.

Any offers of help or ideas on how to tackle concerns is greatly appreciated.

4.9. Flying-fox Subcommittee Report (Maree Treadwell-Kerr and Louise Saunders)

Since the FAGM in August 2015, the Flying-fox Subcommittee has continued to assist the ABS executive with issues relating to flying-foxes through advice and support with writing media releases, submissions, letters to state governments and meetings with minister's advisors.

The FFSC looked at forming an alliance of like-minded people and groups but this was considered difficult in the then political climate.

The FFSC have presented two documents to the executive. The first was the 'Monitoring and reporting guidelines for camp disturbance' for use by participants to document and gather consistent and standardised reporting for dispersal activities. We envisage this document to be available on the ABS website and publicised to be freely available to any persons wishing to document their local dispersal or the vegetation management actions of state or local governments and the consequences of the activity. The Fast Facts document prepared by Steve Amesbury is just that, a short document that outlines factual information such as; bats and human health, bat diseases, the economic and ecological importance, recovery of threatened species, killing for crop protection, dispersals and the devolution of powers from state to local government. We identified and worked on a number of common issues affecting flying-foxes as outlined below.

Damage Mitigation Permits for crop protection – The Executive and FFSC members worked up briefing notes and attended a meeting with the Queensland Environment minister's advisor on flying-foxes, Danielle Cohen. We requested the cessation of issuing permits for the lethal killing of flying-foxes at orchards. The advisor informed the delegation that this would be done by the growing season 2016. To date we have had no written response on this and other requests from our meeting. Subsequently Kyle drafted a stern letter requesting a response to our requests to the Queensland Environment minister's office. We received no acknowledgement of this letter or further comment on our requests.

Dispersals – as above we discussed the possibility of the Queensland state government taking back the management of flying-foxes but were advised this was not on the agenda. We have attempted to keep up to date with dispersal actions across the nation but have not collated a file as such.

The effects of environmental changes such as extremes in temperature i.e. heat events, extended periods of rain, and starvation events caused by food shortages all have an impact on flying-fox populations. We highlighted these events as detrimental to the health and wellbeing of flying-foxes as councils rarely take these factors into consideration when attempting dispersal activities.

The FFSC has supported carers in NSW tackle the cause of horrific injuries to flying-foxes and other wildlife (including venomous snakes) by the use of inappropriate backyard fruit tree netting. We sought a letter of support from QHealth's Senior Director of Communicable Diseases Unit to state that unsafe netting was found to be the number one contributor to people deliberately touching flying-foxes and that from a human health perspective QHealth was therefore willing to write in support of an approach to the federal government to implement some form of safety standard or similar for backyard fruit tree netting imported into Australia.

With the aim of working with governments at all levels to achieve science based management of flying-foxes, the FFSC helped the executive by working with them on the draft Submission on EPBC camp management guidelines. The meeting with the Qld Environment Minister's advisor was also an attempt at further liaison and cooperation between the government and the ABS. One of the ABS requests was to develop a conservation plan under the Nature Conservation for important vertebrate pollinators, including flying-foxes, to promote recovery of their populations, which would have promoted ecological health and adaptation to climate change. We also suggested an education strategy be considered like the one under Labor in 2006. As stated, no correspondence has been received with regards to our recommendations. In March 2016, Louise and Maree met with Sunshine Coast local government and other stake-holders at their Flying-fox Education Forum. We are also asking for the help from all ABS members to raise awareness in their local area and to keep the FFSC informed about any flying-fox issues in their region.

Improving perception of flying-foxes:
a) Media and alliance strategies; we have drafted a media strategy which is still in its infancy. We will need a lot of work and collaboration from ABS members to achieve a workable document. A recommendation to improve the image of flying-foxes by installing a 'Bat Cam – live-streaming from a bat camp' for our website and social media sites could be a great educational tool to raise the

profile of flying-foxes. On investigation this could cost in the vicinity of $11,000. Together with the ABS Fundraising Officer we are investigating fund-raising ideas and looking for a suitable camp.
b. Generate better publicity about bats. We need good media stories on flying-foxes and about the tireless work of local bat carers and educators. We need to get these feel good stories into local papers and other media including the ABS social media pages. We want to encourage all members to participate in Australasian Bat Night events - even if your focus is on our beneficial microbats, you can give a plug for flying-foxes as well.

Finally, the subcommittee is looking at its future structure and composition to most efficiently carry out its functions and is looking forward to working with the new executive on flying-fox issues. We would like to thank the past President Kyle Armstrong and particularly the past First Vice President, Lisa Cawthen, for their support and encouragement of the committee.

5. Election of Executive positions (Greg Ford)

- **President**: Justin Welbergen. Nominator: Kyle Armstrong; Seconded: Lindy Lumsden.
- **1st Vice President**: Monika Rhodes. Nominator: Brad Law; Seconded: Susan Campbell.
- **2nd Vice President**: Lindy Lumsden. Nominator: Greg Ford; Seconded: Brad Law.
- **Treasurer**: Robert Bender. Nominator: Brad Law; Seconded: Lisa Cawthen.
- **Secretary**: Pia Lentini. Nominator: Brad Law; Seconded: Kyle Armstrong.
- **Membership Officer**: Damian Milne. Nominator: Greg Ford; Seconded: Brad Law
- **Newsletter Editor**: Susan Campbell. Nominator: Monika Rhodes; Seconded: Brad Law.
- **Public Officer**: Nancy Pallin. Nominator: Brad Law; Seconded: Susan Campbell.

Other formalised positions:

- Conveners of the Flying-fox Subcommittee: Louise Saunders, Maree Treadwell-Kerr, Martin Cohen.
- Webmaster: Leroy Gonsalves
- Bat Night Coordinator: Maree Treadwell-Kerr
- Conservation Officer: Pia Lentini
- Fund-raising Officer: TBA
- Social Media Officer: TBA
- Media and Communications Officer: Heidi Kolkert

6. Other business arising

a. *Australian Bat Conference 2018* – there was considerable discussion about possible venues for the next ABS conference. The pros and cons of various locations were considered, such as being based in south-east Australia near a major city allowing easy travel and attendance versus a remote location that incorporated a field trip for members. There was general support for a remote location, but this was considered to be easier to organize for the FAGM, which is held in the alternate year to the conference. There was also support for an ABS conference to be held in New Zealand. Timing in relation to school holidays was not considered to be a significant issue for many.

b. *Update on the IUCN reassessments*. Kyle briefly updated the meeting about progress on reassessment of Australian bat species for the IUCN being prepared by Kyle Armstrong, Terry Reardon and Lindy Lumsden. All comments were welcomed.

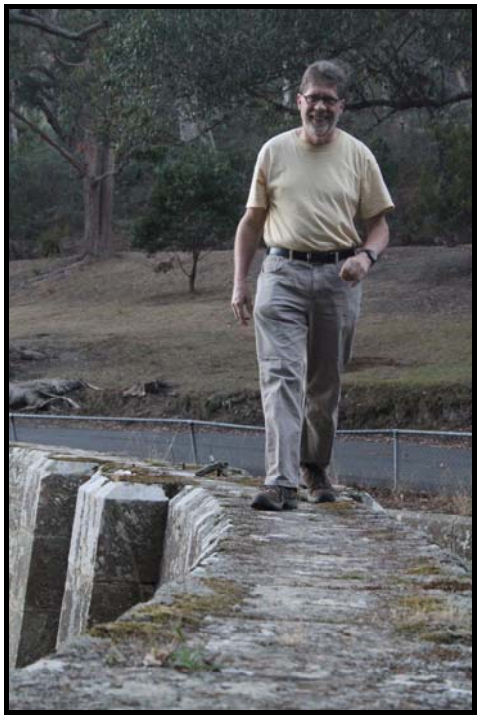
c. *Update on the Acoustic Surveys recommendations document*. Kyle indicated a revised draft of the recommendations had been prepared by incorporating comments from many members. The next step in the process was to circulate the revised report to membership for final comments.

d. *Update on the flying-fox monitoring in Commonwealth Park, Canberra*. Thanks were given to Susan Lamb for her role in undertaking flying-fox counts at Canberra. Susan was stepping down from her role in 2016 and a new coordinator was required to continue these counts.

e. A special announcement: Life Membership of ABS was awarded to Terry Reardon for his major contributions to the Society over many years. Terry was Acting ABS President in 1997 (Terry played a significant role in the development of the draft ABS constitution during this time), Newsletter Editor 2000-2001 and Co-organiser 7th ABS Conference Naracoorte. He compiled past Australian Bat Research News (prior to ABSN and Macroderma) and contributed to ABS efforts on IUCN reassessments. He was a major contributor to Action Plan for Australian Bats and helped with the ensuing difficult discussions. Behind the scenes, as part of the extended executive, he has helped and advised many past Presidents. He has been responsible for fun awards at ABS conferences and a regular attendee. In addition to contributions to the Society, Terry has made significant contributions to bat taxonomy and conservation. Loud applause was received from conference participants on hearing of the award!

7. Close

5:00 pm.



Left: The enigmatic Chris Corben at Hobart's water works reserve, scouting for the best detector locations no doubt!

AUSTRALASIAN BAT SOCIETY, INC.

ABN 75 120 155 626
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ABS President: Dr Justin A. Welbergen
Email: president@ausbats.org.au

19/5/2016

MEDIA STATEMENT

Flying-fox dispersal set to make an already difficult situation worse

The Australasian Bat Society (ABS) acknowledges the difficult situation faced by the residents of Batemans Bay, and encourages all parties to seek a resolution that successfully minimises impacts on people while managing the welfare of our highly mobile threatened flying-foxes.

The ABS considers dispersal of flying foxes from the Water Garden in Batemans Bay to be ill-advised. With the exceptional flowering of spotted gum currently attracting vulnerable grey-headed flying-foxes to the region from across Australia's southeast, any local attempt at dispersal risks multiplying the problem by forcing flying-foxes into other people's backyards. Thus, the dispersal is likely to make an already difficult situation worse, while most flying-foxes will depart the region when the spotted gums stop flowering.

ABS president Dr Justin Welbergen says that "there is now ample evidence to show that dispersals are extremely costly and by and large unsuccessful (e.g., see here), with most resulting in the flying-foxes re-occupying their original roost soon after the dispersal activities have ceased. In those cases where flying-foxes do not return to the original roost site, they usually establish new roosts a few hundred metres away. We cannot predict where the animals may go; therefore, dispersals generally exacerbate the human-wildlife conflicts that they aim to resolve, and have negative consequences for both human and animal welfare".

The ABS believes any management actions should be based on best available scientific evidence, and should aim to minimise impacts on human communities and our native wildlife. Unfortunately, Minister Hunt, by seeking a national interest exemption and by creating a conservation agreement with the Eurobodalla Shire Council to facilitate ongoing dispersal action, does not provide residents with a viable, evidence-based solution for the residents of the shire. In addition, these actions risk undermining the legal protection currently afforded to threatened species, and increase community antagonism towards our ecologically important flying-foxes.

Given the high costs of dispersals and the negative consequences for both human and animal welfare, the ABS consider that the best solution at present is to make funds available for immediate real-life mitigation strategies that help local residents cope with the current difficult situation. Such strategies include the provision of covers for cars and clothes lines, free hire of cleaning equipment, and engaging contractors to assist with cleaning driveways, yards, verandas, roofs and solar panels. In the medium and longer term, community wellbeing would be enhanced by proactive management that prepares roosts and surrounding communities for temporary influxes of flying-foxes in response to exceptional flowering events such as the one that is currently unfolding in the Eurobodalla Shire.

The ABS and others have worked tirelessly for many years to improve community attitudes towards flying-foxes, and have assisted government and industry in achieving the objectives of the EPBC Act and the Nature Conservation Act. Flying-foxes serve our economic interest by providing expensive pollination and seed dispersal services for free, and play key ecological roles in our natural environment. It is in our national interest that that these attributes are factored into any local management decisions. Furthermore, while health authorities advise that the risks of human infection from bat borne diseases are extremely low and avoidable (e.g., see here), unfounded fears about bat borne diseases still complicate effective management of flying-foxes in Australia.

The ABS would like to work with all levels of government to promote the public understanding of flying-foxes, and help develop realistic management approaches to events where flying-foxes may adversely impact on community amenities.

This media statement was prepared by the ABS Flying-Fox Subcommittee

About the Australasian Bat Society (ABS), Inc.
The ABS is a not-for-profit organisation, registered under the NSW Associations Incorporation Act 1984 through the NSW Department of Fair Trading. Our aim is to promote the conservation and study of bats in Australasia. ABS membership is wide-ranging and includes research scientists, natural resource managers, ecological consultants, students, wildlife carers and members of the general public.

About the flying-fox subcommittee (FFSC)
The FFSC is the primary source of reliable, accurate information on Australian flying-foxes. The FFSC is represented by flying-fox specialists from research, government, industry, and advocacy groups, and it encourages a more scientific and sustainable approach to flying-fox management and conservation.

For further information please visit http://ausbats.org.au/.

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28 July 2016

Australasian Bat Society Submission on
Draft Bateman's Bay Flying-fox Camp Dispersal Plan

The Australasian Bat Society, Inc. (ABS) is pleased to have an opportunity comment on the *2016 Draft Bateman's Bay Flying-fox Camp Dispersal Plan (*prepared for Eurobodalla Shire by Eco-Logical Australia. (The Draft)

The ABS is the peak body promoting bat conservation in the Australasian region. The primary aim of the ABS is to promote the conservation of bats and their habitats through the advancement of quality science and the extensive experience of our members (Refer to Attachment 1—*About the Australasian Bat Society, Inc* and *About the ABS Flying-Fox Subcommittee*). We recognise the intrinsic value of all bat species and their place in this country's natural heritage, and their key ecological roles by contributing to the maintenance of biological diversity in our natural environment.

This submission represents the collective views and experience of the Australasian Bat Society, Inc. and is aligned with our policy statements on the management of flying-foxes for their long-term conservation (available on our website). It is authorised by the elected executive members and released by its President.

Executive Summary

The Australasian Bat Society believes that the planned dispersal of grey-headed flying-foxes will not resolve conflict or assist residents affected by living near the Water Gardens colony in the medium- or long-term.

The ABS believes any management actions should be based on best available scientific evidence, and should aim to minimise impacts on both human communities and native wildlife. Given the high costs of dispersals and the negative consequences for both human and animal welfare, the ABS consider that the best solution at present is to make funds available for immediate real-life mitigation strategies that help local residents cope with the current difficult situation.

The ABS supports the professional advice given to the Shire council by the ecological consultancies Eco Logical and Ecosure that dispersal is unlikely to succeed, and is unnecessary given that the current influx of flying-foxes is in response to the extraordinary flowering of spotted gums and other species at this time. Numbers of flying-foxes will naturally reduce as blossoming ceases as most of the flying-foxes return to other camps.

In the medium and longer term, community wellbeing would be enhanced by proactive management that prepares roosts and surrounding communities for temporary influxes of flying-foxes in response to exceptional flowering events such as the one that is currently unfolding in the Eurobodalla Shire. Unlike dispersal, such measures represent a robust and financially sustainable solution for the community and the bats.

We regard the notion of native vegetation clearing to control a threatened native animal to be particularly ill-advised. This solution for managing or displacing camps is not based on best practice or scientific evidence for success, and should be re-evaluated in light of the need to enhance the recovery threatened flying-fox populations, and simultaneously reduce the rate of ongoing native vegetation clearing in Australia.

The ABS is extremely concerned about the precedent being set by the Minister in disregarding expert advice in relation to threatened species, and about the potential for dispersal to have significant impacts on the grey-headed flying-fox population.

The ABS would like to partner with all levels of government to promote the public understanding of flying-foxes, and help develop effective management approaches to events where flying-foxes may adversely impact on community amenities.

Please refer to the ABS press release: http://ausbats.org.au/media-releases/4591750332

Comments relating to Part 1: Introduction

The ABS recognises that an exceptional influx of flying foxes to Batemans Bay is causing distress to residents, and encourages all parties to seek a resolution that successfully minimises impacts on people while managing the welfare of our highly mobile threatened flying-foxes.

The ABS also recognises the excellent Water Gardens Camp Management Plan (ELA 2015) which was built upon extensive community consultation. The ABS was particularly impressed with the practical mitigation actions targeted to the most impacted residents and supports an expansion of these measures to assist more residents affected by the increased numbers of flying foxes.

The ABS considers that greater education of the public is needed to understand the movements and ecology of flying-foxes. Flying-foxes are extremely mobile animals, and their roosts form integral parts of a highly interconnected population at the national scale. Therefore, we need a uniform, federal approach for managing flying-foxes in our human landscapes.

The ABS considers that dispersal is a short sighted and ineffective response to this current situation. It offers no guarantee that the bats will not return at a later date, and is likely to result in negative impacts on other community members who are currently unaffected.

Comments relating to Part 2: Licences and approvals

The ABS believes that any action taken must meet the criteria of the NSW state legislation NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth legislation *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The grey-headed flying fox is listed as vulnerable at both state and Commonwealth level and ABS notes that under the EPBC Act dispersal should be considered as an action of last resort.

Grey-headed flying foxes are highly responsive to changes in food resources. Any management action taken should recognise that most animals will vacate this particular camp when the extraordinary flowering ceases.

The ABS considers that dispersal or extensive vegetation modification may cause undue stress on the flying-foxes and contravene the Prevention of Cruelty to Animals Act.

Comments relating to Part 3: Proposed dispersal methods and costs

The ABS considers that there is sufficient evidence that dispersal is likely to fail, will be expensive, and require repeated actions over a timeframe from months to years.

We specifically refer the Council to the following report by Roberts and Eby (2011) on '*The outcomes and costs of relocating flying-fox camps: insights from the case of Maclean, Australia*' In, The Biology and Conservation of Australasian Bats. (Ed. Bradley Law, Peggy Eby, Daniel Lunney and Lindy Lumsden). Royal Zoological Society of NSW, Mosman, NSW, Australia.

The ABS believes money would be better spent on extending assistance to residents in mitigating the immediate impacts of flying-foxes, education and consultation with the community.

Comments relating to Part 4: Risk assessment

The ABS considers the risks involved in a dispersal are high given that: i) the likelihood of success is low; ii) flying foxes may move to more undesirable places; iii) the expense in both money and human resources cannot be justified; and iv) conflict is unlikely to be resolved. The ABS suggests that money would be better spent in giving residents access to mitigation measures as discussed previously and that consideration be given to creation of new habitat adjacent to the Water Gardens in a direction away from residents.

The ABS believes that short-, medium- and long-term solutions should be sought and this can only occur with extensive community and expert scientific consultation.

Comments relating to Part 5: Monitoring, Evaluation and Reporting

The ABS agrees with the draft that monitoring and evaluation of any actions is vitally important and endorses all points raised in this section.

The ABS has created an evaluation form to assist monitoring dispersal and vegetation modification carried out at flying-fox camps. This evaluation will provide valuable and standardised information to assist councils and land managers monitoring the impacts of actions.

Comments relating to Part 6: Alternative Actions

The ABS encourages alternative mitigation measures to be considered, including expansion of current delivery of targeted actions, maintenance of buffers between residents and flying-fox camps, and creation of new habitat away from residents and areas of conflict.

ABS endorses research into ecology and social aspects of flying-foxes to assist in understanding their behaviour and developing strategies to assist residents living with flying-foxes.

Finally, the ABS encourages the local community to view the flying-fox camp as a potentially exploitable resource for economic benefit such as tourism.

References

ABS position statements: (available from ABS website: http://ausbats.org.au/#/principles-and-policies/4573559802)

- Flying-fox dispersal
- Flying-foxes and Hendra virus
- Submission on the NSW Flying-fox Camp Management Policy 2014
- Submission on Draft EPBC Act Policy Statement: Camp management guidelines for the Grey-headed and Spectacled Flying-fox 2015

Birt P., Markus N., Collins L. and Hall L.S. (1998) Urban flying-foxes. *Nature Australia*, 26: 54–59.

Hall L.S. (2002) Management of flying-fox camps: what have we learnt in the last twenty five years? pp. 215–224 in *Managing the Grey-headed Flying-fox as a Threatened Species in NSW*, edited by P. Eby and D. Lunney. Royal Zoological Society of NSW, Mosman.

Parris K.M. and Hazell D.L. (2005) Biotic effects of climate change in urban environments: the case of the Grey-headed Flying-fox (*Pteropus poliocephalus*) in Melbourne. *Biological Conservation*, 124: 267–276.

Roberts B.J., Catterall C.C., Eby P. and Kanowski J.K. (2012) Long-distance and frequent movements of the flying-fox *Pteropus poliocephalus*: implications for management. *PloS ONE,* 7(8): e42532. doi:10.1371/journal.pone.0042532.

Roberts, B. and Eby, P. 2013. *Review of past flying-fox dispersal actions between 1990-2013.* Available at: http://www.environment.nsw.gov.au/resources/animals/flying-fox-2014-subs/flyingfoxsub-jenny-beatson-part2.pdf

Roberts B.J., Eby P., Catterall C.C., Kanowski J.K. and Bennett G. (2011) The outcomes and costs of relocating flying-fox camps: insights from the case of Maclean, Australia, pp. 277-287 in *The Biology and Conservation of Australasian Bats*, edited by B. Law, P. Eby, D. Lunney and L. Lumsden. Royal Zoological Society of NSW, Mosman.

Tidemann C.R. (2002) Sustainable Management of the Grey-headed Flying-fox *Pteropus poliocephalus*, pp 122–127 in *Managing the Grey-headed Flying-fox as a Threatened Species in NSW,* edited by P. Eby and D. Lunney. Royal Zoological Society of NSW, Mosman.

van der Ree R., McDonnell M.J., Temby I.D., Nelson J. and Whittingham E. (2006) The establishment and dynamics of a recently established urban camp of *Pteropus poliocephalus* outside their geographic range. *Journal of Zoology*, 268: 177–185.

Vardon M.J., Simpson B.K., Sherwel1 D. and Tidemann C.R. (1997) Flying-foxes and tourists: a conservation dilemma in the Northern Territory. *Australian Zoologist,* 30: 310.

Williams N.S., McDonnell M.J., Phelan G.K., Keim L.D. and van dee Ree R. (2006) Range expansion due to urbanization: Increased food resources attract Grey-headed Flying-foxes (*Pteropus poliocephalus*) to Melbourne. *Austral Ecology,* 31: 190–198.

Attachment 1

About the Australasian Bat Society (ABS), Inc.
The ABS is a not-for-profit organisation, registered under the NSW Associations Incorporation Act 1984 through the NSW Department of Fair Trading. Our aim is to promote the conservation and study of bats in Australasia. ABS membership is wide-ranging and includes research scientists, natural resource managers, ecological consultants, students, wildlife carers and members of the general public.

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The FFSC is the primary source of reliable, accurate information on Australian flying-foxes. The FFSC is represented by flying-fox specialists from research, government, industry, and advocacy groups, and it encourages a more scientific and sustainable approach to flying-fox management and conservation.

For further information please visit http://ausbats.org.au/.

Ed: The ABS, through the Flying-fox Subcommittee has contributed to the ongoing debate on flying-fox dispersal via several different media outlets recently. For further contributions on this topic check out:

The Conversation
http://theconversation.com/not-in-my-backyard-how-to-live-alongside-flying-foxes-in-urban-australia-59893

ESA hot topics:
https://www.ecolsoc.org.au/groups/hot-topics-0?page=1

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24 June 2016

Biodiversity Reforms - Have Your Say
PO Box A290
Sydney South
NSW 1232

Comment on the draft Biodiversity Conservation Bill (2016), the draft Local Land Services Amendment Bill (2016) and the proposed Local Land Services Codes of Practice – Australasian Bat Society, Inc.

The Australasian Bat Society (ABS) is the peak body promoting bat conservation in the Australasian region. Its membership comprises over 450 professional zoologists and ecologists, ecological consultants and members of the broader community passionate about the conservation of Australasia's bat fauna.

The primary aim of the ABS is to promote the conservation of bats and their habitats through the advancement of quality science and the extensive experience of our members. We recognise the intrinsic value of all bat species and their place in this country's natural heritage, their contribution to biodiversity, and their keystone roles in ecosystem services, such as helping to maintain the structure and diversity of Australia's native forests and woodlands.

The ABS is pleased to have the opportunity to provide comments on the draft Biodiversity Conservation Bill, the draft Local Land Services Amendment Bill, and the proposed Local Land Services Codes of Practice. The Society has reviewed the draft legislation and codes in the context of a long history of interest in, and involvement with, the conservation and management of the bats of NSW - through research, development of management plans, contributions to on-ground bat management initiatives, and through promotion of public education and outreach. Our comments focus on the issues that will affect bats in NSW. They are appended.

We strongly believe that the changes to vegetation management contained in the draft bills and proposed codes will significantly reduce habitat protection for bats in NSW, and result in a reduction in the biodiversity of this important group of mammals.

We urge the draftees of this legislation to consider carefully the implications for conserving the bat fauna of NSW, and the ecological and economic benefits of the services that they provide.

Yours sincerely,

Dr Justin A. Welbergen
President, Australasian Bat Society, Inc.

Comment on the draft *Biodiversity Conservation Bill* (2016), the draft *Local Land Services Amendment Bill* (2016) and the proposed Local Land Services Codes of Practice

Australasian Bat Society
24 June 2016

Summary: Bats comprise a quarter of the mammal fauna of NSW, and provide vital ecological services, such as pollination and insect suppression. Although bats are difficult to observe and study, it is clear from our current knowledge that elements of the proposed legislation will negatively impact on the ecological requirements of these often maligned species. We have identified our specific concerns in this submission, including the loss of hollow-bearing trees, habitat simplification, land clearing and insufficient attention paid to the full range of bat taxa because of a narrow focus on threatened species.

BACKGROUND

New South Wales supports a diverse bat fauna of 40 taxa, of which 22 (56%) are listed as threatened (Pennay et al. 2011). Bats comprise two distinct groups: flying-foxes; and small, echo-locating, insect-eating bats. Whereas flying-foxes are highly visible, most species of bats are cryptic and generally not observed or detected without employing specialist methods. In fact, bats comprise 25% of the mammal fauna of Australia and NSW and it is not unusual for them to constitute the highest diversity of mammals in local surveys.

There are clear benefits to conserving viable, diverse local populations of bats. Bats are functionally important and provide key ecosystem services such as suppression of insect populations and pollination and/or seed dispersal of trees (Kalka et al. 2008; Kunz et al. 2011). Increasingly, these roles are seen as being economically valuable to both natural and human systems. Bats are particularly recognised for their important contribution to pest insect control in agricultural landscapes; and for their ecological contribution to maintaining genetic diversity and resilience of plant populations in fragmented landscapes (Boyles et al. 2011; Kunz et al. 2011). Bats are considered to be sensitive to disturbance and are often proposed as indicator species of environmental health (e.g. Jones et al. 2009).

Our knowledge of the status, ecology and taxonomy of the bat fauna of NSW is far from complete. This poor knowledge base is a major impediment to identifying comprehensive management actions for their conservation. However, land clearing or degradation is known to significantly impact bats and is identified as a primary threat to all but one species currently listed as threatened in NSW (Pennay et al. 2011).

The habitat requirements of bats are complex and unlikely to be conserved without a targeted approach. These mobile animals require complementary roosting, foraging and over-wintering habitat (e.g. Law and Dickman 1998; Lumsden et al. 2002; Rhodes et al. 2006; Lentini et al. 2012). For some species, these habitat components must be located in relatively close proximity (hundreds of metres) whereas for others, they can be several kilometres apart.

The vegetation required for roosting and feeding often differ; and heterogeneous landscapes providing several options for both roosting and feeding are necessary to support both individual species and diverse local communities (Fuentes-Montemayor et al. 2013). For example, species of echolocating bats vary in their response to the extent and configuration of native vegetation, vegetation structure (e.g. stem density, understorey height and density), soil fertility, distribution and size of hollow-bearing trees and other roost structures (e.g. fissures, bark), etc (Lentini et al. 2012; Threlfall et al. 2012; Law et al. 2016).

GENERAL COMMENTS

The ABS is sympathetic to the need to balance biodiversity conservation with sustainable development. However, we are concerned that the draft legislation and proposed codes of practice go too far in relaxing both provisions for development and constraints to clearing of native vegetation in NSW. The complex habitat requirements of fauna such as bats are neither acknowledged in the legislation nor accommodated in the provisions for development and clearing.

In every decade since 1970, more than 75% of land clearing in NSW has occurred on privately-owned or leasehold agricultural land (Evans 2016). Local Land Services Codes of Practice (LLS Codes of Practice) regulate clearing on agricultural land and therefore play a vital role in biodiversity conservation. We are strongly of view that the proposed codes will serve to simplify landscapes and will not adequately conserve the complex habitat needs of bats. The focus on self-assessment will enable considerable land modification to occur without due consideration of impacts, or even knowledge that the bat fauna will be adversely affected.

We strongly believe that, taken as a whole, the changes to vegetation management contained in the draft bills and proposed codes will significantly reduce habitat protection for the bat fauna of NSW and result in a reduction in the biodiversity of this important group of mammals. Further, we believe that the draft *Biodiversity Conservation Bill* will not achieve its aim of reducing the rate of biodiversity loss in NSW.

Our primary concerns are listed here.

1. We are concerned that provisions under the LLS Codes of Practice will serve to over-simply agricultural landscapes to the detriment of bats. Further guidance must be given for those provisions and additional restrictions must be applied so that the complex habitat requirements of bats and other fauna can be provided for. The aim should be to minimise impacts and maximise benefits.

   For example, the rate of loss of paddock trees important to bat conservation (Law et al. 2000; Fischer et al. 2010) will likely increase under proposed codes. Paddock trees are typically old, contain hollows and may provide the last available roosting habitat for various species in a local landscape. Many trees <80cm DBHOB contain hollows that fulfil these important roles. There is no requirement for a landscape scale assessment of hollow availability, connections between individual hollow-bearing trees or the role of hollow-bearing trees in the movement of animals through landscapes (e.g. Gibbons and Boak 2002; Rhodes et al. 2006).

   Large paddock trees (including trees <80cm DBHOB) also provide valuable feeding habitat for nectar- and fruit-feeding flying-foxes. Paddock trees provide habitat away from the urban and peri-urban localities where roosting flying-foxes can cause problems for local communities. Mature trees with large boughs flower more intensively and produce greater volumes of nectar than younger trees or trees grown in conditions where their canopies are constrained (Law and Chidel 2008; Vesk et al. 2008). The value of these resources and the impacts of their loss will not be assessed under draft provisions.

   Other LLS codes are very likely to produce similarly detrimental effects.

2. The proposed LLS Codes of Practice that enable broad-scale clearing without application to government represent a significant retrograde step and must be removed.

3. The reliance on voluntary compliance and self-assessment of impacts are of general concern, and particularly disadvantage cryptic species that require specialist survey methods. A landholder involved in the self-assessment of impacts of clearing paddock trees may not be aware of their episodic importance as habitat for threatened species, especially bats. Specific and adequate provisions for bats (and other fauna) must be incorporated in the codes and legislation.

4. Provisions that enable clearing of Endangered Ecological Communities must be removed. Even very small patches of various EECs provide critical winter feeding habitat for threatened nectar-feeding bats and birds (Eby and Law 2009).

5. Requirements for independent monitoring (monitoring, evaluation, reporting) must be strengthened and broadened in their application to include all clearing and development. A funding source for this vital work must be specified in the legislation and requirements for the acquisition of high-quality environmental data must be set.

6. Provisions to conserve biodiversity focus too heavily on threatened species. The potential mechanisms for protecting bats not currently listed as threatened must be enhanced if biodiversity is to be conserved and the list is not to continually expand.

7. Key Threatening Processes identify important issues for biodiversity conservation in NSW and must be assessed as part of regulations for development and clearing.

8. "Areas of outstanding biodiversity values" are important for conserving species not listed as threatened. They must be clarified and the public must be provided with an opportunity to comment before the legislation is finalised.

9. Killing of protected species must only occur under licence and the outcomes of licensing programs must be monitored and evaluated. Provisions that enable locally abundant species to be killed without a licence must be removed. The ABS understands that these provisions will not apply to threatened species. However, of particular concern are management actions for contentious species such as flying-foxes. The welfare aspects may be severe if unregulated shooting is permitted (Divljan et al. 2011). This was the practice in NSW until 1986 because flying-foxes were listed as unprotected fauna. We must not go backwards on this matter.

10. "Significant and irreversible impacts" must be defined in the legislation and considered carefully in all developments.

11. Specific provisions for survey and monitoring of bats (and other fauna) must be incorporated in the legislation. The regulatory maps that have been set out are inadequate for detecting bats and identifying their habitats. For example, the habitat of most bat species cannot be readily defined by a relationship with vegetation type (structure is often more important) and our knowledge of the distributions of threatened bat species other than flying-foxes is generally poor.

12. Provisions for offsets embed ongoing biodiversity loss into the legislation. The proposed changes allow proponents to by-pass steps to 'minimise and avoid', and move too readily to offsets. A more equitable balance between public and private interests must be reached.

13. Variations to 'like-for-like' offsets are too flexible and loose. This must be rectified. For example, provisions that permit impacts on a threatened bat species to be offset via protection of another species in the Order Chiroptera (which includes all bats) show limited understanding of the specialised requirements of many threatened bats and completely ignore the unique value that individual species bring to a natural ecosystem or agricultural landscape.

    Similarly, provisions for offsetting loss of vegetation containing large hollow-bearing trees using programs of habitat restoration via tree-planting overlook the delay of >150 years typically required for replacement hollows to develop (Gibbons and Lindenmayer 2002). Tree hollows are becoming an increasingly scarce resource. Off-setting with short-term programs of habitat restoration achieve limited compensation for clearing and minor benefits for conservation of bats and other hollow-dependent fauna.

14. Threats from climate change must be meaningfully addressed in the legislation. For flying-foxes, days of extreme heat are lethal (Welbergen et al. 2008); and changes to temperature and rainfall patterns can alter the flowering sequence of their native food trees (Hudson et al. 2010) resulting in periods of food shortage.

The ABS would welcome the opportunity for further discussion. We urge the draftees of this legislation to consider carefully the implications for the bat fauna of NSW, and for the ecological and economic benefits of the services they provide.

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Continuing loss of hollow-bearing trees from farmland areas, resulting in loss of roosting and foraging habitat for bats. Photo: Lindy Lumsden

An example of how valuable scattered paddock trees can be for bats. The Austbat harp trap set between these two trees caught 29 individuals of seven species in one night!
Photo: Lindy Lumsden

– Research Reports –

Abstracts from the 17th Australasian Bat Society Conference, Hobart, March 2016

- PLENARY -

Progress towards recovering New Zealand's threatened bat populations, 1995-2015

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The range and numbers of bats in New Zealand have declined significantly and all taxa are classed as endangered, vulnerable or declining. The Department of Conservation has led an active recovery programme for bats since 1995. The 1995 Recovery Plan assessed the recovery potential of bat taxa, developed recovery objectives, identified priorities and produced a general guide to management actions for the ten years 1995-2005. The overall goal of the Bat Recovery Programme was to "secure key populations of bat taxa from extinction, which represent the full genetic and distributional range". During the initial 10 years of intensive research, studies of both short-tailed and long-tailed bats investigated habitat, home range and roosting requirements, population structure, breeding behaviour and conservation genetics. A wide range of threats to bat populations were identified including predation and competition from exotic pests, habitat degradation and loss, and disturbance. Intensive ecological studies elucidated the importance of these threats and have led to the development of specific predator control prescriptions for implementation at bat sites. In 2003 the Recovery Group reassessed and revised the recovery objectives and identified 24 priority bat populations for active conservation management across 22 sites. Management includes: using legal mechanisms for protection; general advocacy and education; developing community-based conservation initiatives; control of exotic pests, particularly introduced predators, at key sites; active protection of roosts sites, protection of aquatic and terrestrial foraging habitats and a raft of habitat restoration techniques; and translocations to predator free habitats. By 2014 intensive pest control programmes tailored to protecting bat populations have commenced at 16 (72%) of the priority sites covering 226,000 ha and 7 other sites not originally identified (62,000 ha). Management is planned to commence at a further sites 28 sites within 3-5 years as the Department implements management at representative Ecosystem Management Units throughout the country. In total, management is planned in at least 600,000 ha of bat habitat. However, although there are several examples of pest control reversing declines, these initiatives have not been running long enough to determine overall if management is being effective at reversing declines.

- MANAGEMENT AND CONSERVATION -

Protection of long-tailed bats in the top of the South Island, New Zealand

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New Zealand's two species of bats (one other is presumed extinct) are the country's only terrestrial mammals. The long-tailed bat *(Chalinolobus tuberculatus)* "South Island" retains a threat ranking (most recently reviewed in 2012) as "nationally critical". Whilst over the remainder of the South Island bat populations declined rapidly due to deforestation and then mammalian predation, the top of the island populations were still reportedly in good numbers throughout large river valleys in 1962. Within 30 years they were reported as "very rare". Since 2008, Forest & Bird has contracted survey work by Dr Brian Lloyd to determine the extent of populations across the top of the South Island and has instigated a predator control programme at one of the sites, Pelorus Bridge Scenic Reserve.

Four key population areas were identified in the surveys showing a greater abundance than thought in the 1990s, with a substantive

population on New Zealand's fifth largest island, D'Urville Island/Rangitoto ki te Tonga. Predator control was initiated at Pelorus Bridge Scenic Reserve in 2010, with ongoing management through beech masting events (causing rat and then stoat plagues) a significant concern. The site is also used as an opportunity for public education.

This paper will outline the survey work results and the ongoing management tools and techniques being used at Pelorus Bridge. It highlights a number of challenges around pest management, population monitoring, and the interface with public conservation education.

Assessment of population and individual effects of exposure of New Zealand lesser short-tailed bats to diphacinone during a rodent baiting operation

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Toxic baiting to control introduced mammals is essential for wildlife conservation in New Zealand, but also involves risks to non-target species, including the lesser short-tailed bat (*Mystacina tuberculata*). In 2009, 115 lesser short-tailed bats were found dead during a rodent control operation in Pureora Forest Park. Post-mortem examination confirmed poisoning with the anticoagulant rodenticide diphacinone. To determine the route of exposure of the bats to diphacinone, we used infra-red cameras to record whether bats consumed similar non-toxic bait in captive and wild settings, and to record whether bait was consumed in the wild by arthropods known to be prey items for the bats. Our results suggest that the bats are more at risk through secondary ingestion of toxicants via arthropod consumption than through direct ingestion of bait. Adjustments to bait presentation and delivery in 2012/13 did not completely prevent exposure of wild bats, as revealed by detection of diphacinone in guano, but there were no obvious mortalities. To determine the effect of this level of exposure on wild bats we assessed population survival and physiological measures of fitness in individuals in 2013/14, before, during and after a rodent control operation using the modified baiting practices. Our results suggest that bat exposure to diphacinone was sub-clinical. However, while the pathway of secondary poisoning remains intact we propose that the risk of adverse effects on bats could vary annually depending on the abundance of certain arthropod populations. We recommend further review of baiting practices and associated survival monitoring of short-tailed bat populations.

Managing microbats in houses: some recent challenging cases in far north Queensland.

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Microbats are frequently found roosting in residential and other buildings, where they often go unnoticed; however, once their presence is discovered, human reactions vary from delight to absolute horror. At Balance Environmental, we often find ourselves working at the "horror" end of the spectrum, with building owners, managers and tenants wanting bats removed due to fears of disease, along with more immediate and tangible problems such as noise, odour, guano build-up and staining of walls. Operating under a Species Management Program approved by the Department of Environment & Heritage Protection, we have recently undertaken a number of "bat evictions" in far-north Queensland on behalf of government and corporate asset management agencies. Our approach has been to first understand the nature of the bat roost (species, exact roost location/s, entry/exit points, breeding status of colony) and then devise and implement a building-specific plan for humane eviction. The latter involves mounting alternative roosting sites (bat-boxes) near current roost access points, followed by installation and monitoring of one-way exit devices. Once we are sure all bats are out of the building and cannot return via the devices or any other route, we hand over the permanent sealing of access points to the building managers. The presentation illustrates our approach, using recent experiences in Cairns, Weipa, Kowanyama and Aurukun to highlight the pitfalls and successes of the process.

Microbats and road and rail structures in Australia: a guideline for assessment and management

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Microbats are known to roost in transport infrastructure, such as culverts and bridges, on road and rail lines across Australia. Some species that utilise these structures are listed as threatened under various state and federal regulations. Microbats require specific assessment and management programs if any construction works affecting roosting structures are likely to impact bats in any way. There is, however, no current, nationally-recognised guideline for the assessment and management of bats in road and rail infrastructure.

The purpose of developing a guideline was to identify work activities that may impact upon bats roosting in these structures and provide procedures and guidance for minimising these impacts. This guideline is targeted at professionals involved in the various stages of road and rail infrastructure construction, maintenance and demolition activities that may impact upon microbats. It seeks to identify appropriate processes to be implemented during the planning and preconstruction stages of a project and methods of detection to avoid the problem of discovering bats during or immediately before commencement of works.

The authors have developed the *Guideline for the management of microbats roosting in road and rail structures*, with the endorsement of the Australasian Bat Society. The guideline identifies structures commonly inhabited by bats, works which are likely to impact on roosting bats, legislative requirements, recommended survey guidelines, management options and discusses the provision of compensatory habitat. We provide an overview to the key steps and processes required to effectively assess and manage potential impacts on microbats inhabiting road and rail infrastructure.

Recent Innovations in Microbat Mitigation on Road Projects in NSW

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Roads and Maritime is responsible for over 18, 000 kilometres of road network in New South Wales (NSW). Along the east-coast of NSW, roosting habitat for the Large-footed Myotis (*Myotis macropus*) is often recorded in a variety of Roads and Maritime structures including historic timber truss bridges, pipe and box-cell concrete culverts, and concrete bridges.
To minimise impacts of road projects on microbats, the agency aims to restore roosting and breeding habitat by providing mitigation measures such as bat boxes which are then subsequently monitored for use. However, ecological monitoring has shown that wooden or recycled plastic bat boxes should only be considered as temporary mitigation as most bat boxes deteriorate over time (or in worst cases, may not get utilised by the target species).

Within the Northern Rivers region of NSW, Roads and Maritime have investigated and documented known roosting habitat for the Large-footed Myotis in a variety of concrete and wooden structures. Ecologists, bridge designers and project managers are working together to incorporate similar roosting habitat features into the design and building of new concrete bridges. This methodology has also been applied to the retrofitting of existing concrete culverts and recent ecological monitoring has recorded successful uptake and breeding events.

This paper highlights recent innovations in microbat mitigation for small and large scale road projects in NSW and illustrates how the culture of a road agency is changing to design and incorporate permanent roosting habitat into road structures for microbat species such as the Large-footed Myotis.

Progress towards implementing the soon to be released Southern Bent-wing Bat Recovery Plan

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The Southern Bent-wing Bat *Miniopterus orianae bassanii* is one of only five Australian mammals federally listed as Critically Endangered. It is an obligate cave-dwelling bat with a restricted distribution in south-east South Australia and south-west Victoria, and just two traditionally used maternity caves. Population numbers have declined dramatically in the last 50 years from over 200,000 to approximately 40,000 individuals. Drafting commenced on a National Recovery Plan in 2010 which is currently undergoing government endorsement with release imminent. Although not yet adopted, the draft plan has guided management and research with many of the actions now underway. It is unclear why the population has declined, and so a key focus is to identify the cause of decline. New approaches have been developed using thermal imaging cameras, bat detectors, remote infrared cameras and PIT technology to more effectively estimate population numbers, survival rates and breeding success. The two maternity caves have been regularly monitored to estimate population numbers and trends, and both caves have been geologically surveyed. Long-term monitoring is occurring at key non-breeding caves to examine seasonal and nightly patterns of use, with daily estimates of numbers or relative activity. Cave microclimate is being assessed using temperature and humidity dataloggers in key roosts. Additional caves have been surveyed with the unexpected discovery of a small third maternity colony in a sea cave in Victoria. The extent of the distribution has been investigated by examining disused mines in central Victoria. Detailed investigations are underway to determine if disease may be contributing to the decline. The draft Recovery Plan has provided impetus for action on recovering this Critically Endangered bat.

The ecology and conservation of the Christmas Island flying-fox

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Christmas Island is a remote, beautiful, and ecologically unique part of Australia, but, like many islands of the Indo-Pacific region, its biodiversity is under threat. Following the recent extinction of the Christmas Island pipistrelle, the Christmas Island flying-fox (CIFF) is now the last remaining indigenous mammal on the island. However, the CIFF is in critical decline, and unless current population trends are reversed, it is expected that the species will soon share the pipistrelle's lamentable fate. Recently, a multi-institutional consortium, with expertise in conservation biology, ecology, wildlife disease, and ecotoxicology, has been established to identify and remedy the causes of the CIFF's decline and help safeguard the species' ecological functions across Christmas Island. Here we present the findings from the first six months of field research, including a preliminary assessment of the species' population size and habitat use, and outline how the consortium plans to generate the information and tools essential to understanding and reversing the decline of the CIFF.

- TECHNIQUES -

The efficacy and risk of disturbance of monitoring Southern Bent-wing Bats at non-breeding caves

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The Southern Bent-wing Bat *Miniopterus orianae bassanii* is an obligate cave roosting sub-species that has significantly declined over recent decades. Regular monitoring is undertaken at the two key maternity sites, but little is known of the usage of non-breeding caves. This study investigates numbers and seasonal patterns of bats using non-breeding caves in south-west Victoria. Daily estimates in numbers or relative activity were undertaken in 6 caves over a 2-year period, with the efficacy and potential risk of disturbance of this monitoring investigated.

Bat detectors (Anabats or Songmeters) were set within or at the exit of caves to record relative levels of activity each night. Call pulses were tallied using AnalookW with a filter to obtain an index of nightly activity. Caves were entered once a month to change the detector batteries, with flash photographs taken of the roosting bats to estimate numbers and help interpret the detector results. Noise and disturbance was kept to a minimum.

The bat detector data revealed variation in activity reflecting weather and seasonal patterns. In addition, substantial activity spikes were observed following visits where flash photography was used, with this elevated activity lasting for weeks. As a result flash photography ceased, resulting in considerably smaller activity spikes after battery changes, but less ability to estimate numbers. A new approach is currently being trialed to further reduce disturbance, with Reconyx time-lapse cameras taking an infrared photograph of the roost area once an hour for 3-4months using no visible light or sound. In addition to the disturbance that researchers can inadvertently cause, these findings raise concerns about the impact of noisy or prolonged visits by the public on bat colonies.

PIT tag technology at a stretch: A case study on the critically endangered southern bent-wing bat (*Miniopterus orianae bassanii*)

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Passive integrated transponder (PIT) technology is one of the most promising, yet under-utilised, tools in Australasian ecological bat research. Roost site fidelity of many bat species enables the use of this technology to track tagged bats over their lifetime with just a single trapping. Until recently, PIT tag technology has required tagged individuals to pass closely to the PIT tag reader for detection. Therefore, most studies employing PIT tag technology for bat research have used readers at small-scale roost entrances, such as tree hollows, nest boxes or buildings. This study investigates the use of new PIT tag technology in a large-scale cave system to research the critically endangered southern bent-wing bat (*Miniopterus orianae bassanii*). The PIT tag reader and aerial have been pushed to the limits of detection, being placed in an approximate 2x5 metre configuration within the narrowest section of Bat Cave at Naracoorte, South Australia. Over 800 bats have been tagged for the study so far in order to investigate the population dynamics of the southern bent-wing bat at this critical maternity site. This paper will describe the techniques used, challenges faced and the results obtained to date. The aim is to illustrate the potential application of PIT tag technology for bat research in Australasia, particularly in cave environments.

Problems of assessing reproductive condition in long-term bat projects

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Most bat surveys and projects involve single captures of individual bats, with a small number of recaptures at long intervals. Two long-term, projects involving bat boxes in Melbourne, one with 900 banded bats, the other with 350, have a recapture rate of 70%, some bats recaptured over 30 times, a few captured almost monthly, so seasonal and multi-year reproductive patterns can be studied. Compilation of long-term records of reproductive condition assessments shows erratic variation in reproductive condition assessment of females, some repeat breeders classified as PP, some first-year adolescents classified as PL. This significantly impacts assessment of ratio of older breeders to younger non-breeders. Patterns of errors are analysed, some explanation offered, and proposals developed for improving accuracy of these assessments in projects with frequent recapture of most bats. Some comment on the reliability of repro con assessment when bats are captured once or twice.

And a start has been made on describing population turnover at both sites, duration of colony membership, mix of long-term and short-term members, replacement rates of bats, immigration and emigration.

I Spy: The use of remote camera technology to monitor flying-fox camps and examine behaviour

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Studies of animal behaviour in wild populations are beset by methodological challenges such as limited capacity for nocturnal observations and challenges associated with documenting behaviour over extended periods. Of particular concern is the potential for the act of observation to influence the behaviour being observed.

Advances in technology provide new opportunities to utilise relatively affordable equipment to monitor and study wildlife over extended periods, with minimal or no observer interference.

The Ku-ring-gai Bat Conservation Society is trialling the use of off-the-shelf remote camera technology to monitor diurnal and nocturnal behaviours of flying-foxes in the camp in Gordon, New South Wales. The system being trialled can view approximately 50 m into the camp and has full night vision capabilities. It is capable of recording in Full HD, 24 hours a day and can automatically capture video recordings at a sequence of views, and at pre-determined times and durations.

We report on a trial of strengths and limitations of the equipment. Although the trial is in early stages, it is clear that this method provides an invaluable tool for remotely monitoring behaviours in flying-fox camps, particularly nocturnal activities. The work will enable a more detailed understanding of the role of camps in the biology of the animals; an exploration of the significance of vegetation structure to various behaviours; and will enable descriptions of previously unobserved behaviours such as the development of flight in young and nocturnal territorial and mating behaviours. The work has implications for management of flying-fox camps.

- PLENARY -

Status and Trends of Australia's EPBC-Listed Flying-Foxes: the results to date of the National Flying-Fox Monitoring Program

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The National Flying-Fox Monitoring Program was developed to provide current information on the distribution and abundance of flying-foxes on Australia's eastern seaboard, with a particular focus on the EPBC-listed species, *Pteropus poliocephalus* and *P. conspicillatus*. The program is a collaboration between state and Commonwealth governments, researchers and volunteers. Over 500 camps between Adelaide and Cooktown are monitored on a quarterly basis, with the *P. conspicillatus* camps being monitored on a monthly basis.

The distributions of both species are highly variable with a strong seasonal pattern of movement into and out of camps and variation in

how they are distributed across their ranges. Over the last two decades both species have shown a shift towards urban camps.

Population estimates for *P. conspicillatus'* have declined from 214,750 in 2005 to 92,880 in 2014. This decline appears to be associated with three perturbations: Cyclones Larry (2006) and Yasi (2011), and then a series of smaller perturbations occurring in the cooler months of each year starting in 2011 and occurring each year thereafter. This decline is sufficient to warrant listing as Endangered under EPBC Criteria 1 and 5.
Population estimates for *P. poliocephalus* ranged between 335,000 and 911,000. The November 2014 estimate was 680,000 (±164,500). Insufficient time has elapsed to estimate trends based on the NFFMP data alone but these numbers are roughly consistent with previous monitoring. Given that the identified threats to the species are unchanged and that new threats are emerging we suggest that the species' status remain as Vulnerable.

- FLYING FOX MANAGEMENT -

Flying Fox Critical incidents: Responding to the Casino Heat Stress and Storm Events

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Global warming will inevitably increase the frequency and severity of wildlife disasters and preparation for such critical incidents should be a priority for all wildlife caring groups. Bat handlers generally focus their planning around heat events, however storms also pose a significant risk to flying-fox colonies. This presentation will discuss our experiences, as wildlife carers, responding to two disasters. The first occurred in November 2014 when temperatures in the Northern Rivers region of NSW reached over 42 degrees and the flying-foxes in Casino succumbed to the heat. Over 5000 flying-foxes died, however over 400 orphans were rescued, ranging in age from newborn (some premature) to five weeks. Although wildlife carers have had to deal with bat heat stress events in the past, there are no known records of one in November when there were so many dependent young. The response involved wildlife carers from many groups within NSW, Qld, ACT and even South Australia. The second disaster occurred in January 2016 when a storm hit Casino and a number of tree branches in the colony collapsed. Dead or severely injured totaled 66 and 44 flying-foxes were brought into care. Some of the many lessons learnt from these events will be shared, including coordination, teamwork and communications, equipment and facilities, media and the importance of celebrating positive outcomes in the context of such tragedies.

What influences the presence of black flying-foxes on residential streets in an Australian subtropical city?

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While urbanisation is well documented as being responsible for negatively affecting numerous species some, including black flying-foxes (*Pteropus alecto*), cope well in these environments. We investigated how characteristics of an urban landscape influenced the presence of foraging black flying-foxes on residential streets in Brisbane, Australia. These characteristics included: 1) human factors including population density and socioeconomic disadvantage, 2) the presence and complexity of vegetation, and 3) localised habitat usage and diet choices on residential streets. None of the human or vegetation covariates included in our model significantly influenced the presence of black flying-foxes. Instead, specific foraging resources may be more likely to influence their presence. Black flying-foxes foraging on residential streets in Brisbane appear to be highly dependent upon a single species of exotic plant. Thirty-four percent of all sightings in our study were on the exotic cocos palm, *Syagrus romanzoffiana*. Moreover, the animals showed a greater dependence on this species during winter than any other season. Our data also indicated that in winter black flying-foxes utilized fewer plant species native to south-east Queensland than in the other seasons. Such results highlight the importance of understanding what food sources animals are reliant upon in urban areas, how this changes seasonally, and what the broader implications are of urban vegetation for the wildlife that utilize them. This knowledge will lead to improved understanding of how best to

implement policy and management recommendations that will concurrently balance the needs of people and flying-foxes in continually changing and expanding urban environments.

The challenges associated with managing a large breeding camp of Spectacled Flying-foxes in the Cairns CBD: A case study of working with local government to get positive outcomes

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A large noisy population of native mammals in the centre of a bustling tourist town can cause people either headaches or excitement. The large camp of Spectacled Flying-foxes in the central business district of Cairns has been a polarising issue since the bats first starting regularly using this location to roost during the daytime several years ago. Nowadays the camp is an important birthing site for this vulnerable species.

My talk will present a case study where local government, ecologists, wildlife rescue representatives and the local community have worked together to confront and resolve many of the issues surrounding the presence of this camp, and develop on-going management and education strategies.

Flying Fox Management – a Local Government's Journey

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During 2013, Toowoomba Regional Council received approaches with regard to three flying fox colonies impacting on the businesses, activities and lifestyles of residents. Prior to this, human-flying fox conflict had only played a minor role in wildlife management in the Toowoomba Region and Council did not have a framework in place to guide the management of such matters. Responding to strong community pressure, probably partially fuelled by a high profile of flying foxes in the media at the time, and buoyed by a successful community dispersal action at a roost located on private property, Council resolved to undertake dispersal actions at all three colonies.

During winter 2014, a combination of active disturbance and vegetation modification proceeded at all three sites. Dispersal efforts met with varying degrees of success and flying foxes had returned to all sites by summer. The narrow focus of Council's direction to disperse made it difficult to respond to changed conditions and new information, and to consider alternative management approaches. During the following year Council reviewed and accepted recommendations to manage all three colonies *in situ* and ameliorate conflict by buffering and relocation of conflicting land use.

Experience gained as part of this flying fox management programme were invaluable in shaping Council's position on flying fox management and informing the development of a Flying Fox Management Strategy for the Toowoomba Region.
Toowoomba Regional Council's experiences highlight the importance of proactive planning and adaptive management. Formally adopting strategies to handle complex wildlife management issues provides guidance to local government officers, helps manage community expectations, and may facilitate decision making at a management, rather than political, level, thus improving the ability to respond flexibly.

Flying-fox conservation management policy: A cautionary tale from New South Wales

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In July 2015, Humane Society International celebrated the end to licensed shooting of flying-foxes for crop protection in New South Wales, a state Government commitment which followed many years of work with key stakeholders for the benefit of both orchardists and the environment. The completion of the four-year shooting phase out was tied to the successful orchard netting subsidy program, a practical solution to avoid the unacceptable practice of shooting flying-foxes while providing protection for crops.

Several months on, what has the conservation benefit of this heralded move by the New South

Wales Government been? Has the investment in netting been worthwhile, presenting a potential management solution for other states, or has the push for "special circumstance" provisions undermined a program with promise?

Earlier in the same year the New South Wales Government released its Flying-fox camp management policy. With media attention on human-wildlife conflict at a number of suburban camps at the time, HSI was highly disappointed at the unscientific and protection-weakening amendments made to earlier drafts of the policy. With permitted works seemingly at odds with the positive intentions outlined in the policy, what does the future of flying-foxes in New South Wales look like?

With the national guidelines for the management of flying-fox camps now released and the long awaited Grey-headed Flying-fox National Recovery Plan near complete, the spotlight is on bat conservation in 2016. It is essential the scientific community is at the table to stand up for evidence-based decision making.

Flying-fox management – an update from the Flying-fox Sub-committee

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The management of Australia's flying-foxes is typical of a "Wicked Problem". Despite being keystone species essential to the health of native forests, flying foxes are subject to harassment and abuse should they trespass into the human domain. A misunderstanding of disease risk and poor media reporting continue to fuel public antipathy towards flying-foxes. Most current management practices are not based on science or management experience and ignore flying-fox ecology and behaviour. This has become particularly so since the former LNP QLD government brought in legislation giving local councils "as of right" authority to disperse urban flying-fox camps. This is despite evidence that dispersals are costly and rarely work. Recent policy changes in NSW and at a federal level facilitate dispersals by increasingly allowing land managers to assess whether dispersal can be undertaken based on a set of guidelines.

The ABS Flying-fox sub-committee was re-formed at the 2014 ABS Bat Conference to assist the ABS President to engage in public debate on flying-fox issues. Our role is (in part) to ensure our position is defensible and based on published science and documented experience. We aim to improve the management of flying-foxes and their roosts and protect foraging habitat, while reducing the impact on affected people. We can only achieve this by working with governments at all levels and in collaboration with other community and conservation organisations.

This presentation will focus on the challenges facing the ABS to effectively partner with government to achieve national coordination of flying-fox management.

- EDUCATION -

Bat Brigade to the Bat Portal! – A Citizen Science Project

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Natural Resources South Australian Murray-Darling Basin has been running community monitoring programs for a number of years and has recently introduced a bat monitoring project to its citizen science portfolio, in partnership with Local Action Planning groups. This has sprung from community interest in local bats and the Natural Resources SAMDB's desire for more information on bat species' distribution in the region. Citizen science projects are an ideal way to increase natural resources management engagement and education, while providing much needed long-term monitoring data in a cost effective manner.

The program runs recruitment campaigns for the Bat Brigade and arms members with the tools they need to become effective citizen scientists. Anabat recorders are available for loan and public information sessions are held across the region, in partnership with local bat experts, to explain and encourage their use. Training is

provided to project officers and community members interested in becoming 'intelligence officers', to learn the art of species identification from sonographs. An on-line data portal has been established where the species lists, sonograph images and photographs are entered on-line. They can then be viewed, reviewed and downloaded by anyone interested. Regular reports will be released to the participants and the general public, and the data will become part of the Biological Database of SA and the Atlas of Living Australia's national database.

This project successfully increases community engagement and knowledge, while also providing reliable data that can be used to protect and manage the bats of the SA Murray-Darling Basin.

Monitoring populations of urban microbats bats with volunteers from the general public

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Since 2010, four species of bats have been captured and banded in the Royal Botanic Gardens Melbourne (located three kilometres from the CBD) to understand the population dynamics of microbats in an urban environment. Most of the trapping has been conducted on weekends over late spring to early autumn with the help of volunteers organised through the Earthwatch Institute, a not-for-profit organisation that connects scientists with members of the general public (http://au.earthwatch.org/).

The project achieves two important objectives. First, it collects scientific data that will be used to increase our understanding of how microbat populations thrive and adapt in urban settings. Second, it serves as a useful educational outreach tool to inform and generate awareness about bats and urban wildlife, more generally.

To date, the project has recorded 689 captures across four species; Gould's wattled bat, Lesser long-eared bat, Chocolate wattled bat, and Little forest bat. We have banded 273 bats and have 73 total recaptures; at least one of each species. Eight individuals were recaptured more than once.

Nearly 400 volunteers have participated over the duration of the project. The teams are comprised of two researchers and eight volunteers with ages ranging from 10 to 70+ years. Few volunteers have ecological training and many are not even aware of the existence of microbats. The teams draw both Australian citizens and international visitors with an impressive diversity of backgrounds and experiences including tradesman, doctors, business people, artists, academics, engineers, students, veterinarians, civil servants, and many others.

Societal values for flying foxes and assessing impact of education/ interpretation programs in changing attitudes and impact of this on conservation effort and outcomes

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In this presentation I will give an outline of my research proposal. Australia has four mainland flying-fox species, two of which are vulnerable under state and federal legislation. Despite being keystone species for Australian forests due to their role in long-distance pollination and seed dispersal, all four species can be the subject of human-wildlife conflict. Fruit crop protection has historically been the main conflict, but as flying-foxes have become increasingly urbanised, urban camps have become the focus in recent years. Media is often negative and fuels public attitudes against them, councils may report complaints exceeding 100:1 to calls to conservation, but is this an accurate reflection of the true values held by the Australian public?

My project will attempt to identify the range of attitudes and underling values about flying foxes across all sectors and cultures throughout Australia including international visitors, secondly to assess a range of programs designed to raise awareness in bats for efficacy in changing attitudes and to identify the components of these programs that affect attitudinal change. These programs include wildlife tourism, digital gaming, art and literature as well as more traditional education/interpretative community and school programs. Finally I will look at the relationships between these values and attitudes and policy and conservation outcomes, particularly for the

two vulnerable species, to inform governments in flying-fox management and conservation decisions for benefit of bats, forests and people.

Bats in museums and zoos

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If you have a sharp eye for bats, you can find them in zoos and museums, not in all places, but just often enough to know that bats exist. I have visited zoos and museums in Australia, Indonesia, USA, Greece, Netherlands and Ireland and looked at how bats were displayed. Their presence is overwhelmed by big animals in both zoos and museums, such as lions, deer, bears, primates, and in zoos, animals that will rest quietly, such as reptiles, and in museums, skeletons of extinct large species. Being nocturnal, mostly small, dark and silent to the human ear, zoos struggle to present bats, and although bats in museums can feature in displays that present animals with senses that we don't have, such as ultrasonic hearing, tiny bats suspended from the ceiling in a museum are hard to see, and dried specimens with their wings pinned out have lost part of their character, especially their faces. Behind the scenes, bats receive serious attention, such as breeding in zoos, taxonomy in museums, and that could be an avenue for bringing bats to greater public attention. In opposition is a growing body of writing and activism that opposes zoos and the caging of animals, as well as research on living animals, which includes museum collecting. Bat biology and education will need to be alert to animal rights, and be understood by bat researchers, conservationists and carers (rehabilitators) while looking for new ways to educate a bat-blind public to these magnificent mammals.

Australasian Bat Night

Maree Treadwell-Kerr

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Australasian Bat Night is an annual public awareness programme to educate people about bats, raise the profile of bats, debunk myths and fears, achieve better conservation outcomes and to assist people to live with bats.

For a taxon that comprises close to 25% of Australia's mammal species, bats are surprisingly little known and even less regarded. Many people don't realise microbats live in their neighbourhood, and their only experience with bats, if they live in the north or east coast, is flying-foxes, which are the subject of wildlife-human conflict in many areas. Never-the-less, bats are fascinating and people do wish to know more.

The Australasian Bat Society introduced the inaugural Australasian Bat Night program as part of the celebrations for the 2011-12 Year of the Bat. Based on European Bat Night (now International Bat night, a program running for 20 years in over 30 different countries), the aim was to raise awareness and inform people of bats in their community, their ecological importance, how they live, their needs and the threats they face.

Each year since bat specialists have teamed up with community and local government groups to hold over 130 bat events during March and April throughout Australia and New Zealand. Last year alone 50 events were held ranging from simple information sessions to bat parties and full-blown bat festivals.

I will illustrate some of the highlights of the last four years and talk about some of the challenges of Bat Night and its potential into the future.

- TAXONOMY AND LONGEVITY -

Exceptional lifespan predicts the fatty acid composition of cellular membranes in vespertilionid bats

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Bats are exceptionally long-lived for their size: maximum recorded lifespans are ten-times greater in bats than similar-sized mammals (41

years for a 6 g bat *versus* 4 years for a 20 g mouse). Evolutionary theory explains that bats have evolved 'slow' life-histories because of their low risk of extrinsic mortality, but we still do not understand the underlying physiological mechanisms. Bats provide a unique group for comparative analyses to identify factors associated with rates of ageing.

We found that vespertilionid bats also have an exceptional composition of fatty acids in their mitochondrial and other cellular membranes for their size. Bat membranes contained two-fold greater % monounsaturated fatty acids (MUFA) and a quarter less % polyunsaturated fatty acids (PUFA) compared to a mouse. Among three bat and 11 other mammal species, we found a negative effect of PUFA content (and specifically C22:6 n-3) and a positive effect of MUFA content on maximum recorded lifespan, after statistically accounting for phylogenetic covariance and body mass. Hence, bats have a membrane fatty acid composition that is predicted from their long maximum lifespan.

Bats have mitochondrial membranes that are comparatively resistant to oxidative damage, which supports predictions of the membrane pacemaker hypothesis. However, observed correlations between fatty acid composition and ageing might be caused by other physiological effects, such as on membrane permeability (leakiness) or rates of membrane-bound enzyme activity. Our results provide the first evidence in bats of a general trend linking membrane fatty acid composition and rates of ageing among animals.

Genome-wide high throughput DNA sequencing helps resolve long standing issues in bat taxonomy

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Taxonomic ambiguities persist in certain bat groups because earlier studies were either limited by the available samples or technology. The application of new genetic methods based on high throughput DNA sequencing can provide the necessary power to resolve species boundaries. Two genome-scale molecular genetic techniques—reduced representation sequencing and gene capture—were applied to three bat groups in northern Australia and New Guinea that require taxonomic resolution. Markers from across the genome gave sufficient power to: 1. investigate reproductive isolation between two cryptic sister taxa of *Taphozous* over a 1000 km long zone of potential sympatry and hybridisation; 2. evaluate the species level status of cryptic taxa within *Syconycteris australis* that include allopatric island subspecies and unnamed sympatric taxa on mainland New Guinea; and 3. evaluate the taxonomic status of the Pilbara population of *Rhinonicteris aurantia*. Such new genetic approaches are best used in combination with advanced morphological analysis as part of an integrative approach to taxonomic resolution. Their rise also relegates classic DNA barcoding to a supporting role to confirm field-based identifications of groups where species boundaries have been resolved previously with genome scale data.

- ACOUSTICS -

Acoustic Variation in Gould's wattled bats

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Chalinolobus gouldii in Tasmania, the Otway Ranges and alpine areas of Victoria and southern NSW differ acoustically from those elsewhere. Calls of this Bassian population often show a pronounced droop downwards in frequency at the end of the pulse, a trait missing from other populations. Despite broad overlap, these phonotypes are much easier to distinguish than *Falsistrellus* is from *Scoteanax*, or some of the *Vespadelus* are from each other. These call differences would be unusual between cryptic species, as there is no difference in characteristic frequency. However, the disparities lie in features typically related to clutter and similar distinctions are evident between very distinct taxa elsewhere, such as in North American *Myotis*.

There are places where both types occur in close proximity or even overlap, so the simplest explanation is the presence of two different species. In that scenario, the Bassian form would have a distribution similar to Pink Robin and

Falsistrellus tasmaniensis. If they are parts of the same species, then something else must be maintaining these acoustic differences, and any non-genetic mechanism could have significant implications for acoustic identification of bats. I elaborate on this point, and argue that habitat, climate, co-occurring species or specific prey items do not seem likely causes of such a pattern.

Whatever the situation, Tasmania is a great place to see "Droopy" Bats. It also hosts the type locality for *Chalinolobus gouldii*!

An exercise in frustration: Technical challenges involved in creating a lexicon of flying-fox vocalisations

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Flying-foxes utilise a large, complex, and varied range of vocalisations for communication. Understanding the animals' communication system is critical to our understanding of broader behavioural patterns, and can lead to insights into their activities. The first step towards this is to comprehensively classify and describe the species' acoustic repertoire.

However, attempting to obtain, collate, and analyse these calls is made difficult by the flying-foxes' communal roosting habits, where to obtain clear individual calls they have to be isolated from the background chatter of hundreds or thousands of the animals.

Attempting to achieve the clearest possible recordings has led to considerable experimentation with equipment and methodology, including examining broader soundscapes to attempt to put the vocalisations into the perspective of the wider environment.

We examine different techniques to obtain recordings of flying-fox vocalisations, and discuss the inherent strengths and weaknesses of the different methods.

- ROOSTING ECOLOGY AND MANAGEMENT -

Roosting behaviour and social system of the Ussuri tube-nosed bat (*Murina ussuriensis*) in Japan

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Little is known about the behaviour or social system of bats of the genus *Murina*, which includes at least 39 species. We studied the roosting behaviour of *M. ussuriensis* using radio-tracking (12 females; 2 males). We also looked for evidence of sex-biased dispersal/philopatry using DNA analysis (54 females; 24 males) in lowland warm-temperate rainforest in Yakushima, Japan. The bats used various roost types including tree cavities, bark flaps and exposed sites, but half of the 50 confirmed roosts were in hanging bunches of dead leaves. Almost daily roost-switching was observed by all tracked bats, including females in a maternity group with dependent infants. This group also showed fission-fusion behaviour, with subgroup-size ranging from one to nine adult females plus infants. Eighteen roosts used by 6 radio-tracked females over 8 days were all within 335m. Dispersal and relatedness at the population level were examined by analysis of the mitochondrial D-loop and 12 nuclear microsatellite markers. Mitochondrial haplotypes showed extreme spatial clustering among females consistent with strong philopatry, but some spatial mixing among males suggesting dispersal over short distances. These findings were broadly supported by microsatellite analyses. Pairs of sibs/half-sibs were caught much more frequently at the same site than at different sites (χ^2 = 178.37, $p < 0.001$, d.f. = 2). The results are consistent with a model of philopatric kin-related females forming maternity groups. Potential benefits of group formation include collective defence against predators and cooperative exclusion of non-kin from the home range and the resources within it.

The Secret Hiding Places of the Southern Myotis (*Myotis macropus*): A tale of Culverts and Bridges

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The Southern Myotis, or Fishing Bat, Listed as Vulnerable in NSW, Near Threatened in Victoria and Endangered or Extinct in SA, is a water-dependent species typically roosting in hollow-bearing trees or caves close to aquatic habitats. It has adapted to roosting in man-made structures (bridges, culverts etc), owing to the depletion of natural roost sites by man-induced activities. The NSW Priorities Action Statement for the Myotis includes, as key actions to facilitate the conservation of the species, identifying, protecting and enhancing roost habitat beneath artificial structures (e.g. bridges), and assessing the effectiveness of these procedures.

Assessment of the potential or actual roosting/breeding habitat of Myotis in structures subject to any maintenance or construction works therefore needs to be undertaken with due care, particularly as even quite large colonies can be hidden from view. A recent project in northern NSW has provided an important example of the need for a precautionary approach. Appropriate microbat assessment procedures were in place prior to essential maintenance works on a culvert beneath a major highway, and a precautionary approach to the presence of substantial potential habitat was adopted. Consequently, appropriate fly-out surveys, in conjunction with exclusion procedures, confirmed that a large colony of Myotis would have been trapped in hidden habitat if appropriate measures had not been in place.

This study also highlights the need for further research on Southern Myotis movement patterns, selection attributes of roosting/breeding sites and the extent of genetic interchange between colonies and within roost sites.

Bat boxes - an international review of their use and preliminary findings of two local bat box research studies

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Bat boxes are commonly used for conservation and research. More recently in Australia, bat boxes are also used to offset lost hollow-bearing trees. I conducted an international review of 109 publications on bat box use. The reviewed literature originated from four regions; Europe (70%), North America (16%), Australia (12%) and Asia (3%). Seventy-one species of bats were reported to use boxes. Only a few species were identified to use boxes commonly and there is a lack of maternity and overwintering roost records in boxes. Factors likely to influence box uptake are the provision of suitable box designs, time since box installation, non-target species box competition and providing boxes that comprise of varying microclimates throughout the year. Where boxes are used as a conservation tool, the maintenance cost of a box program may be reduced by using durable box construction materials, such as woodcement, as well as using boxes that are unattractive to non-target species and are 'self-cleaning' (i.e. open bottom boxes). There is concern that boxes may provide a competitive advantage for bat species commonly using boxes and this needs scientific investigation. Other areas warranting further research include the testing of current box types across geographical regions and further development of box designs to accommodate a larger number of bat species and roost types. The presentation also briefly introduces preliminary result of two current bat box studies that look at: 1) the effectiveness of using bat boxes to offset hollow-bearing trees, and 2) testing two multi-chambered boxes under Australian conditions.

Using paint colour to modify thermal profiles of nest boxes

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Thermal properties of roosts play a major role in survival and reproduction of hollow-dependent fauna, yet the factors that drive thermal profiles of nest boxes have received surprisingly little attention. One simple and inexpensive method for manipulating the thermal properties of nest boxes is to paint them different colours. In 2014 we attached 72 bat boxes to trees 5–6 m above the ground at five field sites across Melbourne. At each site, boxes painted three colours (dark green, light green, and white) were facing four different directions (north, east, south, and west). We recorded hourly ambient temperature (T_{Amb}) and temperature inside nest boxes (T_{Box}) for 65 days. Once we accounted for differences driven by T_{Amb}, box colour had the strongest effect on variation in T_{Box}. Temporal patterns in differences between T_{Amb} and T_{Box} were most pronounced for boxes facing north and west, such that north-facing dark green boxes were on average 2.72 degrees hotter than south-facing white boxes, and got up to 57 degrees (or 13.17 hotter than white) when ambient temperatures reached 38.6 degrees. Our data show that paint colour exerts a strong influence on thermal profiles of nest boxes, but how this influences box suitability will depend on the species and environment: higher T_{Box} may be advantageous in cool climates, however higher T_{Box} can have severe fitness costs during extreme heat events. The colour that nest boxes are painted should be considered in relation to the physiological and behavioral needs of target taxa to avoid perverse outcomes.

Microclimate of bat roost boxes in Warrumbungle National Park

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Wildfire burnt most of Warrumbungle National Park in central NSW in 2013. In response to a perceived loss of habitat for hollow-dependent fauna, nestboxes suitable for birds, possums and bats were installed in the Park post fire. To investigate internal temperature and humidity patterns six designs of nestbox were exposed to full sun during spring 2014. All were constructed of 19 mm plywood but varied in length by a factor of two, volume by 3.5x, and entrance areas by 5x. In full sun all nestboxes behaved the same thermally, closely following ambient during the night, but during the day heating to 5º C above ambient by mid-afternoon. Humidity in smaller nestboxes with large entrances was closer to ambient than those with smaller entrances or larger volumes. Overall, nestbox size and shape had no detectable impact on internal temperature fluctuations, but a slight effect on humidity patterns. Sixteen bat roost boxes deployed in the park were monitored for a year. Despite variation in orientation and height above ground, there was no more than 4º C difference in temperature patterns (mean, median, maximum and minimum) within any season. Unlike some of the bird and possum nestboxes, temperatures and humidity in the bat boxes stayed well below summer ambient maximums and above ambient minimums. These results suggest construction material and placement are the likely drivers of temperature and humidity patterns within nestboxes. We are using hemispherical sky photographs to explore placement as a source of variation in nestbox temperature and humidity.

- DIET AND FORAGING ECOLOGY -

Microbats suppress insect pest populations in NSW cotton fields

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Microbats provide a valuable ecosystem service by consuming major agricultural pests. International studies have shown that this pest control service is estimated to be worth billions of dollars to farmers each year with regard to pesticide savings. This large economic benefit could provide incentive to Australian land owners to promote on-farm revegetation and ecological restoration. However, scientific evidence highlighting the benefits of habitat restoration in Australia's intensive farming regions for the provision of pest control by microbats is scarce. A summary of three years of microbat research in the intensive cotton cropping region of northern NSW has shown that microbats occur and forage over cotton fields and have the potential to significantly contribute to insect pest control.

Distribution and key foraging habitat of the Large-footed Myotis (*Myotis macropus*) in the highly modified Port Jackson estuary: an overlooked, but vulnerable bat

Leroy Gonsalves and Brad Law

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Myotis macropus (Large-footed Myotis) trawls for aquatic prey over still water. Its presence over freshwater is well known, but in 2014 a colony was discovered on Sydney Harbour. This unusual saltwater location, in a busy working harbour, led us to design a survey across the entire Port Jackson estuary (Sydney Harbour, Parramatta River, Lane Cove River, and Middle Harbour), targeting potential habitat for *M. macropus*. In 2015, we surveyed 56 sites across the estuary to describe distribution and habitat use using acoustic detectors. Of these, 24 were in harbour bays/coves, 19 were in tributary bays, eight were along tributary channels/creeks, four were on the margins of harbour islands and a single site was located on a freshwater lake. We also investigated relationships between *M. macropus* activity and environmental variables to identify those that should be targeted for management. Radio-tracking of *M. macropus* was carried out to assess roost fidelity and identify key foraging areas. *Myotis macropus* was widespread, present at 92.6 % of sites, but with high activity (>90 passes night^{-1}), including feeding (≥24.5 buzzes night^{-1}) concentrated in a few 'hot spots'. Activity, including feeding, was significantly greater in harbour bays/coves when compared with other habitats. Bats showed 100 % fidelity to the roost site over a three week period. Heavy metals (Zn) in sediments, though positively correlated with total suspended solids (R^2=0.29, P=0.037), were negatively associated with *M. macropus* activity, but not feeding activity. We recommend investigating the use of *M. macropus* as an ecological indicator of environmental degradation.

Linking the needs of insectivorous bats and people at urban wetlands

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Urban wetlands can be hotspots for biodiversity but are often managed for human benefits. Insectivorous bats often occur in urban areas, but the importance of urban wetlands as a source of food, and the characteristics of 'bat-friendly' wetlands are largely unknown. In this study bats and insects were investigated simultaneously using acoustic monitoring and light traps at urban wetland and non-wetland habitats in the greater Melbourne area. A molecular dietary study using a state-of-the-art next generation sequencing technique was undertaken for Gould's wattled bat, little forest bat and large-footed myotis captured at wetlands. A quantitative survey with an experimental design was applied to understand preferences of nearby residents of urban wetlands and if these preferences could be influenced through ecological information. We found that wetlands were important drivers of bat species richness in urban areas and supported a higher richness and abundance of nocturnal flying insect orders, with wetland vegetation and heavy-metal pollution important predictors at the local scale and artificial nocturnal light urban greenness at the landscape scale. Aquatic-dependent insects were found in the diet of all three bat species. People had high aesthetic preferences for wetlands with high vegetation complexity (more trees, understorey and emergent aquatic vegetation) which were also found to support a higher number of bat species and several orders of nocturnal flying insects. Given the joint benefits of wetland vegetation for insectivorous bats, nocturnal flying insects and people's preferences, restoration and conservation efforts may help reconcile the needs of biodiversity and society at urban wetlands.

Foraging biology of the Large-eared pied bat, *Chalinolobus dwyeri*

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The large-eared pied bat, *Chalinolobus dwyeri*, is distributed in Queensland and New South Wales and listed as vulnerable at both state and federal level. Despite this status, little has been published on the foraging biology of the species. As such, research was undertaken with the primary objectives to examine: 1) typical foraging range and core use area (by radiotelemetry), 2) roost locations (radiotelemetry), and 3) fine and course foraging habitat preferences (radiotelemetry, echolocation recorders, light tags, habitat modelling). Seven individuals were radiotracked in the western Blue Mountains, NSW in two seasons, and a single individual in Lamington National Park, Qld. Females typically had larger foraging areas than males, with both sexes showing high loyalty to preferred foraging areas even between seasons. Males and females roosted separately, with females showing less roost loyalty compared to males and roosting at a greater distance to the preferred foraging areas. Both sexes roosted in cliff-faces with no large caverns that faced between west to south-west. At both site locations, preferred foraging areas encompassed a sharp grassland – forest border, with either a creek or moist drainage gully in wetter vegetation types to the surrounding area. Topographically, both preferred foraging areas were in western-facing valleys. We suggest that this combination of features would provide high insect prey activity. At the fine-scale, bats were observed foraging along forest edges at mid to upper canopy height, and occasionally on the outside of individual tree foliage within the forest, diving downwards to capture insects.

Dietary composition of insectivorous bats of the Top End of Australia

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Diet and, more broadly, trophic ecology is an important aspect of microbat ecology that provides valuable information on how species interact and persist within the environment. In this study, we assessed the trophic ecology of a microbat assemblage in the wet-dry tropics of northern Australia. 23 species representing seven families were assessed, including three species with no previous dietary data (*Taphozous kapalgensis*, *Nyctophilus arnhemensis* and *Pipistrellus adamsi*) based on the analysis of stomach and faecal contents. Insects were the principal food source of all species in the Top End microbat assemblage. For foraging guilds, higher proportions of Orthoptera and Coleoptera were present in species from the uncluttered guild whereas Lepidoptera were taken in higher proportions by bats in the background clutter and highly cluttered guilds. However, there was considerable overlap between microbat diets irrespective of foraging strategy.

Microbats of Brisbane's Inner West

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This bat survey was commissioned by the Cubberla-Witton Catchments Network Inc. (CWCN) and funded by Brisbane City Council and consisted of the survey of the microbat fauna found in the Cubberla, Witton, Toowong, Sandy Creek catchments and part of the Brisbane River corridors within the CWCN catchments. Furthermore, opportunity was taken to engage CWCN members and the wider community to raise awareness of the importance bats play in the natural environment through evening bat walks, workshops and the Australasian Bat Night held in May 2015.

The survey was conducted at 20 sites between October 2014 and mid-February 2015. A total of 852 hours and over 9000 call sequences were recorded resulting in the identification of 15 microbat species. Several other microbat species have been recorded in earlier studies in the adjoining catchments, hence the total number of microbats may even be higher than what found during this survey.

The CWCN's catchment microbat diversity represents over half of the total microbat species known to occur in South-East Queensland; with seven of these being listed as significant fauna species in Brisbane. The high bat biodiversity in these inner city suburbs highlights the important work carried out by catchment groups, such as the CWCN, to protect, enhance and manage Brisbane's environment in order to keep and sustain (and hopefully attract back) a wide range of flora and fauna species.

Switching on the bat signal: five years of long-tailed bat acoustic monitoring in Auckland, New Zealand

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Previous to 2010, little was known about long-tailed bats (*Chalinolobus tuberculatus*) within Auckland. Over the last five years, with the assistance from local board and regional funding, Auckland Council has been able to build a picture of long-tailed bat habitat across the mosaic of urban, rural, planted-exotic and native land-use parcels. To date around 60 locations have been accessed using acoustic monitoring across Auckland, from the north to the south, east and particularly in the west. This is proving to be particularly useful as a reference tool in a growing Auckland, where habitat is under pressure from an expanding human population.

Auckland Council has the unique position of doing this bat monitoring, undertaking public advocacy and considering bats through consent conditions across a broad spectrum of land-uses with many of these areas under heavy development pressure. Bats have been detected more widely and across more diverse habitats and land uses than previously thought for Auckland. There has been significant interest from landowners and community conservation groups in detecting whether there are bats in their area, this has been enabled through council and local board funding of bat detectors and encouraging detections to be reported back to create a 'Bat Map' for Auckland. The learnings from all of this are valuable to share not just for bat conservation but also protection of habitat for many other threatened species.

– DISTURBANCE –

The behaviour of bats at harp traps: is a 5-banker enough?

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While harp traps are more successful at capturing certain types of bats than mist nets, previous studies suggest that their overall success rate can be low. Here we combine thermal imaging cameras with ultrasound recorders to describe the behavior and identity of bats as they approach a 5-bank harp trap in the low-land rainforest of Borneo. The majority of bats observed flying down the pathway that included the harp trap avoided capture (55%, n = 66 flights in total). Of the 33 bats that avoided capture, 22 did so be turning around and flying back up the pathway, 7 of them bounced off the strings of the harp trap, 4 of them flew around the harp trap and 4 of them managed to fly/bounce entirely through the trap. Call type influenced trapability with FM bats such as *Kerivoula* and *Myotis* being more likely to avoid capture than CF bats such as *Rhinolophus* and *Hipposideros*. The 5-bank harp trap has greater capture efficiency than that described for 2-bank traps but the detailed relationship between the number of banks in a harp trap, the ability of bats to detect the trap and the ability to bats to negotiate the trap even when detected (which both contribute to trap efficiency) remains to be examined. Is it time to make a 10-banker?

The Rescue of 148 White-striped Freetail Bat *Austronomus australis* Pups

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In February 2015, 152 juvenile White-striped Freetail Bats *Austronomus australis* were discovered in a large hollow limb that had fallen 5 m from a Spotted Gum, *Corymbia maculata.* The limb had internal dimensions of 18 cm diameter, tapering down to 2 cm diameter over a length of 175 cm. The roost tree with a DBH of 95 cm was hollow down the centre. The adult bats were exiting from a hole in a dead section at the top of the trunk, at a height of approximately 11 m.

The surviving 148 juveniles were transferred to a 1 m hollow log, which was hoisted to a horizontal position where the limb had been. When inspected three days later, 102 of the juveniles appeared to have been taken back into the maternity tree, with 46 individuals remaining in the log. This log was then positioned vertically inside the hollow trunk and the large hole created by the fallen limb sealed. No fallen bats were observed under the tree during the rescue process.

Unfortunately the tree fell 2 months later. This however allowed a full inspection of the maternity roost, where only one body was located, indicating that the rescue was a success with most of the juveniles surviving.

The size of this maternity colony has implications for the future conservation of the White-striped Freetail Bat. This species is considered common as it is regularly recorded, however you do not hear large numbers foraging in any one location. It is likely that this one maternity roost serviced a very large area.

Microbats in Warrumbungle National Park two years after extensive bushfires

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Warrumbungle National Park, central NSW, sits on a western extension of the Great Dividing Range surrounded by agricultural plains. In January 2013 wildfires burnt much of the park and surrounding agricultural properties. Fire intensities varied from minor canopy damage (low severity), through total canopy loss followed by epicormic resprouting along the trunks of *Eucalyptus* and *Angophora* trees (moderate severity), to having all above-ground stems killed and regeneration relying on basal resprouting or seed germination (high severity). Ultrasonic surveys at 36 sites for three nights each in early 2015 recorded 0 to 1042 calls per night, (mean 87.32 ± 156.6 SD) and detected 13 taxa in the park. *Vespadelus vulturnus* was the most recorded (44.5 calls per night) and widespread (35/36 sites). Four threatened species (*Chalinolobus dwyeri, Chalinolobus picatus, Vespadelus troughtoni* and *Saccolaimus flaviventris*) were detected at 9, 6, 5 and 5 sites respectively. Overall, the sites with highest species richness had low to moderate fire severity, were ≤ 600 m elevation, and within 150 m of major creek lines. Sites with >200 calls per night were in low to moderate fire severity areas, and mainly in the ironbark vegetation community or in the revegetated areas in the central valley of the park. Both number of species present, and number of calls per night were supressed in areas of high fire severity. There is no evidence that any species of microbat have been lost from the park as a result of the 2013 fire.

Post-wildfire physiological ecology of an Australian microbat

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A changing global climate has resulted in prolonged wildfire seasons and an increase in wildfire severity in Australia. How heterothermic small mammals, those that can become torpid and substantially reduce metabolic rate and body temperature for energy conservation, deal with post-fire changes in habitat and food availability remains largely unknown. Previous studies have shown a post-fire increase in torpor use in terrestrial mammals; we aimed to determine whether volant mammals respond similarly. Therefore, we quantified the thermal biology and activity patterns of Lesser Long-eared Bats

(*Nyctophilus geoffroyi*) using temperature-telemetry in Warrumbungle National Park, NSW, after a devastating wildfire that destroyed about 90% of the park in 2013. We radio tracked bats 4 months and 2 years post-fire to determine possible physiological changes due to the recovering landscape. Surprisingly, 4 months after the fire when a large proportion of trees were blackened and without leaves *N. geoffroyi* used less torpor and was active for longer periods compared to 2 years post-fire when some of the vegetation had recovered. This differs from the post-fire strategies employed by terrestrial small mammals and suggests that increased torpor use may not always be the generic response. It is possible the difference between terrestrial and aerial mammals was due to a suite of factors, including an increase in available aerial food abundance and easier foraging for bats resulting from a decrease in vegetative clutter after the fire.

Changes in Survival of Large-footed Myotis in streams with contrasting disturbance history

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Much remains to be learnt about bat population dynamics and long-term studies are required to develop a deeper understanding of responses to disturbance (e.g. logging or fire) and climate change, especially in complex and dynamic, long-lived systems like forests. Unlike many other taxa, for bats base-line data by which we can identify changes in status overtime is virtually non-existent. We have undertaken two long-term banding studies, the first following a suite of small, hollow-roosting vespertilionids (14 years) and, the second, targeting a habitat specialist, the Large-footed Myotis *Myotis macropus* (17 years). We present mark-recapture analyses for the second project, which is located on two streams in northern NSW with contrasting disturbance history (one being logged and burnt in the middle of the study and the second being undisturbed). We caught bats annually at their roosts beneath timber bridges and banded 529 with a 50 % retrap rate. The maximum time to recapture was nine years. Mark-recapture analyses allowed for dependence of survival on time, sex, and age at marking. Bats had a higher probability of recapture at the logged site (mean adult female = 0.74) compared with the undisturbed site (mean adult female = 0.33) though with some temporal variation, and there was no evidence for transiency in our populations. Adult survival showed only minor fluctuations over time, suggesting that logging did not influence survival. Adult female survival averaged 0.74 + 0.01 in the undisturbed site compared to 0.70 + 0.003 in the seven years post-logging at the second site. In addition, estimated adult female population size was similar between the two sites, though few adult males were recaptured in the undisturbed site. Our study spanned extreme El Nino and La Nina weather events, yet we found little variation in survival. There was some support for a minor influence of Mean Minimum Winter Temperature (+ve) and Rainfall (+ve) on survival. Adult male and female survival was similar at the logged site, but juvenile survival was less than half that of adults, probably due to a combination of mortality and dispersal. Our results suggest that riparian buffers retained during logging operations mitigate potential impacts on stream habitat for *M. macropus* and that specialising on aquatic habitats buffers the species from periods of extreme weather.

Predicted climate change impacts on the phylogenetic diversity of bats across the Australian continent

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Conservation programmes that aim to protect and enhance Australia's biodiversity have typically

been focussed at the species level, but there has been a push to broaden the focus to incorporate genetic, functional, and phylogenetic diversity. Australia's phylogenetic diversity needs protection because it contains a concentration of plant and animal lineages not found elsewhere, and is particularly vulnerable to climate change. Phylogenetic trees have become available for many organisms, but no such tree existed for Australia's bat biota. We set out to a) construct the first comprehensive phylogeny for Australian bats and b) using this information, predict how climate-induced range shifts might impact the distribution of bat species and phylogenetic diversity by 2085. The mitochondrial cytochrome-*b* and nuclear RAG1 genes were sequenced for most of Australia's bat species, and trees were reconstructed using maximum likelihood and Bayesian methods. Trees were then paired with MaxEnt species distribution models for 60 species for which adequate point location data were available for construction. The models were developed both for present-day and 2085 climatic conditions based on climate projections. Finally, present and future species and phylogenetic diversity—the summed length of the tree branches—was calculated for the entire Australian landscape. This study is the first in Oceania and Asia to establish the locations of important centers of bat diversity and to predict how that diversity might change in the future, which is key information for conserving this group.

- POSTER ABSTRACTS -

What are flying foxes doing in Adelaide? Researching the disease and ecological implications of Grey-headed flying foxes in South Australia

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Grey-headed flying foxes (*Pteropus poliocephalus*) arrived in Adelaide in 2010, outside their normal distribution range. Since then, despite pup mortality each summer due to heat stress, the adult population has continued to increase to ~ 3,000. Within this population, Hendra virus (HeV) and Australian bat lyssa virus (ABLV), known to cause disease in horses and people, have been isolated, and a unique, as yet untyped Hendra-like virus of unknown pathogenicity has been discovered. Why have the bats made Adelaide home? What do they feed on and where do they go? Can they survive in Adelaide and are they shedding HeV and other viruses which may pose a risk to horses and people in South Australia? The poster will provide an overview of Grey-headed flying fox ecology and initial movement and foraging data using solar powered GPS collars.

Spatial movements of Grey-headed flying-foxes *Pteropus poliocephalus* in Adelaide and their proximity to horses

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Objective: To collect and analyse flight data from Grey-headed flying foxes, *Pteropus poliocephalus,* at an Adelaide camp including distance, duration and direction. To identify food sources accessed by this population in spring and flying fox proximity to horses.

Methods: This observational descriptive study used data from male Grey-headed flying foxes fitted with CSIRO Camazotz satellite telemetry devices. Flight data collected from 1 September to 2 October 2015 was downloaded to a base station at the camp and interpreted via a combination of GPS Visualiser, Google Maps, Google earth and Daft Logic mapping software and Microsoft Excel spreadsheets. Flight data included spatial, temporal and acceleration measurements of flying fox activity. Flight maps were generated, potential feeding sites were investigated, food species were recorded and

classified, and proximity to mapped horse locations was assessed.

Conclusion: Too few individuals were tracked to be of statistical significance in this population; however the data illustrates flying fox spatial movement in Adelaide, their forage locations and the reliance on introduced food species. The apparent overlap of flying foxes with horses is minimal however this description of new activity has indicated the need for tracking a larger, statistically significant sample size over longer time periods as part of the ongoing study.

Protecting hollow-bearing trees from fire in the Adelaide Hills

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Hollows in trees provide vital natural roosting sites for the majority of Australian microbat species. The loss of hollow trees across Australia has become a real concern for biologists who fear population crashes of hollow-dependent fauna. The Adelaide Hills region in South Australia has lost over 90% of its native vegetation through clearance since European settlement. Large hollow-bearing trees have become rare and continue to be lost particularly from wildfire and prescribed fuel reduction burning. Observations over several years suggest large trees will catch fire even in low intensity fires if there is sufficient fuel load around their bases. The Mid-Torrens Catchment group in association with the Central Hills Landcare Network engaged the Green Army to conduct a trial to protect hollow-bearing trees on a 20 hectare property. The trail entailed mapping the location hollow-bearing trees, taking tree measurements and photographs, and protecting them by clearing the vegetation and accumulated litter from their bases using rakes and leaf-blowers. Around 500 trees per week could be processed by two teams of three people. This trial conducted over two weeks has aroused considerable interest among community groups and land holders, with negotiations currently in progress to have the program adopted across the region.

Remote Monitoring of a Victorian Maternity Cave

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The Critically Endangered Southern Bent-wing Bat (SBWB) *Miniopterus orianae bassanii* is restricted to south western Victoria and south eastern South Australia. It is an obligate cave dwelling bat with two known key maternity caves, one in each state. Little is known about what makes these caves suitable as maternity sites or how microclimate, seasonal conditions and environmental triggers influence the SBWB breeding cycle. This information is critical to effectively manage the caves and the population. To address this knowledge gap we extended our Victorian maternity cave monitoring by installing two Reconyx UltrafireXR6 time- lapse cameras into the birthing chamber and two Hydrochron ibuttons (temperature and humidity), to collect hourly data.

The Victorian cave has several entrances allowing air to circulate. The birthing chamber is within a bell hole approximately two metres above the floor. Pups born here are transferred to a higher (40 m), more open chamber after several days. Preliminary data collected over a four month period indicates that while adult bats are clustering within the birthing chamber they increase the temperature around the pups by up to 17.0°C above ambient cave temperature to a maximum of 33.1°C. They also influence humidity by lowering RH from 99.6 within the cave to a minimum of 72.8 around the pups. Observations of bat behaviour were possible due to time-lapse (hourly) photography, and this technique shows considerable promise for detailed non-invasive monitoring.

Ancestral reconstruction of skull form in Old World leaf-nosed bats (Hipposideridae & Rhinonycteridae) using geometric morphometrics

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Old World leaf-nosed bats (Hipposideridae and Rhinonycteridae; 65 extant spp.) have a tropical to subtropical distribution, with a fossil record extending back to the middle Eocene of Europe. They are nasal-emitting echolocators with expanded nasal chambers and characteristic call patterns specialized for short-range hunting of fluttering insects in and around vegetation. Standard craniodental features and measurements traditionally used in mammalian phylogenetic and morphometric analyses do not fully capture differences between Old World leaf-nosed bat taxa. Current species diagnostic tools may be improved by the use of geometric morphometrics to quantify skull shape. We used (2D) geometric morphometrics: (1) to examine skull shape in Old World leaf-nosed bats of the families Hipposideridae and Rhinonycteridae; (2) to refer unallocated Australian and European fossil species to each family within a phylogenetic framework (using molecular constraints); and (3) to reconstruct ancestral skull form for key clades in these Old World radiations. Our sample included the skulls of 26 extant and 8 extinct species of hipposiderids and rhinonycterids, in which 30 landmarks were placed in lateral and ventral views. Our results indicate that phylogenetic and functional information can be extracted from the quantification of skull shape in leaf-nosed bats. They also give greater insight into the magnitude and mode of variation of skull shape in extinct species, with functional implications for trophic niche partitioning in Old World bat communities.

A pipeline and app for massive filtering and assisted inspection of enormous acoustic datasets

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In the past few years the popularity of using field-deployable full spectrum ultrasonic recorders has led to the collection of massive datasets, which in turn has led to an improvement in levels of species detection and discrimination in certain situations. However, it is not feasible for an analyst to manually inspect every single full spectrum sound file to identify bats present, nor to manually tally bat calls as part of monitoring projects. Thus, semi-automated systems of analysis are now unavoidable. Our bespoke system provides a means to massively filter full spectrum data for bat calls via pulse shape detection, perform multivariate statistical analysis, and then subset the results according to recording site and date. The final step allows the analyst to manually check the output identifications provided by the statistical analysis via a tiny subset of the original dataset. The pipeline consists of an inexpensive commercially available software programme, followed by a series of steps undertaken using an R language script that has been packaged into a 'shiny' app. The pipeline has been applied routinely to datasets collected from northern Australia, Papua New Guinea and beyond, and has resulted in tremendous savings in time—even in regions where bat assemblages and their calls are relatively poorly known—and without significant losses in detection rate.

Modelling the thermal characteristics of rare Pilbara bat roosts in mines and caves

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Engineering solutions can help the conservation of our rare wildlife species. The threatened

Pilbara leaf-nosed bat *Rhinonicteris aurantia* requires warm, humid underground roost refuges to maintain their heat and water budgets for daily survival in a hostile arid environment. Their roosts in caves and disused mines often coincide with mining interests. When this happens, one solution of last resort is to provide bats with new, artificially constructed roosts to avoid a net loss of critical habitat. We developed a general system using computational fluid dynamics (CFD) for modelling the thermal characteristics of underground tunnels: 1. that could be adapted for future real-world application; 2. that used the strict microclimate requirements of the Pilbara leaf-nosed bat as a case study to provide a determination of minimal tunnel length that can maintain suitable roosting conditions, given the cost of building tunnels; and 3. provided a theoretical validation of the CFD model. Pilot studies incorporating thermal modelling of candidate bat habitat designs could prompt mining proponents to explore more effective methods of threatened bat management, and also give government land managers more confidence in accepting non-traditional approaches to wildlife conservation.

The Marianas Fruit Bat: Current Population Trends, Threats, and Recovery Efforts

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The Mariana Fruit Bat is a federally protected species that is endemic to the Mariana Islands. The fruit bat provides essential ecological services to the islands and holds great cultural importance to local indigenous people of the Commonwealth of the Northern Mariana Islands (CNMI). Within the CNMI, populations of fruit bat are threatened by illegal hunting, human development, and natural disasters. Human development that includes agriculture, homesteading, and construction can degrade fruit bat roosting areas, maternity sites, foraging grounds, and movement corridors. The island of Rota sustains the only viable population of fruit bats in the inhabited islands of the Marianas. On Rota, population estimates had suggest that the population level was stable and increasing. Also the number of maternity roosts had remained stable for several years. In 2015, Rota was directly impacted by Typhoon dolphin as well as several other tropical storms throughout the fruiting season. While population counts at maternity colonies showed a decrease, extra colonial bats numbers increased and new maternity colony formation was described in the months following. Decreases in food availability threaten bat populations by increasing the susceptibility to starvation and poaching. Current and future recovery actions must address these vulnerabilities by providing community outreach and education, enforcement, population monitoring, and rehabilitation and release of orphaned or injured bats.

Planes, trains (bats) and automobiles What's happening with microbats at the Gold Coast Airport?

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The Gold Coast Airport (GCA) straddles the Queensland-New South Wales border just north of Coolangatta and incorporates a number of bushland areas adjacent to the runways, terminals and other developed components. Threatened fauna monitoring is carried out by Ecosure, on behalf of Gold Coast Airport Pty Ltd as part of commitments made in the environment strategy contained in the Airport Master Plan prepared in accordance with the Commonwealth *Airports Act 1996*.

Balance Environmental has been assisting Ecosure with bat monitoring since 2010, during which time we have completed four surveys (November 2010, February and May 2014 and December 2015) using a combination of harp-trapping, echolocation detection and direct observation techniques. The poster presents an overview of the monitoring program and results to date, including a discussion of observed changes in microbat species diversity and abundance.

Eavesdropping on ghost bats
Using bioacoustics to uncover characteristics of social organisation in an iconic bat

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The function of acoustic communication is commonly studied in birds, but relatively little research has examined this topic in bats, even though bats are often highly social. The ghost bat (*Macroderma gigas*) is an iconic species endemic to Australia from the monotypic genus *Macroderma*. Ghost bats produce a diverse range of ultrasonic and audible vocalisations and therefore provide an exciting opportunity to investigate the function of non-echolocation calls in bats. Other Megadermatids (false vampire-bats) have specific calls associated with territory (*Cardioderma cor*), food transfer between conspecifics (*Megaderma lyra*), and pair contact (*M. lyra*) indicating that communication is important in false vampire-bats. Similarly, the calls of *Macroderma* are likely to have important functions due to vocalisations being within the hearing range of potential prey and predators resulting in both costs and benefits. We predict that unravelling these functions in relation to bat's intrinsic state and environmental conditions will expand the usefulness of acoustic detection to gain information about behaviour, habitat use and population dynamics of bats.

Here I summarise the current knowledge on non-echolocating calls in bats and explain how I plan to use acoustic surveillance, call analysis and field experiments to determine 1) if there is a function to ghost bat non-echolocating vocalisations, 2) what the function of these vocalisations are, and 3) determine if the calls can be interpreted to infer conclusions on ghost bat social structure, population dynamics, activity patterns, and heterospecific interactions, and 4. Develop a standardised acoustic lure methodology for use in the study of *Macroderma*.

Use of fragmented agricultural landscapes by bats in the Tasmanian Midlands

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The Tasmanian Midlands is listed as one of Australia's 15 national biodiversity hotspots. The Midlands was also one of the first areas used for agriculture when Europeans arrived and still supports grazing, cropping, forestry and, increasingly, pivot irrigation. Currently the area is a mosaic of open farmland with scattered vegetation remnants of varying size and shape that retain lowland native grassland, dry sclerophyll woodland and valley-floor wetlands.

There is a long-term restoration program underway to create linkages between habitat fragments by engaging the support and cooperation of landholders.

The aim of the research is to investigate the effect of habitat fragmentation on the resource utilisation and mobility of nocturnal volant predators (bats). This will inform management of remnants and restoration of native vegetation

It will examine a range of landscape units as well as revegetated areas of differing ages with respect to use of landscape by animals through combining data on presence/absence, seasonal activity and movement patterns. From this, we will build models to describe the response of these animals to landscape patterns. This knowledge will contribute to a new framework and directly inform ecological restoration being implemented in the Tasmanian Midlands.

Bats of Tasmania – an Overview

Kirsty Dixon, Lisa Cawthen, Andy Spate, Cathy Dorling & Anke Frank

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This poster presents an overview of the metrics, calls and images of Tasmanian bats to familiarise our visitors with our chiropteran friends. Tasmania has eight fully confirmed species of resident micro-bat, including the endemic Tasmanian long-eared bat (*Nyctophilus sherrini*). The White-striped free tail bat, *Austronomus australis* is known from calls and sightings.

Whether this is presence, range extension or vagrancy is unknown. The grey-headed flying fox, *Pteropus poliocephalus*, has been recorded as a visitor from time to time particularly to off-shore islands in Bass Strait. Surprisingly bats are largely absent from the abundant cave system of Tasmania, with only a few documented reports of bats roosting in Tasmanian caves on mainland Tasmania and off-shore islands. Tasmanian bats instead largely rely on hollow-bearing trees and exfoliating bark for roost and maternity sites. All bats are insectivorous.

A community discovering its own backyard

Aimee Linke[1] and Renata Rix[2]

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Bats have proven to be a hot currency for connecting people to their local environment, and a little bit of shiny new technology makes it all the more fun. In the Mid Murray area in the SA MDB Natural Resources Management (NRM) region, community engagement activities delivered by our Local Action Planning group are supported by NRM. NRM has been able to supply modern equipment and created a purpose built portal to share data via the Atlas of Living Australia. Along with a raft of other monitoring activities to tempt all interests, bats have proven to be the secret in the garden of the outdoors. Getting people involved in monitoring projects which uncover new creatures can lead to changes in the way people manage their patch or local environment. The aim of our Community Bat Monitoring Program is to identify bats and their spatial distribution, and to increase peoples understanding of the natural diversity that surrounds them. The program supports the development of resources, an education program in schools, bat talks, a Facebook page, and workshops. Through the program landholders can use acoustic monitoring equipment to record bat calls which is interpreted and provides a bat species list for their property. This new knowledge about previously inaudible creatures flying the night skies and taking shelter in habitat on their properties is what leads to a change in awareness and consequently the way they manage their land and the biodiversity it contains.

The bats of Danum Valley Borneo: 2016 Update

Cross C[1], Dowling T[1], Maillet A[1], Roberts E[1], Suffredini P[1], Usher-Chandler L[1], Weiss V[1], Wingfield A[1], Witherby B[1], Wuth M[1], Armstrong K[2], Reardon T[3], Robson SKA[*]

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We provide an update on the batting activities of James Cook University's undergraduate field trip (BZ3001: Field Studies in the Equatorial Tropics) to Danum Valley Field Centre in Borneo (2007-2015). While students engage in a variety of bat-related research projects, a primary goal is to obtain the expertise in capturing and identifying local bats through the development of high definition photographs, .zca and .wav call libraries. The number of bat species detected by the 'bat' students now stands at 44, representing 42 % of the estimated total Borneo bat community of 104 species. Eight new species were trapped in 2015 (using mist nets and 5-bank harp traps) with species accumulation curves suggesting more remain to be discovered. We plan to make high resolution photographs of species in both the hand and in flight, along with .zca and .wav call libraries available online through collaborations with the Centre for Tropical Biodiversity & Climate Change, the eResearch Group (James Cook University) and the Australasian Bat Society.

A relaxed looking conference organising committee at the beginning of the Hobart conference happily receiving compliments on their choice of lime green from New Zealand's Colin O'Donnell.

Congratulations

Best student presentation

Sponsor: Titley Electronics
Award: Christian C. Voigt & Tigga Kingston (Eds): Bats in the Anthropocene: Conservation of bats in a changing word

Winner:

Heidi Kolkert, Nick Reid & Rhiannon Smith – Microbats suppress insect pest populations in NSW cotton fields.

Honourable mentions:

Joanne Towsey, DF Shannon, RA Fuller & AW Goldizen – What influences the presence of black flying-foxes on residential streets in an Australian sub-tropical city?

Emmi Scherlies, Ruth Lawrence, Lindy Lumsden, Noel Meyers & Terry Reardon – PIT tag technology at a stretch: A case study on the critically endangered southern bent-wing bat.

Best student poster

Sponsor: Titley Electronics
Award: Merlin Tuttle: The Secret Lives of Bats

Winner:

Nicola Hanrahan, Justin Welbergen, Christopher Turbill & Kyle Armstrong – Eavesdropping on ghost bats; Using bioacoustics to uncover characteristics of social organisation in an iconic bat

Best overall poster

Sponsor: Balance! Environmental
Award: Merlin Tuttle: The Secret Lives of Bats

Winner:

Terry Reardon – Protecting hollow-bearing trees from fire in the Adelaide Hills

Honourable mention:

Yifu Chen, Zihua Zhu, Kyle Armstrong & Zhao Feng Tian – Modelling the thermal characteristics of rare Pilbara bat roosts in mines and caves.

Best overall presentation

Sponsor: Pettersson
Award: Bat Sound and Software

Winner:

Josie Stokes & Veronica Silver – Recent innovations in microbat mitigation on road projects in NSW.

Honourable mention:

David A Hill, Jon Flanders & Dai Fukui – Roosting behaviour and social system of the Ussuri tube-nosed bat in Japan.

Pia Lentini, April Reside, Kyle Armstrong, Laura Pollock, Terry Reardon & Stephen Donnellan – Predicted climate change impacts on the phylogenetic diversity of bats across the Australian continent.

Other presentations on the short-list:

Amanda Bush
Leroy Gonsalves
Monika Rhodes
Simon Robson
Lib Ruytenberg

The serious task of the conference came down to who could pour the finest beer at Cascade Brewery during the conference dinner.

Hendra summary from papers presented at the 2015 Wildlife Disease Association Conference

Tania Bishop

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Ed: Tania Bishop attended the 64th Annual International Conference of the Wildlife Disease Association on the Sunshine Coast in QLD, 26-30th July 2015. Reprinted with permission from the Proceedings of the 64th International Conference of the Wildlife Disease Association, Maroochydore, Australia.

Determining the role of fruit bat population dynamics in the emergence of Hendra virus in Australia

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Hendra virus (HeV) is a bat-borne RNA virus that has recently emerged as a human public health concern in Australia. HeV circulates in the large frugivorous and nectarivorous bats of the genus Pteropus (known colloquially as fruit bats or flying foxes). Periodically, spillover into an intermediate host (horses) occurs which amplifies viral populations before infecting humans. Anthropogenic influence and landscape change have been implicated as catalysts in the emergence of HeV, as well as analogous bat-borne diseases, such as Ebola and Nipah virus. Therefore, a quantitative understanding of the mechanisms that drive host population dynamics and pathogen epidemiology within the context of landscape change is an important and elusive requisite to predicting the behavior of a bat-borne disease system.

Here, I present spatiotemporal models of both food resource distribution and foraging behavior of fruit bats, the combination of which enables a functional model of bat population dynamics at the landscape scale. My methods employ novel algorithms that analyze patterns in census counts at roosts of fruit bats across southeastern Queensland over the past decade, and mathematical models of social foraging behavior that characterize spatiotemporal flux of fruit bat populations over time. Some initial results indicate that large aggregations of bats are correlated with remotely sensed measures of eucalypt phenology, and the fission-fusion structure of bat populations appears to be driven by hyper-variable patterns of flowering and nectar production across the landscape.

Robust prediction of the mechanistic interaction between food resource variability and bat population distribution facilitates parameterization of epidemiological models of viral transmission that are not vulnerable to typical confounders such as spatial population heterogeneity. And more broadly, it allows construction of scenarios that demonstrate how landscape change quantitatively influences bat population dynamics and ultimately drives spillover and emergence of bat-borne pathogens.

Routes of Hendra virus excretion in naturally-infected flying-foxes; implications for viral transmission and risk of spillover to horses

Dan Edson[1], Hume Field[2], Alice Broos[1], Carol De Jong[1], Lauren Goldspink[1], David Jordan[3], Peter Kirkland[4], Joanna Kristoffersen[1], Nina Kung[1], Amanda McLaughlin[1], Lee McMichael[1], Deb Melville[1], Miranda Vidgen[1], Craig Smith[1]

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[4.] EMAI, NSW DPI, Menangle, NSW

Flying-foxes (genus *Pteropus*) are the natural host of Hendra virus (HeV) which sporadically causes fatal disease in horses and humans in Australia. While there is strong evidence that urine is an important infectious medium that likely drives bat to bat transmission, and in all likelihood bat to horse transmission, we are less certain about the relative importance of alternative routes of excretion. Differentiating between alternative modes of transmission is critical in determining transmission rates in host-pathogen models. Determining the main routes of HeV excretion in flying-foxes is also important when assessing the relative risk of spillover to horses at the bat-horse interface. The main aim of this study was to determine the primary routes of HeV excretion in

three of the four Australian flying-fox species, namely *P. alecto*, *P. poliocephalus* and *P. scapulatus*. A total of 2840 flying-foxes were captured and sampled between 2012 and 2014. A range of biological samples (urine; serum; urogenital, nasal, oral and rectal swabs) were tested for HeV using RT-qPCR. Forty-two *P. alecto* had HeV genome detected in at least one sample and were classified as "HeV-positive". The 42 HeV-positive *P. alecto* returned a total of 78 positive samples, at an overall detection rate of 1.76% across all samples tested in this species (78/4436). Urine was the most sensitive sample for detecting HeV genome, with fewer detections in serum, nasal, oral and rectal swabs. There were no detections in *P. poliocephalus* (n = 1168 animals; n = 2699 samples) or *P. scapulatus* (n = 262 animals; n = 985 samples). While it has been widely assumed that all four species play an important role in HeV infection dynamics, recent evidence suggests that Black and Spectacled flying-foxes may be the main reservoir hosts; the results of this study are consistent with this hypothesis.

Hendra virus infection of Black flying-foxes (*Pteropus alecto*): Assessment of nutritional and physiological drivers

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[4.] School of Veterinary Science, University of Queensland, Gatton, Queensland, Australia
[5] Ecohealth, Ecohealth Alliance, New York, USA

Hendra virus has caused periodic fatal disease in 90 horses and 7 humans in Australia since 1994. Epidemiological studies suggest that flying-foxes, in particular the Black flying-fox (*Pteropus alecto*) and the closely related Spectacled flying-fox (*P. conspicillatus*) are the natural reservoir hosts. This study investigates the hypothesised causal relationship between sub-optimal nutrition and physiological stress with Hendra virus infection in the Black flying-fox. During a twelve month study of flying-foxes in South East Queensland, samples were collected from captured wild Black flying-foxes for hematologic, biochemical and urine analysis, establishing normal reference ranges. The population demonstrated no significant deviation from normal hematologic or biochemical ranges across the study, but did demonstrate statistically significant temporal changes consistent with life cycle events. Measurements from Hendra virus positive animals were within the established normal ranges, but demonstrated statistically significant differences compared with Hendra virus negative animals, notably, increased lymphocyte %, decreased neutrophil %, decreased plasma triglyceride and increased plasma alkaline phosphatase levels and increased urinary protein levels. In order to investigate physiological stress, population urinary cortisol and Hendra virus urinary excretion prevalence was measured from mixed species roosts of flying-foxes from 2 geographically distinct sites (inland subtropical SE Queensland and coastal tropical Far North Queensland). This study demonstrated no significant seasonal fluctuations in Hendra virus excretion prevalence, nor urinary cortisol for the Far North Queensland population, but significant seasonal fluctuations in both Hendra virus excretion prevalence and urinary cortisol for the South East Queensland population. As population measurements are difficult to interpret due to the presence of multiple species and cohorts, a novel urinary collection and molecular analysis method was employed over a 1 year study to collect individual animal urines from the South East Queensland roost site to identify sex and species cohorts, and assess cortisol levels and Hendra virus excretion status.

SUMMARY (Tania's notes)

Hendra
- Incidence has increased over last decade.
- Incidences appear seasonal in subtropics (winter in subtropics but not in tropics).
- Occurs in discrete pulses.
- Mostly related to prolonged periods of landscape change.
- Most spillover events in high human density areas with seasonal distribution.
- Environmental stress effects are involved.
- Black flying-foxes were involved in highest number of spillover events.
- Bats have evolved a generalist feeding behaviour to adapt as well as fluid population structure related to food availability etc.
- Can possibly predict flying-fox population in different areas related to food availability but an also use to predict hendra virus spillover.
- High level of hendra virus sero-virulence in emaciated / malnourished bats.

- Trees that flower in winter are not protected, need rich soil in coastal and lowland areas which have usually been the victim of severe clearing etc in recent years.
- Flying-foxes respond by changes of their behaviour in winter coming into smaller colonies closer to reliable food sources, e.g. fruit, fig trees often near horse paddocks and are therefore implicated in horse hendra virus spillover events.
- All Hendra virus spillover events are near areas where traditional feeding areas have been cleared / affected. Where flying-foxes are also under nutritional stress due to clearing / adverse weather patterns, this leads to pulses of infection.

Black and spectacled flying-foxes main vectors of Hendra virus

- Pooled urine - hendra virus / cortisol and PCR to determine sex and spp.
- Peak of cortisol in Autumn and winter in SE QLD.
- Far north QLD - mainly elevations in Hendra virus incidents are associated in tick mortality season - not the Autumn winter changes seen in SE QLD.
- SE QLD - significant annual winter HeV elevation in prevalence in 2 of 3 winters.
- No such fluctuation seen in Far North Queensland.
- Most bats only detect in urine or urogenital swabs - not usually from other sites.
- Limited detection in oral and nasal and rectal swabs compared to urine.
- Transmission is most likely via horizontal spread.
- No evidence of vertical transmission.
- Usually urine from infected bat and oral intake / conjunctival exposure of horses are main method of outbreak development.
- No detection of Hendra virus in grey-headed flying-foxes or little reds.
- Studies indicate that *P.alecto* (Black flying-foxes) are main reservoir of hendra virus in SE QLD.

How on earth… ?

Emmi Scherlies

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At the Hobart conference I presented a spoken paper about my PhD project, which is utilising PIT tag technology to study the critically endangered Southern Bent-wing Bat (*Miniopterus orianae bassanii*). So far, we have tagged almost 1000 bats and had over 150,000 detections on the PIT tag reader in the Bat Cave maternity site at Naracoorte in South Australia.

When discussing the project, I highlighted some of the challenges that had been faced, in particular due to the large dimensions of the cave passage that is being monitored. One of the issues has been a reduced read-range due to interference from mains power, which is being used to charge the battery banks (that are in turn powering the PIT tag antenna and reader). Despite isolating the charging batteries from the system with a battery-switcher unit, the mains power was still interfering with the reading capacity of the antenna.

This issue has now been resolved by installing a heavy duty earthing cable to the negative terminal of the PIT tag reader. But how do you create a solid earth in a limestone cave with no soil or clay? I was reluctant to drill an earth rod into the cave floor, and the overriding consensus was that the conductivity of limestone is poor at best anyway. The solution was to lay the earth rod horizontally and bury it in a little bit of bat guano. To my relief, guano provided a fantastic earth, and the system is now running optimally!

Thank you to all the people that have been involved in the project so far. In particular to all the hard-working volunteers that helped with the tagging in January and February. At the conference a number of people indicated that they would be interested in helping with future fieldwork. If that's you, please send me an email. I'd love to hear from you! Also, if you are interested in using PIT tag technology for other bat research, please feel free to contact me. I am happy to share what I have learnt so far.

Does thinning of regrowth forest benefit bats (and other biodiversity)?

Brad Law, Leroy Gonsalves and Rachel Blakey

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Below is a quick research update from the Forest Science Unit of NSW DPI. While we have our finger in many bat pies, we've decided to focus here on the theme of thinning of young regrowth forest.

Thinning of unnaturally dense regrowth forests as a method to restore habitat values is one potential means of restoring degraded habitats. There have been growing calls to thin extensive areas of dense regrowth, especially for cypress forests in western NSW, because these forests often regenerate as dense 'wheatfields', but then lock up in a dense state that does not change for decades. Thinning is often considered to be a controversial practice, but the science is lacking to identify the impacts or benefits of thinning for biodiversity and this hinders providing guidance to managers. As well as cypress forests, there have been proposals for thinning dense regrowth in River Red Gum forests and coastal forests. Thinning can be for both silvicultural purposes (in State Forests) to promote tree growth for timber, but also for ecological purposes to restore a mosaic of structurally complex woodland. Despite the appeal of thinning as a restoration technique, the science is limited in underpinning the benefits for biodiversity and in recommending an appropriate scale at which it should be undertaken.

Bats are one group for which some benefits have previously been shown, especially overseas. We have recently received funding from the NSW Environmental Trust to look at this question. Ultimately we hope the research will guide how thinning could be used for restoration.

Progress to date has involved sampling bats (and other biodiversity) at 30 sites in the Pilliga forests of NSW that represent unthinned stands requiring thinning, stands that have been thinned but vary in time since thinning (up to over 40 years ago) and reference, long-undisturbed stands. We are also in the middle of establishing a field trial of thinning to provide a base-line for measuring future responses to thinning. The trial is relying on a before-thinning and after-thinning comparison with impacted (thinned) and control (unthinned) sites. Thinning will be completed mid-2016 and the first post-thinning surveys will be undertaken in early 2017. Part of the trial will involve radio-tracking a sensitive, threatened species to help identify retention levels of unthinned stands. Stay tuned for some results.

Much of this project builds on other related research by the Forest Science Unit of NSW DPI and students. For instance, we have recently published a paper on roost selection of the South-eastern Long-eared Bat *Nyctophilus corbeni*. The Pilliga forests represent a stronghold for this federally-listed threatened species. We were able to catch 54 *N. corbeni*, radio-tracked 39 individuals and located 41 unique maternity roost trees. Small maternity colonies (<10 bats) were found in hollows and fissures often in exposed locations of trees with a small diameter (means range 23–39 cm) that were usually dead (82.5% of roosts). Buloke *Allocasuarina luehmannii* was most commonly used for roosting (49%), yet has been overlooked previously as a source of hollows for fauna. Landscape-scale habitat use was subtle: bats avoided roosting in commercially thinned stands and selected old regrowth.

Logged and mechanically thinned stands were used in proportion to availability. We concluded that heterogeneity in the landscape should be maintained when the habitat of *N. corbeni* is manipulated (e.g. thinned) by retaining a diversity of stem densities, including dense patches (especially with dead *A. luehmannii*). This work has just been published in the journal *Wildlife Research*.

Rachel Blakey at UNSW has also recently completed research (as part of her PhD) on the response of bats to the early thinning of dense River Red Gum forests near the Murray River. Rachel measured bat activity with bat acoustic recorders and nocturnal insects with light traps to compare dense regrowth with sites that had been thinned recently and in the medium term, as well as a mature open forest. Overall, bat activity was 60% lower in dense regrowth than all other forest stands. It didn't seem to matter whether forest had been thinned recently, in the medium term, or had been relatively undisturbed, open forests. We even found that bats with relatively clutter-tolerant traits (higher frequency calls and broader

wing shapes) were much less active in dense regrowth. The pattern for insects was opposite; on average the insect biomass was much greater in dense regrowth, whereas foraging activity by bats was reduced by 80% in these areas. Putting these findings together, it was clear that forest structure, or the density of vegetation, was a key driver of bat activity, more important than prey availability and time since disturbance. Rachel's study is currently in press with the *Journal of Applied Ecology*.

Leroy Gonsalves and Brad Law (photo opposite) at the Forest Science Unit have extended Rachel's study by implementing a thinning trial in the same river red gum forests where Rachel worked. Similar to the cypress study outlined above, the aim has been to implement a before and after thinning (with controls) comparison of bats (and other biodiversity). So far the first post-thinning surveys have been completed and data are currently being analysed. Hopefully, future repeat surveys will track how bats respond to thinning over time.

Finally, as part of one of Brad's long-term bat research projects on the north coast (Chichester State Forest), analyses are currently underway to explore how bats respond to thinning of very different, regrowth wet sclerophyll forests, which took place in 2011. We know most bats avoid cluttered, dense regrowth unless a track provides access via a flyway (Law and Chidel 2002), but what happens when such forest is thinned? We are now close to finding out.

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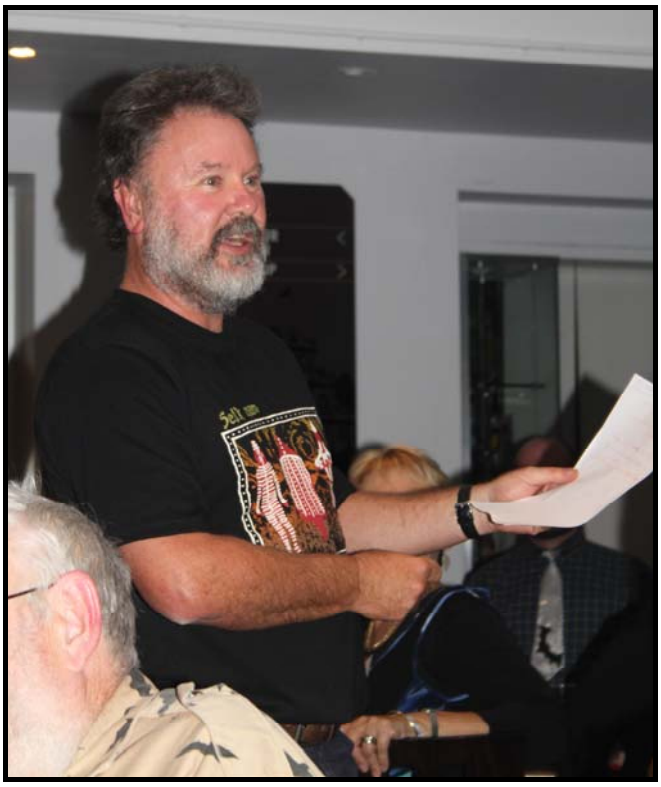

Blacktown City Council Citizen Science

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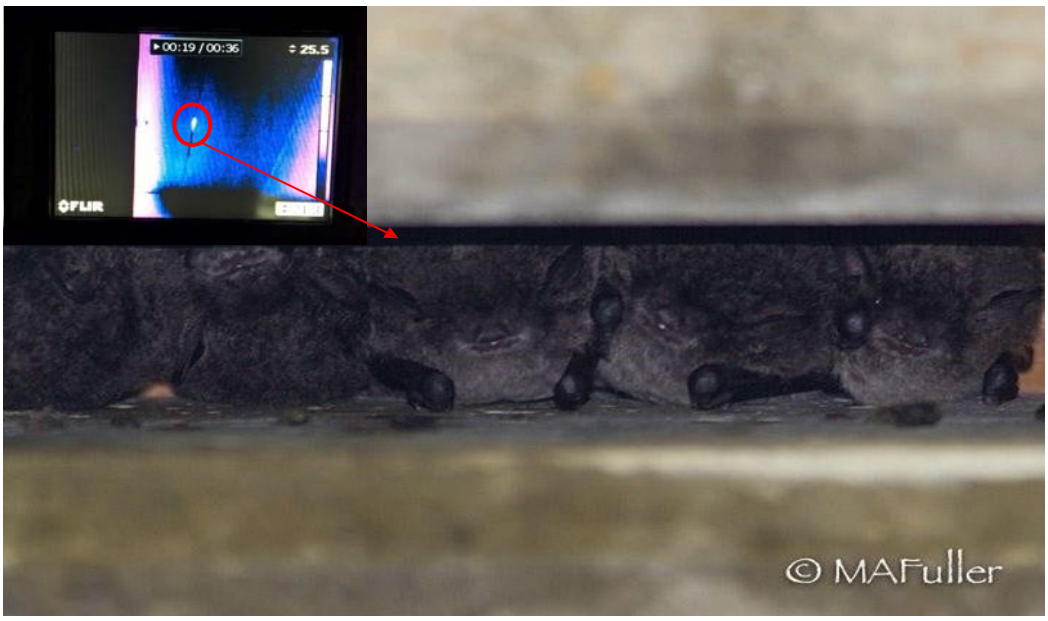
Over the last 9 months, Blacktown City Council in partnership with researchers from the Forest Science Unit of NSW DPI has undertaken two citizen science projects focusing on the Large-footed Myotis (*Myotis macropus*). The aim of the first project was to confirm the presence of the species within the LGA and identify important habitat (roosting and foraging) while also engaging and educating the community about the importance of waterways. Using acoustic detectors, it took just one night of sampling to confirm the species presence on a major waterway (Eastern Creek). The next phase of that project involved trapping and radio-tracking Large-footed Myotis to identify roosting sites and to quantify time spent foraging on Eastern Creek.

Above: A line of harp traps suspended over Eastern Creek to capture Large-footed Myotis *(Myotis macropus*).

Below: A small cluster of five Large-footed Myotis individuals roosting in the gaps between concrete joints of a very busy (and noisy) road in western Sydney (inset: thermal camera image of the cluster of Large-footed Myotis revealing their higher temperature compared to the rest of the roadway). Photo: Mark Fuller.



A network of around 20 volunteers assisted with night time tracking as well as some daytime searches for roosting sites over a 2-week period in September last year. The team was able to locate a small cluster of 5 individuals roosting under a roadway above Eastern Creek around 700 m from where Large-footed Myotis were trapped. Bats spent 75% of the tracking period on Eastern Creek, but could not be located the rest of the time, indicating they were moving further afield and using other waterways.

Following on from the success of the first project, Blacktown City Council were keen to locate these other waterways and continue to engage the community. A survey was designed by Leroy and Brad to identify key waterways used by Large-footed Myotis as well as the attributes of those waterways. A team of volunteers (new and old) participated in a training event run by Leroy in February to learn how to deploy acoustic detectors to survey for Large-footed Myotis.

Some of the volunteers with their 'bat kits' and nets for water-bug sampling at the training day.

In autumn, the volunteers were able to survey 26 waterways across the Blacktown LGA which included natural channels, urbanised channels and wetlands. Large-footed Myotis were recorded at 20 out of 26 sites, with hotspots of activity identified, including a large wetland with up to 500 calls recorded in a single night! Analysis of these data is still ongoing.

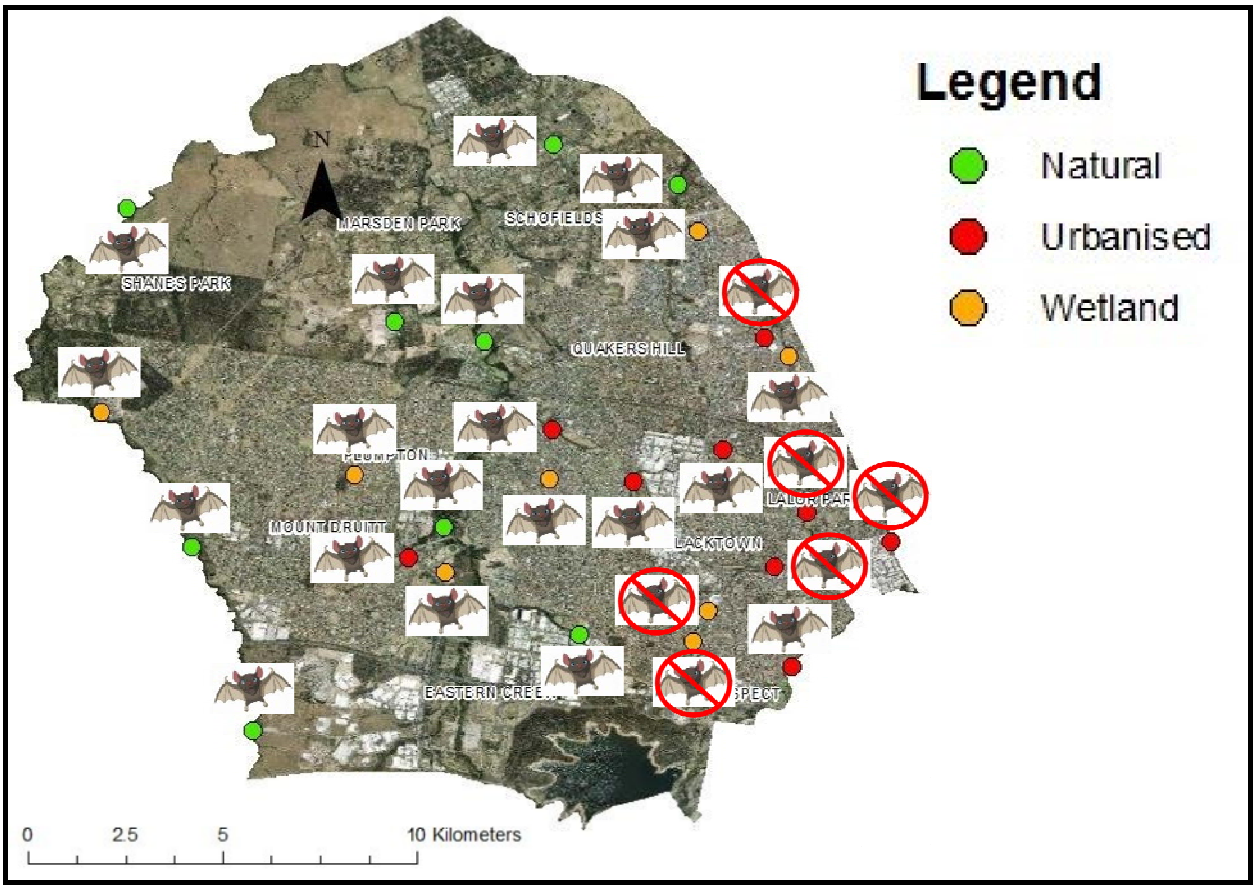
As well as contributing to our knowledge of Large-footed Myotis distributions in western Sydney, Blacktown City Council has actively promoted key conservation messages for Large-footed Myotis and waterways. A great example of this is the creation of Flappy the fishing bat, which is the iconic character in a great educational resource produced for children (http://www.blacktown.nsw.gov.au/files/0e8633f0-b2d7-4650-bc0ca50600a5a7ee/Flappy_the_Fishing_Bat.pdf)

To illustrate how effective the project was at promoting conservation messages, a survey of the volunteers found:

- 85% increased their knowledge about local wildlife and the environment.
- 55% increased awareness of issues like biodiversity conservation and the impacts of water pollution and littering.
- 39% changed their attitude towards bats.
- 55% increased their understanding of how bats provide ecosystem services like pollination and insect control.
- 55% had an increased understanding of what affects our environment and how individuals can make a difference.
- 58% were encouraged to join others in caring for the environment.

One volunteer said "…This is my first time participating in any kind of volunteer work. I've been wanting to give back to the community for a while but never found anything interesting to take part in. The bat surveys sounded interesting and anything to do with conservation is great. Plus my kids have been watching and learning along the way which is a bonus".

The partnership between Blacktown City Council and NSW DPI highlights the value of citizen science as a means of engaging and educating the community about bats and their habitats while also collecting meaningful data.



Map showing presence / absence of Large-footed Myotis in Blacktown waterways.

The Large-footed Myotis *Myotis macropus*. Photo: Lindy Lumsden

– Reports, Viewpoints –

Additional conference events: Mircobat rescue and rehabilitation workshop, and field trip

Lisa Cawthen

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Bonorong Wildlife Sanctuary hosted a microbat rescue and rehabilitation workshop as part of the 17th Australasian Bat Society Conference. This was the first workshop of its kind in Tasmania, with the aim to educate Tasmanian carers, and ABS members, about the best techniques for rescuing and rehabilitating microbats.

Tasmania has eight species of microbat, many of which come into care. Microbats are one of Tasmania's least understood mammals when in care. With few bat carers in Tasmania, it was Australasian Bat Society's hope that this workshop would train future bat carers.

Sixty passionate people attended from throughout Tasmania, mainland Australia and overseas. The workshop was delivered by two dedicated bat carers that work in a dedicated bat hospital – Trish Wimberley and Rachel Lyons.

The workshop covered everything from personal protection to bat husbandry, and how a bat species physiology and ecology influences how it should be cared for. Both Trish and Rachel spoke in depth about the techniques they had learnt over decades to decrease bat mortality in care. In particular, the importance of rehydration through subcutaneous injections and appropriate heating regimes for bats.

Participants were encouraged to join the Australian Microbat Rehabilitation Forum on facebook, a closed group where carers can get advise on bat care and rehabilitation, as well as access the latest manual in microbat care and rehabilitation.

After the conference a field trip was held in the foothills of Kunanyi / Mt Wellington. Twenty-nine bats were captured, representing all eight species known to occur in Tasmania, including the endemic Tasmanian Long-eared Bat *Nyctophilus sherrini*, which everyone was very excited to see. The majority of captured individuals were male, and all but one was captured in the first half of the night. Reference calls collected by conference attendees will significantly improve our understanding of Tasmanian bat calls, and help future work in surveying these bats.

Robert Reid of National Geographic

Robert Bender

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Robert Reid from the National Geographic visited Melbourne from Oregon USA for a week. Robert was collecting information for a story, on Melbourne by day, to go with a companion piece on New York by night. He wanted to be taken on a tour of the flying-fox colony at Yarra Bend. I offered to help and we corresponded back and forth to make arrangements. Helen Reilly, who has been involved in helping with the monthly fly-out counts, agreed to come with me to help.

After collecting them from their Fitzroy hotel, we drove out to the Bellbird picnic ground at Yarra Bend, Robert taking notes all the way. We walked down to the open meadow and watched the flying-foxes hanging from eucalypt branches, flying about, squabbling. It turned out they had never seen a flying-fox before, and were fascinated by the big colony.

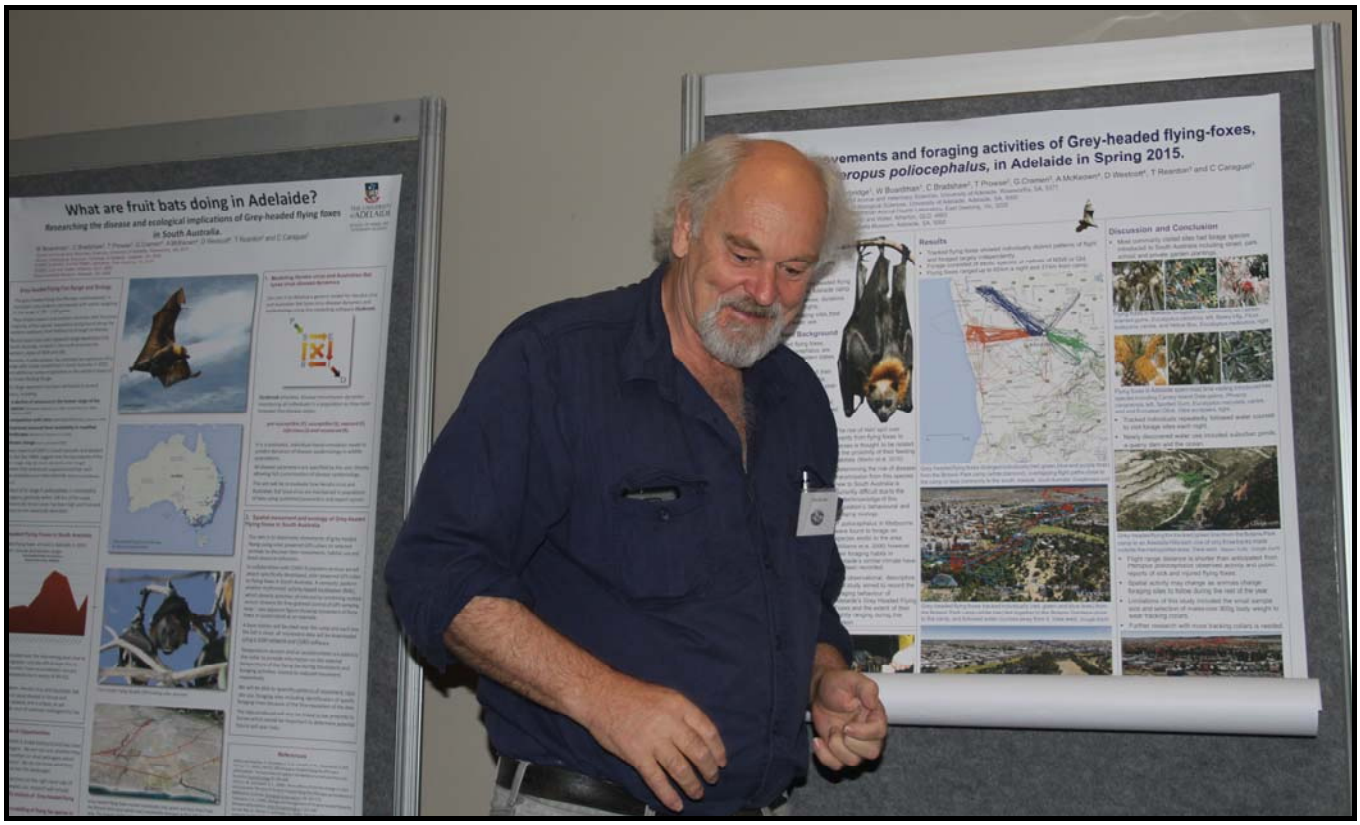
Previous page and above, Robert Reid from National Geographic, Kim and Helen Reilly appreciating the Yarra Bend flying-fox colony in Melbourne.

I gave them some history of the arrival of the bats in the Royal Botanic Gardens in the 1980s and the efforts to persuade them to leave and their settling at Yarra Bend and the recent setup of a second colony at Doveton, their migratory life, contribution to pollination and seed dispersal, shift to becoming an urbanized species, etc.

They took many photos, and Helen told them about the fly-out counts and the seasonal fluctuation in the colony size and how this fits in with their reproductive cycle.

Then we drove to Studley Park boathouse as Robert said he might go kayaking upriver later in the day, so I showed him the prices and the grounds, and recommended going near sunset to see the fly-out.

He needed to be back at his hotel by 12:15 to meet afternoon commitments, so back we went. They both seemed very pleased with the outing and felt well looked after.



Above: Overall poster winner, spot prize winner on first morning *and* honorary life member of the ABS, the great Terry Reardon.

– News and Announcements –

A conference in limerick

Ed. What's a conference dinner without a limerick competition? The stunning surrounds of the Cascade Brewery reception centre in Hobart provided the lubricant required to free the inner poet in us all. Inspiration for each of the limericks, as you will see below, came as always from the many varied topics covered throughout the conference. Enjoy!

Jenni Ovenden & Myree Handley
There was a man from Ballarat
Who saved the life of a bat
The bat was so grateful
cos some people can be hateful
But this was kind and that's that.

Lib Ruytenberg
There once was a microbat
Living in a perfect habitat
The loppers appeared
Her tree was sheared
And that was the end of that.

Casey Visintin
There was a young man called Terry
Who came to Tassie on the ferry
He renamed 'Tad's'
Which drove us all mad
That young taxonomist named Terry.

Martin Cohen
We eat fruit and we masticate
But we sure as hell don't echolocate
We fly around town
And give birth upside down
We are flying foxes – and we are great!

David Hill
There was an old pirate called sparrow
Whose views of the bat world were narrow
He sponsored a bat
(well just fancy that)
Trish's heart was never more mellow.

Nicola Hanrahan
There once was a bat called Bob
He lived with his family in a log
The wind came along
And then the tree was gone
Lucky, carers were there to save the day.

Josie Stokes
Mormopterus taxonomy was heinous
So they looked at the bat glans penis
But it wasn't a male
What they saw was a tail
So they x-rayed to go beyond Genus.

Cathy Dorling
Terry was mad about bats
So he knitted each one a nice hat
To keep their heads warm
From midnight till dawn
And make them less tasty to cats!

And the crowd favourites…

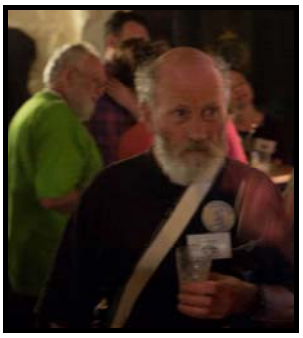
Mark Venosta
There was a young man called Kyle
He was our president for a long while
Although he looked like Greg Hunt
He loved the environ-munt
And tonight he goes out with style.

Dan Lunney, Ana Doty & Justin Welbergen
As a book keeper he is no doubt a hero
But with nipples his error rate was not low
His accounting cut in
With numerical spin
And his error rate finished at zero.

Brad Law
There was a wise man named Bender
Who was quite obsessed with bat gender
There were issues with nipples
But after too many tipples
With Excel graphs he was a repeat offender.

and with his super quick, off-the-cuff reply:

Robert Bender
You blow the dense bat fur apart
Seeking data from a repro con chart
When the nipple you see
Judge PL or PP
But mistakes show you aren't all that smart.



Be part of Australasian Bat Night 2016

Time to start thinking about 2016 Bat Night!

Australasian Bat Night is happening again in 2016.

Australasian Bat Night is a public awareness programme aiming to educate people about bats, to raise the profile of bats and debunk the myths and fears, to achieve better conservation outcomes and assist people to live with bats.

Australasian Bat Night is getting bigger and better! Over 50 events all over Australia and New Zealand occurred during 2015 as bat specialists again teamed up with community and local government groups to raise awareness of bats, with some events attracting 100, 200 and even 500 participants!

Help make 2016 even better!

What can you as an individual ABS member help?

Do you belong to a community group? Add a batty element to your event next autumn.

We are asking ABS members to team up with local councils, land-care groups, Field Naturalists, eco and wildlife tourism operators, wildlife carers, zoos, sanctuaries and wildlife parks, museums and other community groups to run bat activities during March and April of next year, anything from a Bat walk looking for microbat activity or watching a fly-out or giving a simple presentation to holding a full Bat Festival.

ABS will be inviting community and local government organisations and individuals to register events and activities but we need your help to make it even better and bigger. If you know of any regular events, e.g. daily bat talk at a wildlife park, happening during Bat Night months, please badge it as part of Australasian Bat Night.

We will be promoting events on the ABS website, and our social media pages.

For more information and to register contact Maree Treadwell Kerr at batnight.ausbats@gmail.com. And then check the ABS website **http://ausbats.org.au/** to keep in touch and find out more.

Can you run a Bat Night event? Looking for ideas?

Into sports?! Why not organize a sporting event, like a “Bike for Bats” or an “Evening Bat Run” around the time bats fly?

If you live near a landscape where bat colonies are frequently spied in the twilight skies, a local Evening Bat Walk could be just the ticket. Expert bat conservationist advice and the right location may mean you have the makings for an exotic Eco-Bat Tour. You can give a presentation on any bat research or survey you have carried out. Or arrange a visit to a bat clinic or bat exhibit at a zoo or museum. You can also organize a bat shaped cookie baking session or bake sale at your kindergarten or school! Or try a fun hour of finger painting or other craft activity with a bat-tastic theme. What about bat masks or bat mobiles? Family or group activities such as planting trees to benefit both bats and forests, is a good opportunity to spend the day in a stimulating environment of informal learning. Or ask your local hardware store, Mens shed or bat group, to sponsor a

family bat box-building day at a nearby zoo, public park or landcare group. Have a read through the Bat Night reports in past newsletters for more ideas.

Need more help?

If you haven't given a presentation before or don't think you have enough knowledge, we can help you. The ABS Bat Facts, which we send out to all registered events, is a great way to give out factual information on bats.

We also have a couple of Bat Night presentation templates to help you, and can help source extra photos. You can download kids' batty activities and ideas for bat games.

Sharing ideas

If you have a good presentation, please consider sharing it as a template for other bat presenters. We are putting together a file of resources for Bat Night including photographs that can be put into a PowerPoint presentation, craft and other bat themed children's activities, bat movies etc and other information that can help make Bat Nights even better.

Holding a bat event outside of Bat Night months?

We can still promote it on the events page on the ABS website and on ABS social media. Just send details to Maree Treadwell Kerr at batnight.ausbats@gmail.com

Evaluate your bat night or other bat activities

As part of a student research program into societal values on bats, I am preparing questionnaires to look at attitudes to bats pre and post bat event, and will be sending these out to all bat night organisers. Thank you for your cooperation into finding out if a Bat Night event or other education/ interpretation events can change attitudes to bats.

Above: A caped bat night coordinator (Maree) behind costume winner Emmi Scherlies at the conference dinner. Narawan and Anne Williams fly in behind Maree and Kirsty Dixon and another caped avenger complete the fashions on the field. Photo thanks to Tim Pearson.

Request for assistance into study on attitudes of flying-foxes

Maree Treadwell Kerr

Maree.treadwellkerr@gmail.com

As part of my study into "*Societal values of flying foxes and assessing impact of education/ interpretation programs in changing attitudes and impact of this on conservation effort and outcomes*" for Griffith University, I will be conducting an online survey and semi-structured interviews to assess attitudes to flying-foxes.

I will need your help in disseminating the on-line survey. I am interested in views of the general public, across all sectors and age ranges of the community and need to get this out to the widest possible audience.

But I will also need your help in conducting semi-structured in person interviews throughout Australia, particularly those states with flying-foxes and would like to get out to regional towns as well as major cities.

It is particularly important that these interviews be conducted objectively and I will be conducting training sessions to interested people. I would like to carry out both surveys in the first half of 2016.

I will also be looking at attitudes to bats before and after interpretation/ education activities including Bat Night events and bat education programs to schools. If you are involved in bat education in your community, and would like to assist this evaluation research, please contact me. One of the education programs I would like to evaluate is the ABS Bat Pack for schools which is on the members section of the ABS website, but would be interested in assessing any other bat education programs for schools and public programs for the general community.

If you would like to be part of this research please contact me at maree.treadwellkerr@gmail.com.

Disease risk perception and safety practices: A survey of flying-fox rehabilitators

Cecilia Sánchez

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My coauthor (Michelle Baker, CSIRO AAHL) and I recently had our paper "Disease risk perception and safety practices: A survey of flying fox rehabilitators" published in PLOS Neglected Tropical Diseases. Some ABS members may have participated (thank you!) and so we wanted to share the results. Our paper is publicly available at:

http://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0004411.

We would welcome any comments or feedback from carers or others.

Bat with white-nose syndrome confirmed in Washington state

In a media statement released on the 31st March 2016, the United States Department of Fish and Wildlife announced that a Little Brown Bat (*Myotis lucifugus*) had succumbed to white-nose syndrome (WNS) in western North America. This report extended the western known range of WNS in North America by 1,300 miles (~2,000 kms). First seen in North America in the winter of 2006/2007 in eastern New York, WNS has spread to 28 states in the U.S. and five Canadian provinces. WNS is caused by the fungus *Pseudogymnoascus destructans*. The fungus invades hibernating bats' skin and causes damage, especially to delicate wing tissue, and physiologic imbalances that can lead to disturbed hibernation, depleted fat reserves, dehydration and death. The disease is transmitted primarily from bat to bat, although people can carry fungal spores on their clothing, shoes or caving gear.

To learn more about WNS and access the most updated decontamination protocols and cave access advisories, visit: www.whitenosesyndrome.org.

– Reviews –

Bats and Water: Anthropogenic Alterations Threaten Global Bat Populations

Carmi Korine, Rick Adams, Danilo Russo, Marina Fisher-Phelps, David Jacobs

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'Bats and Water: Anthropogenic Alterations Threaten Global Bat Populations' is one of 18 chapters in the open access book, 'Bats in the Anthropocene: Conservation of Bats in a Changing World'. The authors of this chapter have put together a great review of what is known about the use of waterbodies by bats in semi-arid and arid regions around the world. Furthermore, they identify factors influencing the richness, behaviour and activity of bats around bodies of water, before discussing anthropogenic changes in hydrology and water availability that influence the distribution of bats in desert environments. Finally, the authors offer directions for future research on this topic.

The chapter is divided into five sections. The first is a general introduction to dryland environments, identifying that bats are a major component of mammal fauna in these environments and use open water sources for drinking and foraging. The second section of the chapter focuses on the ecology of bats and water in dryland environments, including the types of water sources used by bats, the use of these for drinking and feeding and the influence of water sources on roost site selection and reproduction. The third section of the chapter focuses on threats to water sources used by bats, including loss of existing water sources, degradation of water sources via practices associated with mining and agriculture and establishment of contaminated waste water. The next section deals with mitigation and restoration of water sources used by bats, before a final section identifies area of future research.

This chapter is a very valuable resource for researchers interested in the role of water sources in bat ecology, particularly in arid and semi-arid environments. Additionally, it highlights some serious threats to bats that may not always be considered in bat management and the management of water in anthropogenic environments. I definitely recommend having a read of this chapter.

Left: A very happy Yvonne Ingeme, winner of a raffle prize at the Conference Dinner in Hobart. The prize consisted of a beautiful nest box donated by Narrawan Williams and an inflight bat photo taken by Steve Bourne.

– Recent Literature –

This literature review was prepared by Amanda Lo Cascio using Web of Science – using keyword 'bat'. (New literature between October 2015 and April 2016)

Bats and bugs

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Echolocation and flight

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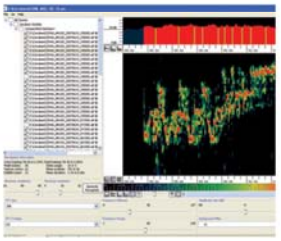

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