
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 –

Hello everyone,

Welcome once again to another edition of the *ABS Newsletter*, and once again – my apologies that this edition has missed reaching you before the end of 2016. As I write this, the wind up to Christmas is in full swing and I am eagerly looking forward to the end of year break. I hope that all our members have had a safe and enjoyable festive season, hopefully pleasantly interspersed with some time out batting in your favourite location.

The new ABS executive that came together after the Hobart conference earlier this year has certainly been kept busy in the ensuing months. We have increased the frequency of our regular meetings and as has been the case of late, there have been lots of issues around the management of flying-foxes. These efforts culminated in a lengthy submission prepared under a tight time frame for a Parliamentary Inquiry into flying-fox management on the east coast (p. 8). Many thanks Pia Lentini, Jess Bracks, Peggy Eby, Dave Westcott and Phil Shaw for representing both their own views and those of the ABS in person at Parliament House in Canberra in November 2016 (see p. 21 for details).

On the topic of the ABS executive, we are still seeking a Fundraising Officer to join us. Ideally, this officer would assist with leveraging sponsorship in conference years. In addition, the role would also involve investigating ways of raising additional funds to help provide ongoing support for our popular ABS Conservation Grants program. Check out pages 28, 30 and 35 to see how this program is assisting bat research and care. A reminder to all ABS Conservation Grant recipients that submitting a report to editor@ausbats.org.au is a requirement of your grant, and that once your report is published in the *Newsletter*, you are eligible for your last payment installation. For further advice please contact treasurer@ausbats.org.au.

Enjoy this edition of the *ABS Newsletter*. Inside you will find excellent data on just how hot it gets inside a harp trap bag (p. 23), a range extension report for the Pilbara Leaf-nosed Bat (p. 32) and as always, Robert Bender has been incredibly busy upholding his reputation as an in-demand bat night presenter (pages 41 – 43)!

Stay tuned, the ABS exec will be in contact with the membership soon requesting your input into the location of the Financial Annual General Meeting (FAGM) in 2017. This will be followed in 2018 with the Annual General Meeting (AGM) which is increasingly looking like it will be hosted by our President at The Hawkesbury Institute for the Environment (Western Sydney University).

Until 'early' 2017, happy batting.

Susan Campbell
ABS Newsletter Editor

Cover image: "On the twelfth day of Christmas, my true love brought to me – a fruit bat in a pear tree". Thank you to Tallulah Cunningham for this edition's cover image and to everyone else who sent through beautiful images – which you will find printed throughout this current edition. Check out page 48 for details on how to help Tallulah complete the remaining days of Christmas for her next exciting art installation.

P.S. Heading west these holidays? In lieu of a photo from my non-existent batting activities at the moment, I thought I'd shamelessly promote my paid work, part of which is to prevent starlings (image below, courtesy of DAFWA) from establishing in Western Australia (WA). Proving to be no easy task this season, with a protracted, wet winter and a locus plague to boot – conditions are ripe for starlings as they make their way into WA and find lovely habitat along the south coast. If you are travelling west and spot any of these birds – please let me know!



– From the President –

Happy New Year everybody!

As usual, it has been a rather busy time for our society and much has happened since our last *Newsletter*. Our Australasian bats are faced with a growing list of threats, and I am pleased to see that our society is rising to meet the challenges this poses for their conservation. While the ABS has been actively promoting bat conservation on many levels, in this report I would like to highlight its work around the threat of white-nose syndrome for Australian microbats and the threat of potential changes in the legislative environment for flying foxes – two key issues that the ABS has recently been busy trying to address.

The ABS is seriously concerned about [white-nose syndrome](#) (WNS). This devastating fungal disease has already killed millions of hibernating bats since its appearance in North America in 2006, and an introduction of the disease to Australia could have extremely dire consequences, especially for our southern cave-dwelling species. ABS members are key in preventing the introduction of the responsible fungus (*Pseudogymnoascus destructans*) onto our shores, and it is extremely important that anyone who has been in contact with bats or caves overseas uses [appropriate precautions](#) before coming into contact with bats or caves in Australia. For more information on WNS and how to report a suspect case, I recommend that you take a moment to familiarise yourself with [this material, which is on the Wildlife Health Australia website](#).

In response to increasing concerns about WNS, Wildlife Health Australia (WHA) recently commissioned a [risk assessment](#) from a team of contributors led by Peter Holz, an ABS member and PhD student from the University of Melbourne investigating if disease may be contributing to the decline of the Southern Bent-wing Bat, and included our venerable experts Terry Reardon and Lindy Lumsden. This report concluded that it is almost certain that *P. destructans* will come in contact with Australian bats at some point in the next ten years. Following on from the risk assessment, WHA convened a workshop that Terry, Lindy, Peter and I attended to develop response options to likely WNS incursion (for details see p. 40). A key outcome from the workshop was a recognition among the broad range of

stakeholders that we urgently require a better understanding of i) the potential distribution of *P. destructans* in Australia, and ii) the hibernation ecology of the bat species that risk becoming exposed. To fill these knowledge gaps, the ABS is now helping to develop an ARC Linkage Grant proposal, involving a multi-institutional consortium of researchers and industry partners, with the ultimate aim of bolstering Australia's preparedness to WNS.

Fortunately, there are also some encouraging developments elsewhere on the microbat front. Earlier this year, a broad contingent of ABS members submitted comments on the Threatened Species Scientific Committee's consultation documents recommending delisting of three bat species: Semon's Leaf-nosed Bat *Hipposideros semoni*, Greater Large-eared Horseshoe Bat *Rhinolophus robertsi*, and Bare-rumped Sheath-tail Bat *Saccolaimus saccolaimus*. In short, the ABS considered the proposed delisting of *H. semoni* and *R. robertsi* unwise in light of lack of critical information, and suggested instead that it would be prudent to take a more precautionary approach and match the species against criteria for Vulnerable. On the other hand, we agreed that the case for delisting *S. saccolaimus* was clearer; however, we asked that consideration be given to reducing the listing to Vulnerable as a step-wise approach until there is greater confidence that the species no longer fits the threatened criteria. In accordance with our submission, the TSSC has now retained Threatened status on [these three bat species](#) but reduced all to Vulnerable. Thanks again to all who helped put the initial submission together, and to Kyle Armstrong especially for his help with the first draft.

The last six months were another shocker for flying-foxes. In November, several ABS members gathered at Parliament House in Canberra for a roundtable discussion of the Parliamentary Inquiry into the management of flying-foxes in the eastern states (for details, see p. 21). Many thanks to Peggy Eby, Dave Westcott, Phil Shaw and Jess Bracks for representing their own expert views and those of the ABS so effectively in such a daunting political arena. I would like to thank Pia Lentini especially for doing an absolutely wonderful job representing the ABS executive as I was overseas. Helped by a lengthy ABS submission (p. 8), the ABS participants managed to mount a powerful case for the need of an

evidence-based, nationally-coordinated approach to flying-fox management. It is expected that the Federal Government Standing Committee on the Environment and Energy will hand down its findings in early 2017.

The ABS continues to work tirelessly through such issues with the help from its Flying-Fox Expert Group (FFEG; formerly known as the 'ABS Flying-Fox Sub-Committee'), but this has been becoming increasingly difficult in the face of the escalating number of conflicts around urban camps. To address this, we have recently renewed the FFEG's membership and focus:

"The Flying-Fox Expert Group (FFEG) is the primary source of reliable, accurate information on Australian flying-foxes. It 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".

Louise Saunders has been doing a wonderful job as co-convenor for the FFEG, but recently decided to step down in order to devote more time and energy to her many other commitments. I would like to take this opportunity here to convey our heartfelt appreciation for the enormous help she has been for flying-foxes in this role! While Louise left some big shoes to fill, fortunately Jess Bracks has now bravely stepped up and will join Maree Treadwell as FFEG co-convenor. Jess' primary role is to help manage people's inputs and delegate tasks around high-priority submissions. Please join us in welcoming Jess into this important role!

The ABS executive is always looking for more helping hands. So, we are very happy that Eridani Mulder has recently joined us as the society's new Conservation Officer! Eri's two key roles are to coordinate the society's responses to conservation issues as they arise, and to act as a judge for the ABS Conservation Grants. However, we are still seeking a Fundraising Officer to organise sponsors for our biennial conference, but also to develop new funding initiatives now that Robert Bender has managed to wrangle tax-deductible gift recipient status for the ABS.

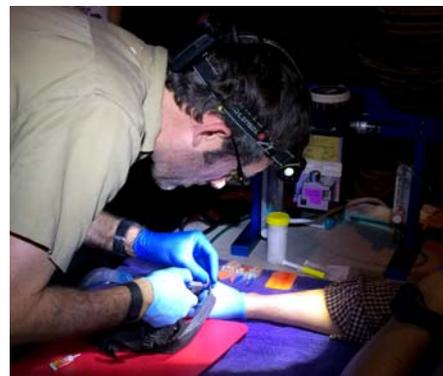
There have been some behind-the-scenes deliberations about where to hold our next Financial Annual General Meeting (FAGM) and Annual General Meeting (AGM). One exciting

option that has been floated for the 2017 FAGM is to hold it in the Solomon Islands and combine it with a week's worth of field-based activities. For the 2018 AGM and conference, the executive felt that after several conferences in regional or smaller cities we needed a place that would be more easily accessible to the majority of our members. As mentioned in Susan's editorial, it now looks like the next conference will be held at the Hawkesbury Institute for the Environment (Western Sydney University) in Richmond NSW. This institute is within easy striking distance of Sydney and the Blue Mountains, and provides wonderful facilities to host our members and great opportunities for local field trips (e.g., Jenolan Caves). Watch this space!

The ABS has several more exciting things on the horizon for this year. This includes organising an ABS photo competition for a '2018 Bat Calendar' (similar to the [2016 Flying-Fox Calendar](#)), and the development of an 'ABS Bats app' – a comprehensive eGuide to the bats of Australasia including species profiles, images, and calls (similar to the [Frogs of Australia App](#)). Finally, the University of Melbourne, Western Sydney University, and the Bureau of Meteorology have made significant progress in developing a much-needed flying-fox heat stress forecaster, which should be made available on ausbats.org.au very soon.

As I hope the *Newsletter* will attest, the ABS continues to work hard to promote the conservation of all populations of all species of bats in Australasia. Thus, I am happy to report in this 47th *Newsletter* that "the state of our ABS is strong"!

Justin Welbergen
POTABS



Justin on Christmas Island processing an anaesthetised *Pteropus melanotus natalis* for PhD student Chris Todd



– Australasian Bat Society Inc. Business and Reports –

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ABS President: Dr Justin A. Welbergen

ABS Submission to the Parliamentary inquiry into flying-fox management in the eastern states of Australia

To whom it may concern,

The Australasian Bat Society, Inc. (ABS) is pleased to have an opportunity to comment on the 2016 *Parliamentary inquiry into flying-fox management in the eastern states of Australia*.

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 Appendix 1 – *About the Australasian Bat Society, Inc.* and *About the ABS Flying-Fox Expert Group*). 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 has been prepared by the ABS Flying-Fox Expert Group. It has been authorised by the elected ABS executive members and is released by its President. As such it represents the collective views and experience of the ABS and is aligned with the society's policy statements on the management of flying-foxes for their long-term conservation (available on our website).

Yours sincerely,

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

Executive Summary

Term of Reference 1: The circumstances and process by which flying-foxes are listed and delisted as threatened species at both the state and Commonwealth levels.

Using the widely adopted IUCN criteria, there is no evidence to support a downgrade in the listing of the Grey-headed flying-fox. There is, however, evidence available to upgrade the current listing of the Spectacled flying-fox. The ABS considers the current processes by which flying-foxes are listed and delisted appropriate, and recommends accordingly that the Grey-headed flying-fox remain listed as Vulnerable and the Spectacled flying-fox be upgraded to Endangered under both Commonwealth and state legislation. The ABS insists that the listing process should always be based upon the best available scientific evidence, without influence of political considerations.

Term of Reference 2: The interaction between the State and Commonwealth regulatory frameworks

There is a mismatch between State and Commonwealth priorities for the listing and conservation of threatened species. This causes significant impacts on flying-foxes whose ranges span multiple jurisdictional boundaries. A nationally-consistent legislative and regulatory framework overseen by the Commonwealth is required across all jurisdictions for all flying-fox species.

Term of Reference 3 - Strategic approaches to managing species at a regional scale

Flying-fox management at the regional scale is inappropriate, unless it is aligned with nationally-consistent legislative and regulatory frameworks operating across all jurisdictions. The ABS recommends development of a national strategy for flying-fox management with representation from all stakeholders to facilitate effective, nationally coordinated management of flying-foxes for the benefit of people and bats.

Term of Reference 4 - Opportunities to streamline the regulation of flying-fox management

There is scope for improving the legislation and regulatory framework for flying-fox management. The ABS may support streamlining the regulation of flying-fox management only if a nationally coordinated and consistent strategic approach is developed, based on scientific evidence and best practice, and no loss of protection to flying-foxes.

Terms of Reference 5 - The success or otherwise of management actions, such as dispersal of problematic flying-fox camps

Dispersal activities for flying-fox camps are generally prolonged, expensive, and typically ineffectual for resolving conflict between humans and flying-foxes. Outcomes from dispersal activities are unpredictable and often involve the creation of additional conflict with nearby human communities. The ABS recommends alternative management strategies to reduce conflict between humans and flying-foxes in the short, medium and long-term.

Preface

All Australian flying-fox species are protected fauna under Australian law. In addition, two species, the Grey-headed flying-fox (*Pteropus poliocephalus*) and the Spectacled flying-fox (*P. conspicillatus*) are listed as Vulnerable under the EPBC Act and respective state legislation.

Flying-foxes are extremely mobile, their movements tracking changes in floral resources across the Australian landscape. This makes flying-foxes vital for the health of our forests^{1,2} and several commercial hardwood species (see Appendix 2). When native food is scarce flying-foxes may feed on orchard fruits and can sometimes cause substantial losses for growers³.

In recent years, flying-foxes have also increasingly come into conflict with humans as flying-fox camps (or 'roosts') have become more numerous in urban areas.^{4,5,6} The reasons for the increased urbanisation of flying-foxes are complex. They include loss of foraging resources due to vegetation clearing, especially winter flowering species; and increased availability of reliable food resources in urban environments, such as parks and gardens and backyard bird-attracting plants. In addition, prolonged droughts or extreme rains can negatively impact on flowering and can force flying-foxes into new areas, resulting in the establishment of new camps in sometimes undesirable locations.

When mast flowering occurs in an area, particularly on the east coast, local areas may see large temporary numbers of flying-foxes arrive in response⁷. These temporary influxes can be major drivers of conflict. When local populations increase, people may feel they are being invaded and are often unaware that the bats will leave once the flowering stops.

The emergence of two viruses that can be transmitted to other species (Hendra virus and Australian Bat Lyssavirus), and the lack of understanding of these diseases among the general public, has further exacerbated the conflict between humans and flying-foxes. Health risks to humans are often exaggerated. Although the prevalence of both viruses is very low, both diseases can have fatal consequences. Australian Bat Lyssavirus (ABL) can only be contracted if a human is bitten by an infected bat, the presence of bats themselves does not pose a health risk provided the bats are not handled. Hendra virus and ABL are both 100% preventable. There needs to be greater education of the public about the real risks of transmission of disease from flying-foxes and management¹².

Despite claims in the media to the contrary, there is currently no evidence that the populations of the two vulnerable species of flying-fox are increasing. At best, the population of Grey-headed flying-foxes is currently stable or declining, but it will take more years of regular monitoring of the population to be confident of population numbers and trends. The other vulnerable species, the Spectacled flying-fox, which has the most restricted distribution, has been demonstrated to have declined by approximately 50% over the last decade. The cause of this decline appears to be cyclones which can deplete fruit and floral food resources for the species^{8,9}. There are likely other causes that have impacted on the species since 2011, including the clearance of winter foraging habitat⁹.

The other two mainland species, the Little red flying-fox (*Pteropus scapulatus*) and the Black flying-fox (*Pteropus alecto*), are assumed to be secure; however, very little is known about the actual population sizes, and the threats faced by these species¹⁰. Monitoring of the small, south-eastern part of the range of these two species occurs as part of the National Flying-Fox Program but, with the majority of their distribution being in the savannas of northern Australia, little is known about their population dynamics elsewhere. Some progress has been made recently by the Queensland Government in this area with the release of \$2.7 million towards research and education on Little red flying-foxes¹¹.

Traditionally, management of flying-foxes for orchard protection has been by shooting, but this is inhumane¹³, and as an alternative, the NSW government provides subsidies to assist growers to erect full netting, the most effective orchard protection method. Research into other methods should be supported by government, noting that many other methods have been trialled without success¹⁴. In Qld, shooting is still allowed by permit, having been reintroduced by the former LNP government after being banned in 2008. There are no permits given to shoot flying-foxes in other states and territories but also no subsidies for netting for orchard protection, leaving potential for future conflict.

Recently, dispersals have become the preferred method for addressing the conflict between humans and flying-foxes. However, dispersals have been clearly shown to be ineffective at dispersing bats to more desirable locations, and often exacerbate the conflict they aim to resolve. Dispersals are expensive, prolonged, and have unpredictable outcomes¹⁵. Many local government authorities in Qld have turned to in-situ management, e.g. trimming of trees to minimise impact. Managing conflict requires education, principles of conflict resolution and provision of practical assistance to alleviate and mitigate impacts of flying-foxes on residents. Research into effectiveness of community education and engagement strategies, and sharing of knowledge and experiences, is required to effectively manage conflict successfully for people while conserving flying-foxes¹⁶. This will be discussed more fully in this submission under TOR points 3 and 5.

In summary, flying-fox management is complex¹⁷, with no easy answers or quick fixes. Interdisciplinary research involving expertise from the biological and social sciences is needed to address this problem. Several members of the ABS are currently conducting research on national attitudes to flying-foxes, analyses of effectiveness of management approaches, and foraging ecology of flying-foxes and the impact of changes to flowering under climate change.

Term of Reference 1: The circumstances and process by which flying-foxes are listed and delisted as threatened species at both the state and Commonwealth levels.

Two species of Australia's mainland flying-foxes are listed as Vulnerable under EPBC Act (1999) and as threatened fauna under respective state legislation. The Spectacled flying-fox is also listed as vulnerable in Qld under *Nature Conservation Act 2002*. The Grey-headed flying-fox is listed as Vulnerable in NSW under *Threatened Species Conservation Act 1995*, as Rare in SA under *National Parks and Wildlife Act 1972*, and as Threatened in Victoria under *Flora and Fauna Guarantee Act 1988*, and, while of Least Concern in Qld, is ranked as a critical priority under Department of Environment and Heritage Protection's *Back on Track* species prioritisation framework. The Grey-headed flying-fox is also listed as Vulnerable under IUCN Red List of Threatened Species¹⁸.

Like all species, flying-foxes must meet at least one of five criteria to be eligible for listing under the EPBC Act. The Threatened Species Scientific Committee (TSSC) must assess nominations against each of the following criteria:

1. Decline in numbers
2. Geographic distribution
3. Population size and decline in numbers or geographic distribution
4. Population size
5. Probability of extinction in the wild

The Grey-headed flying-fox was identified as vulnerable in the 1999 Bat Action Plan¹⁹ under Criterion 1 as numbers of the national population were estimated to have declined by 30% over three generations (see IUCN listing). In 2001 the TSSC considered the available data and concluded that, despite uncertainties with the data, that a decline from a known under-estimated population of 566,000 in 1989 to 400,000 in 1998-2001 was sufficient to warrant listing as Vulnerable under the EPBC Act²⁰. This listing was considered controversial by some parties at the time due to the perceived geographic extent of the population, and frequent conflict with flying-foxes in orchards and urban camps. Recent monitoring conducted as part of the National Flying-Fox Monitoring Program and outlined in a report⁹ to the Commonwealth government on the status and trends of Australia's EPBC-listed flying-foxes, does not recommend any change in the species' status. The analyses from the CSIRO's scientifically rigorous population monitoring program contained in the report indicate that we do not yet have enough statistical power to conclude that the population is no longer declining and that several more years of monitoring is required before any population trends can be identified with sufficient statistical confidence.

For a species to be found eligible to be removed from the threatened species list, evidence must be provided to demonstrate that the species no longer meets any of the five criteria for listing. In addition, it must be demonstrated that delisting and subsequent removal of conservation management programs for the species would not result in the species becoming eligible for listing in the foreseeable future²¹.

Similarly, flying-foxes are assessed for inclusion on threatened species lists in the states as for other species. Species nominated to the Threatened Species List under the Victorian Flora and Fauna Guarantee Act 1998 (FFG Act) are assessed using IUCN criteria²². In NSW, the NSW Scientific Committee assesses nominations according

to criteria based on IUCN criteria under the Threatened Species Conservation (TSC) Act 1995²³. In Qld, species are assessed by Special Technical Committee (STC) to meet guidelines for each threatened species level, which include reduction in state-wide population and/or the existence of threatening processes that could put the species at risk of extinction²⁴.

The main threats to the Grey-headed flying-fox are the loss and modification of its habitat, illegal shooting in orchards and the disturbance of camps, droughts, starvation and extreme weather events (especially episodes of extreme heat²⁵). These threats continue to persist, and others, such as extreme heat events, are expected to escalate further in the future. At the time of writing, a large number of this year's flying-fox pups are presenting as dead or ill throughout Qld and NSW with symptoms that may be consistent with a food shortage.

In summary, current best scientific evidence does not support the notion that the Grey-headed flying-fox is no longer declining, whereas the threats responsible for the species decline are continuing and/or increasing. Accordingly, the recommendation of the authors of the CSIRO report is that the status of the Grey-headed flying-fox status should remain as Vulnerable⁹.

The Spectacled flying-fox was listed as Vulnerable under the EPBC Act in 2002 and in Qld under the Nature Conservation Act in 2015. The Spectacled flying-fox is restricted in Australia to North Queensland but also occurs outside of Australia in PNG, Indonesia and the Solomon Islands where it is considered secure. However there is demographic distinctness between Australian and overseas populations of the Spectacled flying-fox, and currently no evidence to discern the levels of genetic exchange between these populations.

Data from the 2012 to 2015 National Flying-fox Monitoring program indicate (with statistical confidence) that the species has declined by 50 to 60 percent over that time period. The decline appears to be associated with recent cyclones in 2006, 2011 and 2013, but populations have continued to decline since. This decline is sufficient to warrant listing as Endangered under Criteria 1 and 5. A nomination to upgrade the status from Vulnerable to Endangered has been submitted with deadlines to comment last week.

Recommendations

Based on the monitoring data, the ABS recommends the Grey-headed flying-fox remain listed as Vulnerable and the Spectacled flying-fox be upgraded to Endangered under Commonwealth and state legislation.

The ABS also insists that the listing process should be determined by the TSSC based upon the best available scientific evidence, without influence of (local) political considerations.

Term of Reference 2: The interaction between the State and Commonwealth regulatory frameworks

All four flying-fox species are highly mobile and far ranging following foraging resources, freely moving between a network of camps throughout their distribution. Due to their extreme mobility, all four mainland species of flying-fox behave as single populations, but face different jurisdictions with differing legislation and levels of protection in different parts of their ranges. This poses serious problems for the long-term sustainability of flying-foxes, and thus the ABS argues for an evidence-based national regulatory framework for the management of these species.

The ABS has noted in previous submissions [see ABS submission from 2012 into the *Inquiry into the effectiveness of threatened species and ecological communities' protection in Australia* and from 2013 to the *Inquiry into the Environment Protection and Biodiversity Conservation Amendment (Retaining Federal Approval Powers) Bill 2012*²⁶] that there can be a mismatch between State and Commonwealth priorities for conservation of threatened species, and in listing of species. State governments may not act in the national interests for conservation of flying-foxes. Poor local management decisions and differing legislation by a State Government can potentially have significant impacts on flying-foxes whose ranges span multiple jurisdictional boundaries.

The management of flying-fox camps involves a complex set of environmental, legislative and social issues. Disturbance of camps is an identified threat to the survival of the Grey-headed flying-fox²⁷; and in 2006 the Grey-headed flying-fox recovery team determined a range of criteria by which camps could be classified for their

importance to the species. Of the 216 camps subsequently assessed, 166 were deemed to be of critical importance by these criteria and recommended for protection in the draft Recovery Plan²⁷. Recent modifications to the criteria resulted in only 43 Grey-headed flying-fox camps²⁸ and 20 Spectacled flying-fox camps²⁹ being identified as “Nationally Important” camps in the 2015 *Referral guideline for management actions in grey-headed and spectacled flying-fox, camps, Commonwealth of Australia 2015*³⁰.

The Grey-headed flying-fox is found across four states and the ACT, and management of its camps and foraging habitat differs in each jurisdiction, often devolved to local council level where management decisions are often made and implemented without consideration of actions taken in neighbouring councils.

The Spectacled flying-fox is found only in North Queensland but despite being nationally listed as Vulnerable in 2002, it was only in 2015 that it was listed as Vulnerable under Qld legislation. Nevertheless, although dispersal is considered as a last resort management option under the Commonwealth Referral Guide for management actions in Grey-headed and Spectacled flying-fox camps³⁰ only dispersals at Nationally Important camps^{28,29} or those likely to result in a significant impact on a nationally Vulnerable flying-fox species (under a self-assessed decision making process) are required to be referred to the Commonwealth Department of the Environment and Energy.

There are also mismatches in listing and protection levels under State legislation. The Grey-headed flying-fox is listed as Least Concern in Qld but as Vulnerable under the EPBC Act. It is illegal to shoot any flying-fox in Victoria, but all four species of flying-fox, including both nationally Vulnerable species, can be shot under permit in Qld as a measure of crop protection. Flying-foxes may be shot under permit only in exceptional circumstances in NSW, although these circumstances are not specified. The Grey-headed flying-fox is not listed in the ACT but its status as Vulnerable under Commonwealth legislation provides it with protection. The one camp in the ACT is located on Commonwealth land where shooting is illegal, their Commonwealth conservation status protects them from dispersal and non-lethal control methods are considered ineffective and impractical³¹.

In South Australia, management of the Grey-headed flying-fox colony in Adelaide’s Parklands is carried out by the Adelaide Botanic Gardens under Department of Environment, Water and Natural Resources (DEWNR) state legislation. Approval is required from DEWNR, and in some cases the Commonwealth government, to disturb or relocate a flying-fox camp³².

In Victoria flying-fox colonies are managed by the Victorian Department of Environment, Land, Water and Planning, but the City of Geelong has developed a camp management plan for its colony. DELWP has developed the Management Plan for the Yarra Bend colony.

Management plans for the Grey-headed flying-fox have been created for seasonal and permanent camps at local and regional levels in NSW and Qld often with no relationship to nearby jurisdictions or neighbouring management policies. In Qld, though subject to State law, and in the case of the Grey-headed and Spectacled flying-foxes Commonwealth Law, management of camps has effectively been devolved to local government level.

Since early 2013, Qld local governments have had an ‘as of right’ authority to manage urban flying-fox camps without need of permit from the State government. Permits are required for management of rural camps. This has resulted in a large number of dispersals without consultation with neighbouring management authorities, including for the two nationally Vulnerable species. While dispersals have to comply with the Qld *Code of Practice – Ecologically sustainable management of flying-fox roosts*³³ which recommends against, but does not forbid, dispersal during late gestation or birthing season. The two nationally Vulnerable species have additional protection under the EPBC Act if actions are deemed likely to have a significant impact (through a self-assessment process), but not the protected Little red or Black flying-foxes, and dispersals can legally be carried out throughout birthing season, resulting in issues of inhumane treatment and large numbers of flying-foxes entering care, which overburdens wildlife care organisations and volunteers.

Similarly in NSW, despite very strict criteria for the dispersal of Grey-headed flying-foxes from the Sydney Botanic Gardens, recently LGAs have been carrying out dispersals of this same species during birthing season under advice from ecological consultants, despite recommendations under the *NSW Flying-fox camp management policy 2015*³⁴ that Level 3 management actions, which include passive and active dispersals, not be carried out during critical reproductive periods, from late gestation until young are independent.

Recommendations

The ABS recommends that:

- Nationally-consistent legislative and regulatory frameworks across all jurisdictions for all flying-fox species are established as a matter of urgency.
- The regulatory framework for the two nationally threatened species is aligned with the EPBC Act.
- The Commonwealth maintain the highest level of involvement to oversee and mitigate against cumulative impacts on the two Vulnerable species.
- The precautionary principle is applied in the development of coordinated and consistent regulatory frameworks.

Term of reference 3 - Strategic approaches to managing species at a regional scale

As argued above, flying-foxes do not recognise local or state boundaries or differing management regimes. Therefore, species management at the regional scale is inappropriate, unless it is aligned with nationally-consistent legislative and regulatory frameworks operating across all jurisdictions.

Each species is recognised as a single population across its range and telemetry studies have confirmed that individual animals can easily (and repeatedly) traverse the full range of their distribution³⁵ (J. Martin and J. Welbergen pers. comm.). Therefore, localised management actions can have widespread and cumulative impacts on the species as a whole³⁶.

It is thus essential that a *national* strategy for management of all flying-foxes be adopted with input from all stakeholders, including all levels of government. NGOs, researchers and ecologists, for the benefit of people (managing mitigation of impacts) while conserving flying-foxes and their eco-functions.

The ABS suggests that such a national strategy should address:

- Implementation of national Recovery Plans for both threatened species.
- National repository for reporting of actions at camps that do not currently require notification under existing codes of practices and state and federal legislation to mitigate the impacts of cumulative actions, which could be occurring on the same flying-foxes.
- Implementation of planning schemes and zoning so new developments are not built near existing permanent or seasonal camps to reduce potential for future conflict.
- Real community consultation and engagement with residents living near flying-fox camps including assistance with mitigation of impacts which may comprise:
 - Creation of buffer zones between houses and flying-fox roosts.
 - Use of sprinkler systems where appropriate to create buffers as employed by Sunshine Coast Council at some sites.
 - Planting of vegetation for future habitat at flying-fox camps away from residential developments to reduce future conflict and allow flying-fox populations to move and expand into areas away from humans. This can be carried out simultaneously with creation of cleared buffer zones. Enough vegetation should always be retained at camps to support the maximum local population and to allow for temporary increases in population in relation to extraordinary flowering events.
 - Education strategies particularly of real risks of disease, and including flying-fox ecology, particularly population fluctuations of local camps in response to seasonal or occasional food supplies.
 - Impact mitigation support including provision of covers for cars and clothes-lines, free pressure cleaning service for paths and buildings and window cleaning, assistance towards air-conditioning and/or double-glazing where smell and noise are a problem.
- Education of whole communities, including teaching about flying-foxes and other bats in the school curriculum, and holding bat community events and public programs, with an emphasis on disease risk, mitigation and prevention and on flying-fox ecology. A One Health approach has been found to be effective in education about disease risk from bats³⁷.
- Conservation of foraging habitat. A key component of a national strategy for flying-fox management is protection and restoration of foraging habitat. Commonwealth-funded research has identified foraging habitat for the Grey-headed flying-fox for use in recovery planning and habitat management; however, there has been little adoption of this research to assist with recovery efforts to date. Vegetation clearing of

winter foraging resources of the Spectacled flying-fox is implicated as a contributory factor in the decline of the species, and retention of this vegetation as a top priority in recovery of the species.

Recommendations

The ABS recommends development of a national strategy for flying-fox management with representation from all stakeholders to facilitate effective, coordinated management of flying-foxes for the benefit of people and bats in Australia.

Such a strategy should include education and community engagement as well as management to assist people impacted by flying-foxes, and conservation of flying-foxes to aid recovery of these threatened species. The strategy needs to be built on a strong foundation of robust ecological and social research.

The ABS recommends government support for ecological and social science research to facilitate conflict resolution.

Term of reference 4 - Opportunities to streamline the regulation of flying-fox management

Streamlining and avoiding duplication of State and Commonwealth regulation within flying-fox management should only be considered under a nationally-coordinated and consistent flying-fox management strategy and be overseen at the Commonwealth level under criteria guided by robust and scientific evidence and best practice.

There should be no compromise of the protection offered by environmental legislation under any proposals to streamline regulatory and legislative processes. ABS noted in its submission from 2012 into the *Inquiry into the effectiveness of threatened species and ecological communities' protection in Australia*²⁶ that in some cases the EPBC Act was ineffective in protecting threatened species of bats including flying-foxes.

In its submission to the *Inquiry into the Environment Protection and Biodiversity Conservation Amendment (Retaining Federal Approval Powers) Bill 2012*, the ABS noted that:

- There was a risk of loss of scientific rigour in environmental impact assessments should there be shorter assessment periods under a streamlined process.
- State governments charged with responsibility for environmental management are often not sufficiently resourced. This applies even more so to LGAs charged with the responsibility of managing Australia's flying-foxes.
- State governments are not always likely to act in the national interest for conservation of threatened species. This third point is illustrated by the mismatch in protection of flying-foxes during the Campbell Newman era in Queensland. At this time, the only protection of the nationally Vulnerable Spectacled flying-fox was its listing on the EPBC Act.

Over the last few years, there have been changes to flying-fox legislation and regulatory processes under the 2014 *Commonwealth Referral Guide for management actions in Grey-headed and Spectacled flying-fox camps*, the *NSW Flying-fox camp management policy 2015* and the *Qld Code of Practice – Ecologically sustainable management of flying-fox roosts* that have streamlined regulatory processes with regard to actions that can be taken at flying-fox camps.

For instance, although these documents recommend the use of dispersal as a last resort option, they do in fact make dispersals easier and their potential for resulting in a significant impact higher. Only Nationally Important camps require referral to the Commonwealth. For other camps, the self-assessment process to determine if an action could have a significant impact on one of the two Vulnerable species cannot take account of any potential cumulative impacts arising from similar actions in neighbouring LGAs, as there is no requirement to report actions. In addition, guidelines recommending that disturbance to camps or dispersals should not take place at critical times, such as when from late gestation until weaning, is not enforceable. This lack of oversight mechanisms results in unregulated impacts of management actions on flying-foxes throughout their ranges, and highlights the need for a nationally-coordinated strategy for the effective conservation of the Vulnerable Grey-headed and Spectacled flying-fox as well as the other Australian species.

Recommendations

The ABS can support streamlining the regulation of flying-fox management only if a nationally coordinated and consistent strategic approach is developed, based on best scientific evidence and practice.

There is scope for improving the legislation and regulatory framework for flying-fox management, including improved consistency of legislation, coordination of legislation and regulatory frameworks, removal of ambiguity in legislation, consistency of language and terminology, and clearer guidelines on assessment of potential of actions to have a significant impact on flying-foxes, and better reporting on the outcomes of actions to facilitate sharing of knowledge and experience to improve management and policy. The ABS is working on a standardised reporting form for actions at camps to help build the knowledge base needed for effective management.

The ABS supports continuing research into flying-fox ecology and management, and consistent nationwide monitoring of the species and management impacts, to underpin an evidence-based approach to the regulatory framework.

Terms of reference 5 - The success or otherwise of management actions, such as dispersal of problematic flying-fox camps

The ABS considers dispersal of flying foxes from camps in urban areas to be generally ill-advised, and should only be contemplated as a management action of very last resort. There is now ample evidence to show that dispersals are extremely costly and by and large unsuccessful, with most resulting in the flying-foxes re-occupying their original camp soon after the dispersal activities have ceased. In those cases where flying-foxes do not return to the original camp site, they usually establish new camps a few hundred metres away. It is not possible to 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.

Specifically, an assessment of the outcome of 17 dispersals in NSW (1990-2013)¹⁵ found that:

- Although dispersals sometimes caused animals to move from the original camp, in all cases, dispersed animals did not abandon the local area.
- In 16 of the 17 cases (94%), dispersals did not reduce the number of flying-foxes in the local area.
- Dispersed animals generally formed new camps located close to the original site (64% within 600 m; 91% within 2 km) and the close proximity of new camps typically resulted in ongoing conflict within the local community.
- It was not possible to predict or predetermine where new replacement camps would form.
- Conflict was usually not resolved. In 12 of the 17 cases (71%), conflict persisted either at the original site or at replacement camps within the local area after the initial dispersal actions.
- Repeat actions were required to keep animals from returning to the original site. Often dispersal actions were repeated over months or years to keep animals from returning.
- Financial and social costs were high.

This analysis noted the importance of maintaining habitat links to acceptable locations such as river and riparian vegetation and existence of other camps in close proximity in improving success of a dispersal action.

The current emphasis on dispersals has led to community expectations that dispersal is the only solution, despite evidence to the contrary. Short, medium and long-term strategies to assist people to live with flying-foxes and reduce potential future conflict should be the focus of management efforts.

The ABS recommends alternative management actions, including:

- Community engagement and education strategies particularly on disease risk and flying-fox ecology;
- Mitigation assistance for people impacted by flying-foxes;
- Creation of buffer zones between housing and flying-fox camps, and trials of different deterrent systems that help create buffers;
- Habitat creation in low conflict areas.

These are more fully detailed under ToR 3 above.

The ABS notes that education is key to successful management of flying-fox issues and conflict resolution. Education must be truly consultative, impacts of flying-foxes are real and concerns of residents must not be dismissed. The ABS recommends looking to techniques of interpretation and social psychology to improve community education, engagement, and conflict resolution.

The ABS notes that all management must be underpinned by good science and research, and recommends that there is government support for ecological and social science research into resolving conflict.

Recommendations

The ABS recommends that:

- Conflict resolution is focused on community education and engagement strategies, mitigation of impacts for community, and the creation, restoration and protection of flying-fox habitat;
- Funds are made available for research into new management options and deterrents;
- Dispersal (including substantial vegetation modification) is only considered as a very last resort;
- A set of uniform criteria is developed to govern decisions to disperse, as part of a nationally-coordinated and consistent flying-fox management strategy.

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Appendix 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, educators, students, wildlife carers and members of the general public.

About the Flying-Fox Expert Group (FFEG)

The FFEG is the primary source of reliable, accurate information on Australian flying-foxes. The FFEG 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/>

Appendix 2. Eucalypt and related food trees of flying-foxes including commercial timber

<u>Common name</u>	<u>Species name</u>
Sydney red gum	<i>Angophora costata</i>
Rough-barked apple	<i>Angophora floribunda</i>
Smooth barked apple	<i>Angophora leiocarpa</i>
Lemon-scented gum	<i>Corymbia citriodora</i>
	<i>Corymbia clavigera</i>
Yellow bloodwood	<i>Corymbia eximia</i>
Red flowering gum	<i>Corymbia ficifolia</i>
Red bloodwood	<i>Corymbia gummifera</i>
Large-leaved spotted gum	<i>Corymbia henryi</i>
Pink bloodwood	<i>Corymbia intermedia</i>
Spotted gum	<i>Corymbia maculata</i>
Ghost gum	<i>Corymbia papuana</i>
Long-fruited bloodwood	<i>Corymbia polycarpa</i>
Carbeen	<i>Corymbia tessellaris</i>
Cadaga	<i>Corymbia torrelliana</i>
Brown bloodwood	<i>Corymbia trachyphloia</i>
Northern spotted gum	<i>Corymbia variegata</i>
White mahogany	<i>Eucalyptus acmenoides</i>
White box	<i>Eucalyptus albens</i>
Cabbage gum	<i>Eucalyptus amplifolia</i>
New England Blackbutt	<i>Eucalyptus andrewsii</i>
Orange gum	<i>Eucalyptus bancrofti</i>
Southern blue gum	<i>Eucalyptus bicostata</i>
Blakely's red gum	<i>Eucalyptus blakelyi</i>
Bangalay	<i>Eucalyptus botryoides</i>
River red gum	<i>Eucalyptus camaldulensis</i>
New England blackbutt	<i>Eucalyptus campanulata</i>
Sugar gum	<i>Eucalyptus cladocalyx</i>
Gympie messmate	<i>Eucalyptus cloeziana</i>
Yate	<i>Eucalyptus cornuta</i>
Mountain blue gum	<i>Eucalyptus deanei</i>
Broad-leaved ironbark	<i>Eucalyptus fibrosa</i>
Flooded gum	<i>Eucalyptus grandis</i>
Pink bloodwood	<i>Eucalyptus intermedia</i>
Bushy yate	<i>Eucalyptus lehmannii</i>
Yellow gum	<i>Eucalyptus leucoxydon</i>
Grey gum	<i>Eucalyptus longirostrata</i>
Red stringybark	<i>Eucalyptus macrorhyncha</i>
Maiden's gum	<i>Eucalyptus maidenii</i>
Grey gum	<i>Eucalyptus major</i>
Silver-leaved ironbark	<i>Eucalyptus melanophloia</i>
Yellow box	<i>Eucalyptus melliodora</i>
Darwin woollybutt	<i>Eucalyptus miniata</i>
Grey box	<i>Eucalyptus moluccana</i>

Yellow stringybark	<i>Eucalyptus muelleriana</i>
Narrow-leaved black peppermint	<i>Eucalyptus nicholii</i>
Grey Ironbark	<i>Eucalyptus paniculata</i>
Parramatta red gum	<i>Eucalyptus parramattensis</i>
Blackbutt	<i>Eucalyptus pilularis</i>
Sydney peppermint	<i>Eucalyptus piperita</i>
Needlebark	<i>Eucalyptus planchoniana</i>
Small-fruited grey gum	<i>Eucalyptus propinqua</i>
Large-fruited grey gum	<i>Eucalyptus punctata</i>
Large-fruited blackbutt	<i>Eucalyptus pyrocarpa</i>
Narrow-leaved peppermint	<i>Eucalyptus radiata</i>
Red mahogany	<i>Eucalyptus resinifera</i>
Swamp messmate	<i>Eucalyptus robusta</i>
Steel box	<i>Eucalyptus rummeryi</i>
Sydney blue gum	<i>Eucalyptus saligna</i>
Narrow-leaved red gum	<i>Eucalyptus seeana</i>
Grey ironbark	<i>Eucalyptus siderophloia</i>
Mugga ironbark	<i>Eucalyptus sideroxylon</i>
Eucalypt	<i>Eucalyptus</i> spp.
Forest red gum	<i>Eucalyptus tereticornis</i>
Darwin stringybark	<i>Eucalyptus tetradonta</i>
Red ironbark	<i>Eucalyptus tricarpa</i>
Manna gum	<i>Eucalyptus viminalis</i>

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ABS at the parliamentary inquiry into flying-fox management

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On the 24th November 2016, members of the ABS assembled at Parliament House in Canberra for a roundtable discussion on the issue of management of flying-foxes in and around urban areas of eastern Australia. The discussion was attended by seven Members of Parliament who sit on the Standing Committee on the Environment and Energy, as well as representatives from the Department of the Environment and Energy, and Threatened Species Commissioner Gregory Andrews. I represented the ABS in my role as Secretary, and other invitees included Peggy Eby, David Westcott, Jess Bracks and Phil Shaw as experts in their own right as well as members of the ABS Flying-fox Expert Group (FFEG).

There had been a call for submissions to the inquiry only two weeks before, with interested

parties being given a week to address the Terms of Reference which related to listing (and delisting) processes under the EPBC Act, regulatory frameworks, and the relative effectiveness of different approaches used to address issues that arise from the establishment of flying-fox camps around urban areas. In total, 63 individuals or organisations choose to make submissions, including impacted residents, flying-fox advocates, councils from all along the eastern seaboard, and groups such as the Royal Zoological Society of NSW, the WWF, and the ABS (see p. 7).

The discussion was also attended by delegates from Eurobodalla Shire Council, who recounted the experiences of the Bateman's Bay community during a recent large influx of Grey-headed Flying-foxes into the Watergardens camp in response to prolific flowering of the nearby spotted gums. These events had led to then Minister for the Environment, Greg Hunt, granting a national interest exemption from the EPBC Act to the council, allowing them disperse the flying-foxes. This decision triggered controversy and was viewed by some to be unfair preferential treatment in a swing seat, particularly given that Member for Hunter Joel Fitzgibbon had called for an inquiry into flying-fox management in March.



L-R: Pia Lentini, Jess Bracks, Peggy Eby, Dave Westcott and Phil Shaw in Canberra to contribute their knowledge to a parliamentary inquiry into flying-fox management (next page).
Photos thanks to Pia Lentini.

The discussions covered questions commonly raised around the behaviour, ecology, and management flying-foxes. The Committee queried why it was that Australian flying-fox camps appeared to be becoming increasingly established in urban areas, and it was acknowledged that while some drivers of the patterns had been proposed, evidence was not yet conclusive. Peggy Eby spoke of the ongoing destruction of overwinter foraging habitat of the Grey-headed Flying-fox, which leads to critical food shortages, and is likely to worsen with recent changes to legislation surrounding vegetation clearing in New South Wales. David Westcott answered questions about the uncertainty in counts at camps which are coordinated through the National Flying-fox Monitoring Program, and noted the difficulties deriving these estimates given the highly mobile and gregarious nature of the species'. He also pointed out the dangers of comparing back to counts conducted under previous programs due to the differences in the areas covered by the different programs.

Jess Bracks and I addressed the issue of camp management, and particularly dispersal successes and failures. Jess and Phil were able to give a personal account of their work as

consultants who are commonly asked to implement these actions but rarely recommend them because they are so frequently ineffective, stressful for both the people involved and the bats, and because the outcomes are so often unpredictable and contentious. In both the discussion and the submissions, many noted the currently fragmentary approach to flying-fox management, whereby poorly resourced councils are delegated responsibility of managing camps, some of which contain species nationally recognised as threatened. This is with little coordination, limited opportunities to learn from past interventions and no formal means of keeping record of who has done what. The ABS continues to advocate for a nationally coordinated and systematic approach to flying-fox management to ensure resources are spent wisely and to avoid a process whereby the outcome for the species is "death-by-a-thousand-cuts".

Members of the ABS are currently involved in large research projects that we hope will in the coming years address some of the uncertainties highlighted in the discussions. It is expected that the Committee will hand down its findings in early 2017.



– Research Reports –

How hot does it get in a harp trap bag?

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Introduction

Bat research often requires the live capture of free-living animals, and harp traps allow for overnight captures without the presence of the researcher (Tidemann and Woodside 1978). Traps may be cleared during the night allowing immediate processing and release of captured individuals. However, traps may be checked after sunrise by which time the animals can be exposed to increasing temperatures. The neutral temperature ranges of small mammals are called their thermoneutral zones, outside of which metabolic heat production [active thermal regulation] is required to maintain a constant elevated body temperature, have upper limits from about 32 to 43 °C for bats (Riek and Geiser 2013). Exposure to temperatures above the neutral range can force body temperatures to lethal levels if mechanisms like panting are unable to disperse excess body heat and death may occur many hours after a small mammal has experienced a short-term elevated body temperature (Wright 1976) resulting in post-release mortality. The diversity of responses to elevated temperatures across mammalian species show little relationship with body size or habitat (Erskine and Hutchison 1982; Riek and Geiser 2013). This means that the response to heat stress by individual species are difficult to predict, so caution must be practiced when trapping small mammals.

Animal welfare concerns have led to guidelines for the use of traps to be developed by various jurisdictions (e.g. National Health and Medical Research Council 2013). Without access to field

trial data on conditions within traps such guidelines are only able to make generalised recommendations, such as avoiding weather extremes, providing shade, checking traps early (e.g. within 3 hours of sunrise). Gradually published information is accumulating for pitfall, funnel and metal box traps (e.g. Hobbs and James 1999; Thompson and Thompson 2009; Ellis 2015) to help researchers design ethical trapping programs when applying for research permits. However, this information is needed for all trapping methods. In this study I explore temperature ranges within the capture bags of harp traps with different types of artificial shading when exposed to morning sun.

Materials and Methods

The study was conducted in Warrumbungle National Park, New South Wales, Australia (31.304171 °S, 149.015881 °E) during the austral spring and summer of 2014/15. The study area consisted of a 100-m wide cleared valley floor running north-south, vegetated with low grass and forbs, and with remnant woodland with denser understory vegetation on the slopes to the east and west. Three trap bases (without the frame of lines to prevent any captures occurring) were aligned north-south and a Stevenson screen was installed at the study site to record the ambient temperature throughout the trial. Shading materials consisted of green 90% shade cloth (Coolaroo™, Gale Pacific Limited, Braeside, Victoria, Australia) or laminated aluminium reflective insulation foil sarking with an nominal heat reflectance of 97% (Silverwrap™, Ametalin, Regency Park, South Australia, Australia) which were hung on the eastern side of one trap each, while a third trap remained exposed (Fig. 1).

Thermochrons were placed to approximate the location of trapped bats between the plastic lining and the cloth shell of the trap bags on the eastern side of each trap, and on the western side (back) of the unshaded trap (Fig. 2), with temperatures recorded every thirty minutes across the 26th Sept to the 1st Oct 2014 inclusive.



Figure 1. View from the eastern side of the three trap bag assemblies with, from left to right, shade cloth, sarking and no shading.



Figure 2. The view in mid-morning from the western side showing the silhouette of a temperature sensor placed between the internal plastic lining and the cloth outer shell of the trap bag.

Results

Sunrise was just before 06:00 so the period under consideration was from 06:00 to 09:00 to approximate a wide range of potential trap clearing times. Ambient temperature at 06:00 ranged from 5.6 to 12.4 °C, while at 09:00 it ranged from 14.4 to 22.6 °C. The ambient temperature was subtracted from each concurrent treatment temperature to reveal the pattern of increase within the bags. The morning temperature increase varied widely between days and between treatments (Fig. 3). On average the sarking provided slight protection from heating

compared to the unshaded trap bag (Tables 1 and 2), while the shade cloth resulted in higher temperatures in the trap bag than for the exposed bag or the sarking shaded bag as the morning progressed. The western side (back) of the unshaded trap bag warmed slowly initially but an hour and a half after sunrise its temperature rapidly rose above ambient and the other treatments. The back of the exposed bag reached the highest 09:00 temperature of 49.5 °C (having passed 34 °C at 08:00) when the ambient was 22.9 °C and the exposed bag's sunward side was 35.8 °C.

Table 1. Mean differences between the temperature (°C) within trap bags with different exposure to morning sun and ambient across the three hours after sunrise.

Time	Exposed	Sarking	Shade	Back
06:00	-1.2	-0.8	-0.8	-1.2
06:30	-0.3	-0.2	0.2	-0.5
07:00	4.5	3.1	4.7	2.2
07:30	5.7	4.3	6.8	10.1
08:00	5.9	4.4	10.2	14.3
08:30	6.0	4.7	10.5	16.7
09:00	8.5	8.0	12.3	20.6

Table 2. Maximum differences between the temperature (°C) within trap bags with different exposure to morning sun and ambient across the three hours after sunrise.

Time	Exposed	Sarking	Shade	Back
06:00	3.6	3.6	3.4	3.3
06:30	5.3	5.0	5.0	5.0
07:00	6.1	5.0	8.4	4.5
07:30	8.6	7.7	10.4	17.1
08:00	8.6	7.3	23.7	21.3
08:30	8.9	8.1	22.8	23.8
09:00	13.2	13.9	20.3	26.9

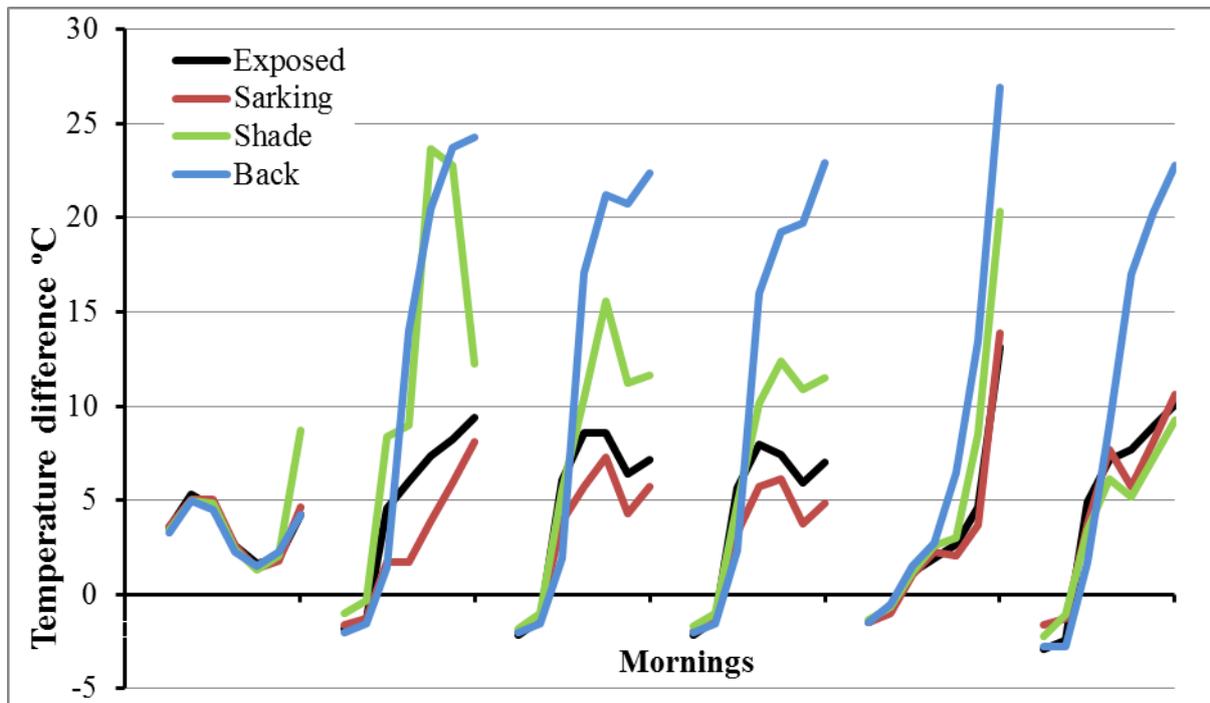


Figure 3. Temperature differences between the temperature (°C) within trap bags with different exposure to morning sun and the ambient temperature across the first three hours after sunrise for six consecutive mornings.

Relative humidity showed the reverse trend. Overnight the relative humidity in the trap bags approached or reached 100% but as temperatures began to rise within the trap bags after sunrise the relative humidity dropped much faster than ambient values did. By 09:00 it could be 40% lower than ambient in the hottest trap bag situation.

Discussion

Continuous shading by vegetation or topography from sunrise until trap clearing is the ideal to aim for but it is unlikely to occur naturally in open habitats such as woodlands (Ellis 2015). Consequently, careful placement of traps and/or the use of artificial shading needs to be considered when trapping nocturnal species in such habitats (Hobbs and James 1999; Thompson and Thompson 2009; Petit and Waudby 2012) if traps cannot be cleared by dawn. Fortunately the capture bag of a harp trap is large relative to the size of the animals it contains so that they have some scope to use behavioural mechanisms to avoid uncomfortably hot sections of the bag.

In the worst-case scenario of no natural shade as tested here, sun exposure made harp trap bags heat more rapidly than the atmosphere after sunrise, but different artificial shading systems influenced the rate (Fig. 3, Tables 1 and 2). Dark shade cloth with no air space between the top of the shade cloth and the trap bag acted as a solar heat sink and made the trap bag hotter than for unshaded traps. This effect has been demonstrated for metal box traps as well (Ellis 2015), but when there was an air space between the metal box traps and the cloth it kept the traps cooler than unshaded traps. Thompson and Thompson (2009) found that even when there is space for air movement, temperatures in funnel and pitfall traps under shade cloth were elevated when there was no breeze compared to during windy periods. Similarly, the amount of heat reflection and absorption by different coloured shade cloths can influence the temperature within enclosed shade houses (Pérez *et al.* 2006). Consequently, using a pale or infrared reflective shade cloth placed so that allows air movement between it and a harp trap's bag is recommended even when using the material to occlude flyways rather than as a shading structure.

Reflective sarking did generally reduce the temperature in the trap bag, but only marginally. Once again, additional air space between a metal box trap and the sarking improved the

performance over the situation with no air gap (Ellis 2015) so an extra improvement may be possible if the sarking is not in close contact with the cloth bag. However, given that this was for the worst possible orientation (orthogonal to the rising sun) in the open, the gains would not warrant its use in normal field placement of harp traps.

The pattern of heating of the back of the trap bag is the most concerning. Once the sun has risen enough to shine directly into the bag (about 1.5 hours after sunrise) the plastic lining creates a small hot house environment, but the increased temperature produced a marked drop in the relative humidity in the bag which would mean that evaporative cooling could be more effective. Clearly the erection of shading high enough to protect the back of a north-south orientated trap bag from morning sun would compromise the operation of the trap during the night. The alternative is careful trap orientation with respect to the rising sun. Aligning the long axis of the trap bag towards the rising sun minimises the impact of direct radiation onto the plastic lining. Even aligning the long axis $\pm 15^\circ$ of the rising sun would reduce the radiation load to one quarter of the rate per square metre of that occurring when the bag is orthogonal to the rising sun. Additionally, this orientation would allow for additional shading to be erected while not obstructing the flight path to the trap. It has been demonstrated for metal box traps in plastic bags as rain protection that their temperature rapidly rises above ambient after sunrise when fully exposed to the sun, but was within 4 °C of ambient at 09:30 when completely shaded by vegetation (Ellis 2015). There is no reason to believe that this shading effect would not apply to conditions under the plastic lining of a bat trap bag.

While the worst-case scenario trialled here indicates that unacceptably high temperatures can be reached in a bat trap bag within two hours of sunrise, it takes a concerted effort to achieve that result. Until more detailed studies are undertaken, these data mean that it can be argued that the common practice of careful placement of traps in relation to shading, thus allowing at least some of each side of the trap bag to be protected from direct sun as a refuge for trapped animals, and the checking of traps early in the morning before ambient temperatures approach critical levels will provide the necessary safeguards to protect bats from thermal stress while trapped.

Acknowledgements

This work was carried out with the consent and assistance of Mark Fosdyck and the cooperation of the staff of Warrumbungle National Park, and with the encouragement of the Office of Environment Animal Ethics Committee. Christopher Turbill provided useful comments on an early draft of this paper.

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Male Black and Little Red Flying-foxes – rehabilitated and now flying free. Photo thanks to Toni Mitchell.



Left: University of Queensland PhD candidate and ABS Conservation Grant recipient Julie Broken-Brow with a Papuan Sheath-tailed Bat *Saccolaimus mixtus*. Photo taken by Judy Morrin.

Below: *Saccolaimus mixtus* radiotracked by Julie during her time on Cape York. Photo thanks to Julie Broken-Brow.

The search for *Saccolaimus* in Cape York...

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The last time I wrote an article for the ABS newsletter, I was a bright-eyed and bushy-tailed Honours student. I was in the final throes of a successful Honours thesis submission and my focus was on the horizon, looking for an exciting PhD project. Four years later, and I can honestly say that my eyes are less bright, and my tail is far less bushy! I like to think that PhD students are no smarter than the average person, they only have an unreasonable sense of persistence – this is certainly true in my case...

At the end of 2012 I began the hunt for sheath-tail bats *Saccolaimus* in Cape York. With a well-funded project, my supervisors and I had high hopes for a successful PhD examining the ecology of threatened *Saccolaimus* species in Cape York. Two days before my first independent field trip, the funding was cut completely. This was initially quite a blow, but it gave me the opportunity to explore the rest of Cape York. I managed to build strong relationships with land managers and traditional owners across northern Cape York. On my

second field trip to Iron Range National Park, I spent two weeks trying to canopy mist-net *Saccolaimus saccolaimus*, with no success. Until on the last day I noticed a dead bat at the base of a flag post next to my car. Unbelievably, it was a *Saccolaimus saccolaimus*! I could only assume a raptor had caught and then dropped it whilst perched. Queensland Museum was most pleased with the specimen, and I renewed my resolve to catch the cheeky critters.



Field trip after field trip, the “Sacc saccs” evaded my nets. After throwing a small tantrum at the distance I had to drive to my field sites (Brisbane to Cape York) and the frustrations of time-limited field trips, my partner and I moved to Iron Range, where we lived in our tent for a full year, certain that a concentrated wet-season trapping effort would yield Sacc saccs. The support of an ABS conservation grant for a tracking project meant that during March this year, after mist netting almost every night, all night, for eight weeks, we finally trapped the first foraging *Saccolaimus saccolaimus* in Australia! I promptly took my measurements and attached a radio transmitter, certain I would find the Holy Grail roost of *Saccolaimus* in Cape York. We listened to the ever quieting beep of this female Sacc sacc when we released her. Dawn the next day had me out in the tray of the ute, yagi in hand, listening eagerly for a beep. My happiness at finally catching one soon turned to dismay, I spent the next two weeks radiotracking every road, river and hilltop within a 100 km radius of Iron Range – to no avail.

a unique reference call data set for *Saccolaimus saccolaimus*. In April this year, my PhD project changed direction and I am now examining the effects of fire regimes on all microbats in northern Cape York, and am on track to complete my thesis. For those students out there struggling in the field to collect a decent data set, whilst you may not find the Holy Grail you want, the journey will be something that you’ll never forget. I know that I wouldn’t change a thing!



Above: Deceased Bare-rumped Sheath-tailed Bat *Saccolaimus saccolaimus*. Photo: Julie Broken-Brow.



Top right: The *Saccolaimus saccolaimus* caught by Julie and fitted with a radio transmitter. Photo: Andrew Dawson.

Bottom right: First roost tree for *Saccolaimus mixtus* located by Julie on Cape York. Photo: Judy Morrin



Despite being unable to track *Saccolaimus saccolaimus*, the project has not been for nothing. All of these years working in Cape York have produced some fantastic results. I have radiotracked *Saccolaimus mixtus* to the first roosts recorded for the species, collected thermal footage and wing morphology measurements for many high-flying species, and managed to record



Acquittal of grant with grateful thanks to the Australasian Bat Society

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Introduction

With the wonderful support via an ABS grant I was able to replace my old bat cameras with a wireless night vision 4 channel camera system to allow us to monitor and record the activities of our in-care rehab flying-foxes and free-flying visitors. Thank you ABS!

It was a quite a challenge to find the system we wanted as there are many different types, some battery operated (which are expensive as the batteries have to be continually replaced), some mains powered, some wired and some wireless. We also had to negate the “Faraday Cage Effect” (stopping or degrading the signal from the cameras back to the Visual Display Unit) and find a way to bat and weather proof the separate components. I let Scott (techno savvy husband) decide what was most suitable and would meet our needs – he eventually settled on a TECHview, 2.4 GHZ Wireless Surveillance System. This system has:

1. High Definition Camera;
2. Quad Screen Display;
3. Waterproof Camera;
4. InfraRed Night Vision;
5. SD Card Recording;
6. Remote Viewing; and
7. 100 metres Wireless Range.

This system also allows for simultaneous viewing and recording with the added advantage of supporting up to four cameras. The main components being the display screen and a single camera, with the three extra cameras purchased separately.

We had to ensure that the mains power was waterproofed against our tropical wet season so Scott bought this waterproof box which he adapted for the power box. The “ToolPRO” waterproof box (image below) fitted with a back board, added power board, drilled holes and liberally sealed all wires into and out of the box with silicon sealer.



The finished product (above) waterproofed and set up with the power adapters that the cameras are powered by. Note that the hinges are at the top when it is in place on the outside of the Rehab Flappery.

We also had to bat proof the two inside and two outside cameras as previous experience has taught us that flying-foxes love to swing off, lick and bite the lenses, pull off the aerials and generally play with cameras and anything that is not protected from prying fingers, toes and mouths.

We tried enclosing the cameras in Systema Cracker Containers with removable lids held in place with cable ties around the latches of the lids to make sure flying-fox curiosity was overcome by human ingenuity. Unfortunately, whilst the lids/covers worked during the daylight with only a very slight haze to the picture, at night the covers reflected the infrared so much that all you got on the display screen was circle of little lights showing on each camera reflected off the cover and you couldn't see anything else.

We removed the covers and just have to regularly wipe the lenses to remove excess saliva! Yup the flying-foxes love those little circles of red lights and regularly lick, preen and show off in front of them.



We ended up with two separate methods, the first being mounted on a back board with the aerials and power wiring coming through the back board so that when mounted inside the flappery the aerials and wires are able to be outside the wire of the cage to overcome the effect that the wire cages cause to a wireless signal. The finished product ready for mounting is shown in image below.



Two of the cameras were set up this way, one for the middle of the flappery and one for an end corner to get maximum coverage of flying-fox activity.

The second method was to do the same with the two outside cameras but using the mounts that came with cameras and a brick but still with the Systema Cracker containers as the main method to cope with flying-fox curiosity.



Above image shows the outside mounted camera again still inside a Systema Cracker Container but using the brick as added protection. Note that in both pictures including the one above, the containers had the covers on them.

Below, inside mounted cameras. The positioning of the cameras also had to be done within the reach of the power cables from the power box.



Cameras are working very well, with the visual display unit set up on my bedside table. The system allows for you to split the vision between all four cameras at once and record all at once or select a single camera and just record that, all done on a handy little remote.



The visual display unit also takes a SD card, so you record to and then view it on a larger computer screen. I now have a number of hours of viewing and will pester Scott to edit what bits I want to keep.

Obviously the important part is why go to all this trouble, the aim of having the cameras is to record the behaviour of in-care flying-foxes and to show fellow and prospective carers the practices that have worked for me in Darwin to successfully rehabilitate and release flying-foxes.

Once I've got the recording and editing sorted out, a video will be made available on the ArkAid (and ABS if wanted) website and can be used freely to support flying-fox introduction and caring training/workshops that ArkAid provide to the public and carers.

We also want to provide a resource through video links showing examples of flappery and smaller cage set up and use, for callers/rescuers in remote areas who rescue sick or injured flying foxes but can't get the individuals to Darwin expediently and will therefore need to provide appropriate housing and care in the interim (or long term).

Some particularly important behaviours I would like to capture are:

1. the importance and safe use of toys;
2. use of bush tucker, bark and leaf eating;
3. use of space;
4. colony interaction;
5. record who is visiting over time, i.e., at different times of the year Little Red Flying-foxes will drop in, Black Flying-foxes are year rounders.



Rope for climbing, flapping and movement through the enclosure with a landing pad at the long end. Photo thanks to Toni Mitchell.



Pilbara Leaf-nosed Bat record from Karlamilyi National Park in the Little Sandy Desert

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The Pilbara form of the Orange Leaf-nosed Bat (*Rhynonictoris aurantia*) (PLNb) is widely accepted to be extant across the Pilbara and the northern Gascoyne (Ashburton sub-region)

bioregions. In October 2016, one of Western Australia's biologists, Greg Harewood, visited the Karlamilyi National Park (formerly known as Rudall River National Park) during a trip and put full spectrum SM2 detectors (Wildlife Acoustics, USA) out at likely bat habitats along the way and sent the recordings to me for identification.

One of the recordings picked up a series of PLNb calls from one or more bats at Desert Queens Baths, a well-known permanent water hole in the hills just off Rooney Creek within the park. The hilly area separates the true Little Sandy Desert to the south from the Great Sandy Desert to the

north. This represents a range extension of about 100 km east of the current accepted range for the species and is the first “live” record from the Little Sandy Desert to my knowledge. It is an important record as the Pilbara form of the species is listed as Vulnerable under the EPBC Act, a listing based on the limited number of roosts that exist, their very specific characteristics and their vulnerability.

The eastern boundary of the known range of this species lies approximately along the Oakover River southeast from BHP’s Yarrie mining complex past the Rippon Hills and the Gregory Range and then south west to Newman.

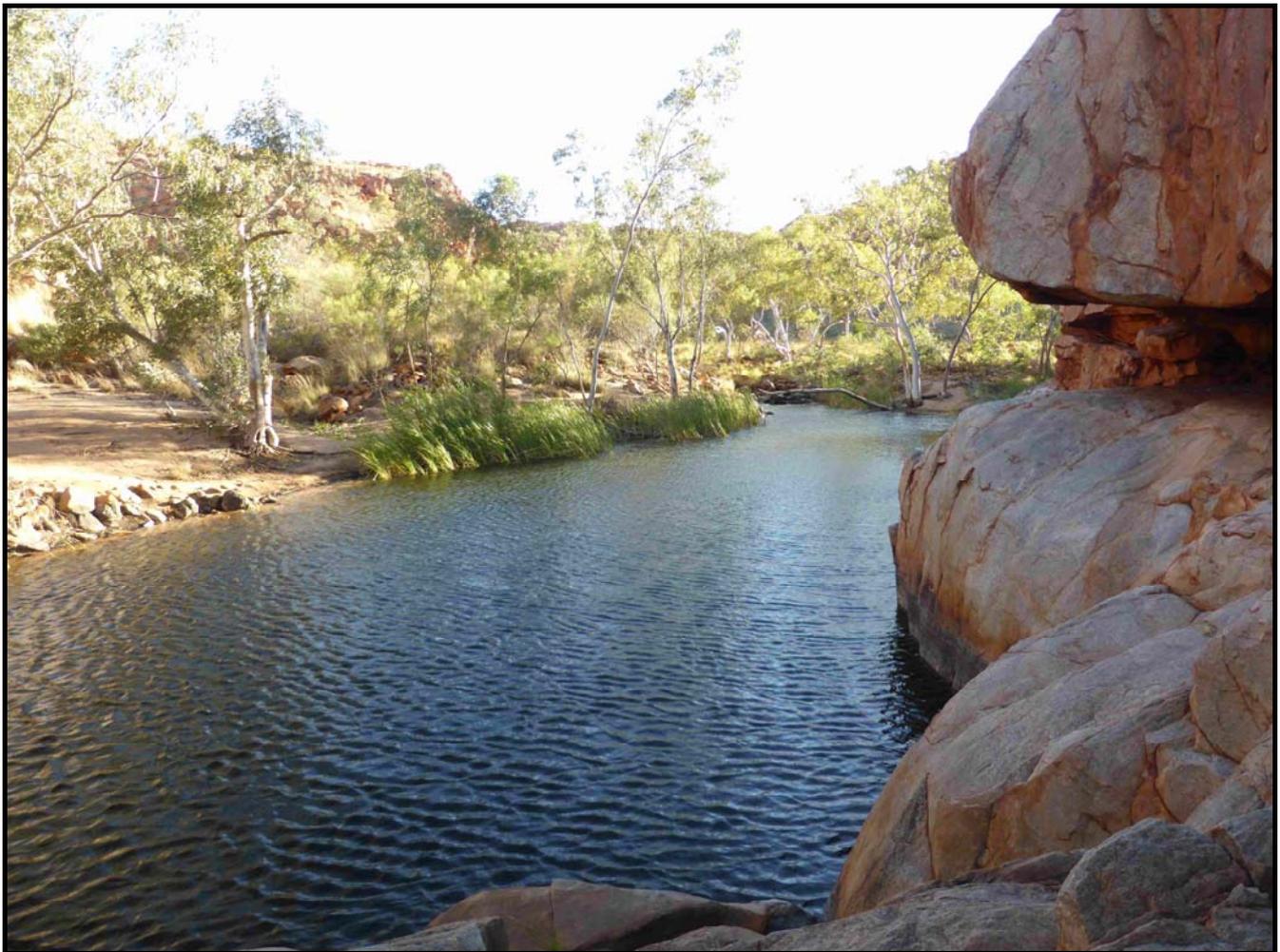
The only previously published record of this species well east of the Oakover is from a survey completed by R.P. Hart of Hart, Simpson and Associates in the Coolbro Hills north of the National Park in 1988. “Old” bones were collected from a cave approximately 30 km north

west of Desert Queens Baths and were identified as PLNb at the WA Museum. These subfossil bones were thought by that author to be pre-European settlement remains from Barn Owl (or possibly Ghost Bat, my interpretation) prey remains.

The earliest timing of the recent detections was over two hours after sunset so the bat(s) had ample time to fly a considerable distance after leaving their roost. They are known to forage out between 20 and 30 km, and occasionally further, from their roost in an evening and return before dawn. At their known foraging flight speed of 20 km per hour (see Bullen *et al.* 2016) the roost could be anywhere within or adjacent to the National Park.

Reference

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Images (above, below and previous page) of Desert Queens Baths in Karlamilyi National Park in the Little Sandy Desert. Photos thanks to Greg Harewood.



Bat calls of the Solomon Islands: A reference call library and identification key to the bats of the Solomon Archipelago

Tyrone Lavery & Michael Pennay

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Introduction

Eighteen species of echolocating bat from five families are known to occur in Solomon Islands and four of these are endemic to the archipelago.

Capture rates of echolocating bats are typically very low in Melanesia's forest environments when using conventional trapping techniques (mist nets and harp traps). The majority of species records thus stem from surveys of cave roosts. This method of sampling is inadequate as there are

likely additional species that are not obligate cave roosters. For example, the endemic Solomons Flower-faced Bat (*Anthops ornatus*) has only been recorded six times since the late 1800s and has never been detected through searches of caves. There may also be additional non-cave roosting species that are yet to be added to the Solomon Islands fauna or are yet to be scientifically described.

The use of echolocation recording devices represents a method to greatly improve chiropteran surveys and inventories in the Solomon Islands. However, in order for this survey technique to be effective, a robust library of species reference calls is required.

Methods

The Solomon Islands archipelago (including Bougainville and Buka, which are politically part of PNG) comprises almost 1000 islands including a double chain of seven large islands (Fig. 1).

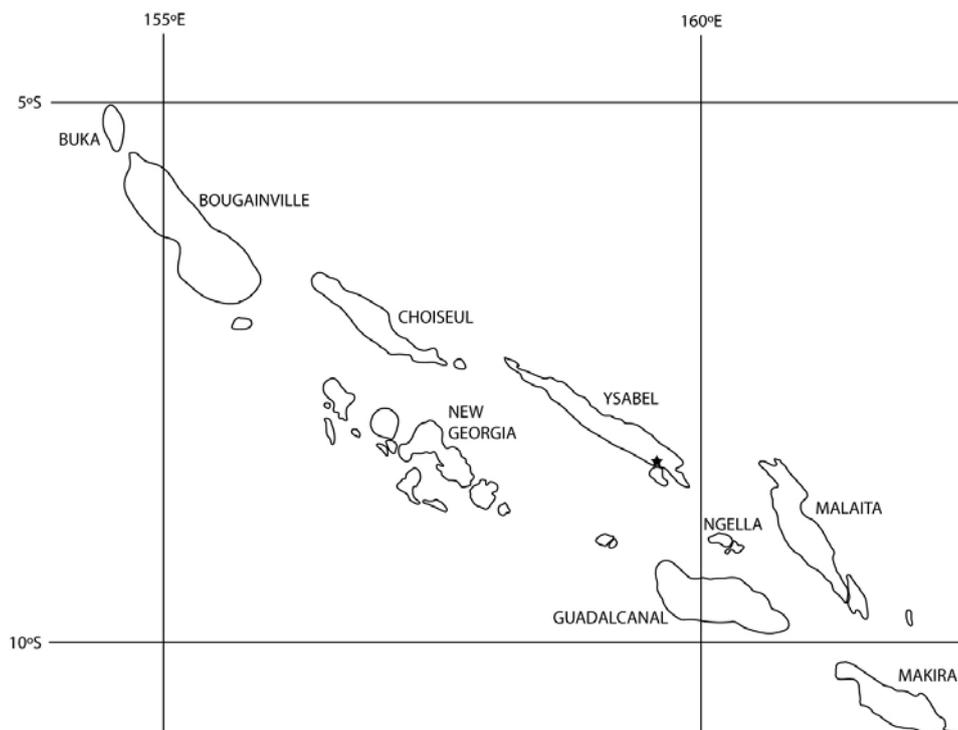


Fig. 1. Main Islands of the Solomon Islands archipelago referred to in this project.

We aimed to prepare an echolocation call library and identification key for bats of the Solomon Islands. Bats were captured from known cave roosts using hand nets, and mist nets and harp traps positioned at their entrances prior to dusk. We also captured bats by positioning harp traps in suitable locations within lowland forest. Echolocation calls were recorded using Anabat Walkabout recording devices (Titley Scientific, Brendale, QLD, Australia) (Fig. 2).

Calls of hipposiderid species were recorded by holding stationary bats approximately 30 cm from the microphone. Stationary bats are frequently used to record calls of hipposiderid species, as this minimises the impact of Doppler compensation of the constant frequency component of the calls. All species were also recorded in free flight by releasing captured bats at dusk and tracking them with recording devices.

Results

Funding provided by the Australasian Bat Society (through the Conservation Grants) allowed us to successfully record reference and free-flight calls for 14 of the 18 known echolocating bats from the Solomon Islands archipelago (Table 1). This included the recording of calls from Bougainville, Choiseul, Isabel, Kolombangara, Vangunu, New Georgia, Guadalcanal, Malaita and Makira. Examples of the calls recorded from various species and islands are included as Appendix A. We were unable to record four species of echolocating bat reported from the region. One of these is a *Miniopterus* species. The taxonomy of this genus is greatly confused and the species may or may not be present in the archipelago. The remaining three species are rarely encountered.



Figure 2. Recording bat echolocation calls with an Anabat Walkabout on Malaita Island, Solomon Islands

Table 1. Echolocation calls recorded as part of this project. ® Reference call recorded from captured individuals; ✓ echolocation call recorded from animals in free-flight and identified using reference calls. The four species shown with shading are those for which reference calls could not be obtained.

Species	Bougainville	Choiseul	Isabel	Western Province	Guadalcanal	Malaita	Makira
EMBALLONURIDAE							
<i>Emballonura diana</i>					®		
<i>Emballonura raffrayana</i>							
<i>Mosia nigriscens</i>	®				✓		
<i>Saccolaimus saccolaimus</i>	®				✓		
HIPPOSIDERIDAE							
<i>Anthops ornatus</i>							
<i>Aselliscus tricuspis</i>	✓	✓	✓	✓	®	✓	®
<i>Hipposideros calcaratus</i>					®		
<i>Hipposideros cervinus</i>	✓	✓	✓	✓	®	✓	®
<i>Hipposideros demissus</i>							®
<i>Hipposideros diadema</i>		✓		✓	®		
<i>Hipposideros dinops</i>				✓	®		
MINIOPTERIDAE							
<i>Miniopterus cf. australis</i>							®
<i>Miniopterus cf. macrocneme</i>							
<i>Miniopterus cf. schreibersii</i>							®
<i>Miniopterus cf. tristis</i>							®
MOLOSSIDAE							
<i>Chaerephon solomonis</i>							
VESPERTILIONIDAE							
<i>Myotis moluccarum</i>				®			®
<i>Pipistrellus angulatus</i>				®			

Conclusions

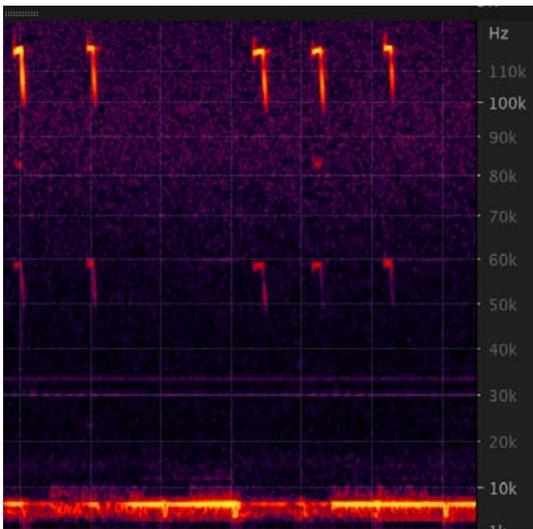
The large volumes of data we have collected are taking time to process, however we plan to complete our guide to the echolocation calls of the Solomon Islands in the coming months. The reference guide being compiled from these data will help researchers to detect cryptic, undescribed or previously undetected taxa. It will also allow for better understanding of the distribution and status of echolocating bats in the Solomon Islands. We anticipate that this resource will unlock a vast number of potential research projects that can be undertaken by Solomon Islands students on echolocating bats as only limited resources will necessary to undertake such studies. This project, enabled by

ABS, has provided a basis for more efficient, effective and achievable survey and research of Solomon Island bats using echolocation recording devices.

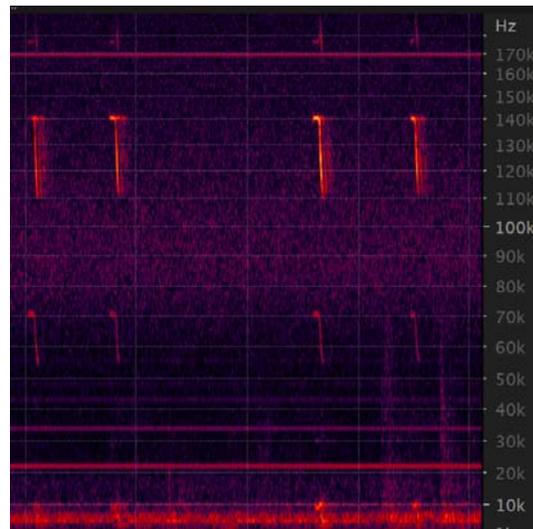
Acknowledgements

We must give special thanks to Titley Scientific for supplying two Anabat Walkabout recorders. Without these the project would not have been successful. We would also like to thank David Boseto, Tammy Davies, Tommy Esau, Benjamin Kaniotolu, Esau Kekeabata, Logino, Jeffrey Noro, Patrick Pikacha, Corzzierrah Posala, Veira Pulekera, Joseph Waihuru and the many communities that welcomed and helped us during this project.

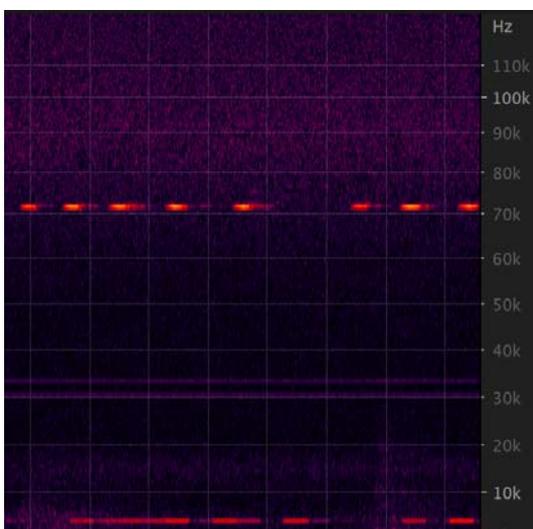
Appendix A – example reference calls



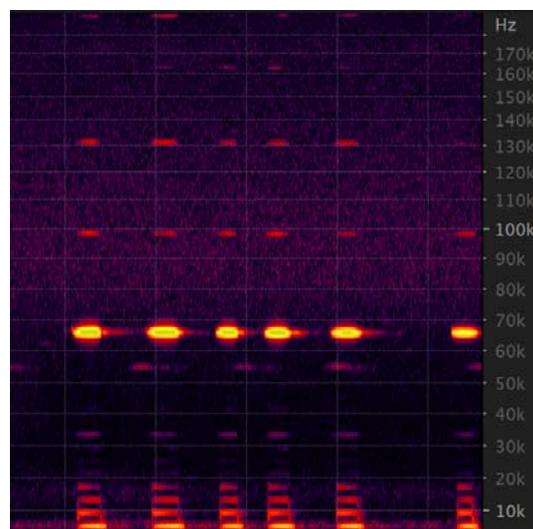
1. *Aselliscus tricuspidatus* (Makira)



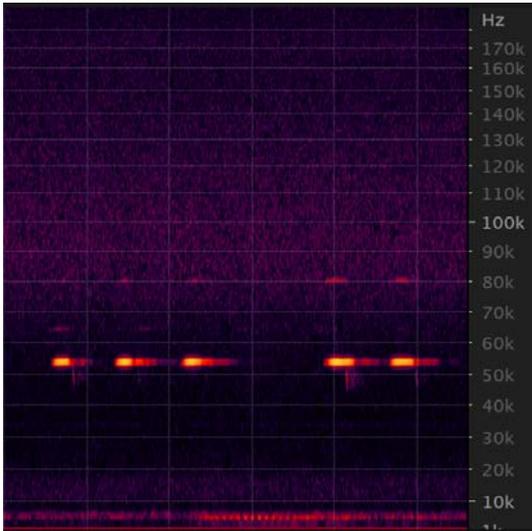
2. *Hipposideros cervinus* (Makira)



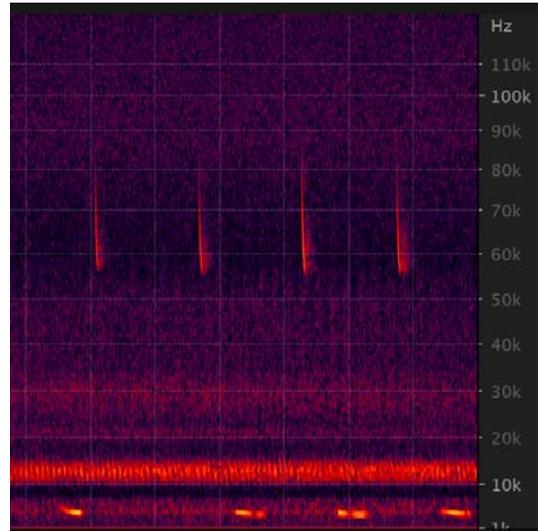
3. *Hipposideros demissus* (Makira)



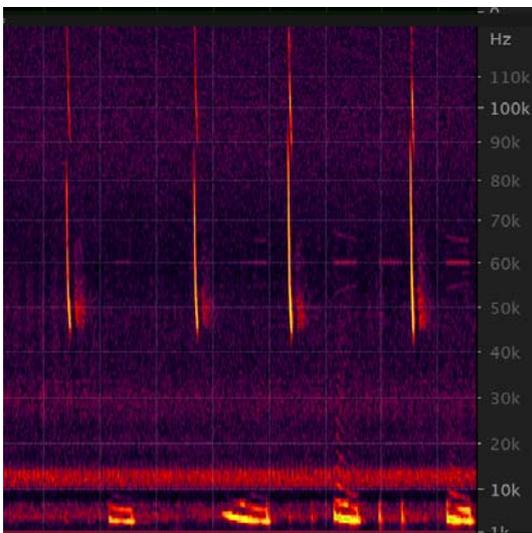
4. *Hipposideros diadema* (Guadalcanal)



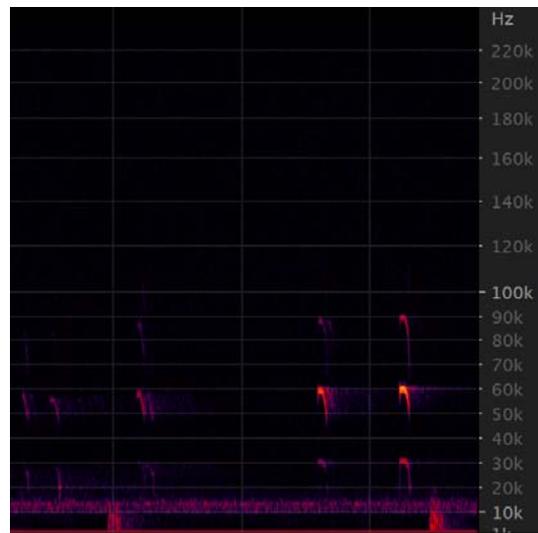
5. *Hipposideros dinops* (Guadalcanal)



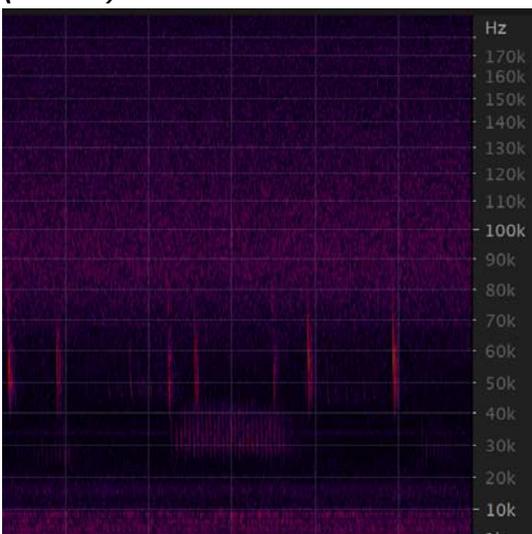
6. *Miniopterus cf. australis* (Makira)



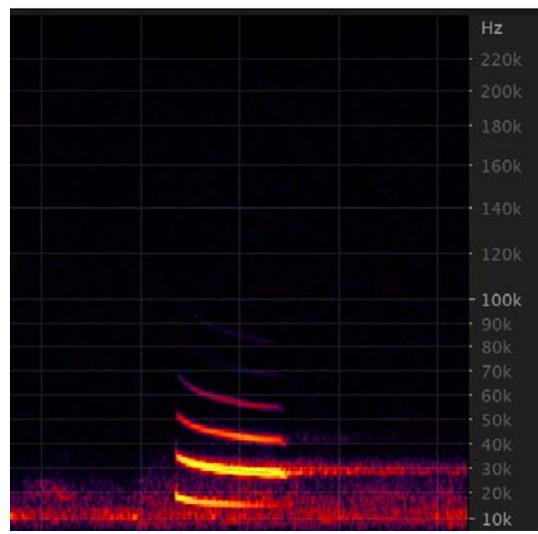
7. *Miniopterus cf. schreibersii*
(Makira)



8. *Mosia nigriscens* (Bougainville)



9. *Myotis moluccarum* (Makira)



10. *Saccolaimus saccolaimus*
(Bougainville)

– Reports, Viewpoints –

White-nose Syndrome Response Workshop

Keren Cox-Witton
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Wildlife Health Australia and Animal Health Australia ran a workshop in October 2016 to discuss response options for a possible incursion of the exotic disease white-nose syndrome into bats in Australia.

White-nose syndrome (WNS) is a recently recognised fungal disease of insectivorous bats that has caused massive mortalities – estimated at over 5.7 million animals – and collapse of numerous bat populations in North America.

Transmission of WNS is by direct contact between bats, but humans have been implicated in the spread of the disease by transferring fungal spores between caves on boots and equipment.

WNS has not been identified in Australia, but could be introduced into Australia by humans.

A workshop was held as part of a project coordinated by Wildlife Health Australia (WHA) and funded by the Department of Agriculture and Water Resources to better prepare Australia for an incursion of the exotic disease WNS. The first stage of the project was to conduct a disease risk assessment for WNS in bats in Australia, to identify possible avenues of introduction and likely consequences, and to identify potential Australian host species and geographic areas of risk. The risk assessment is now available on Wildlife Health Australia's website: <http://www.wildlifehealthaustralia.com.au/ProgramsProjects/BatHealthFocusGroup.aspx#WNS>.

The workshop brought together key stakeholders and response agencies, to:

- Consider the roles and responsibilities of government and non-government agencies in a response to WNS affecting bats in Australia;
- Document the options for responding to WNS in bats in Australia;
- Test the response options in a range of scenarios;

- Develop a list of preferred management options for inclusion in response guidelines.

Participants included representatives from:

- Commonwealth agriculture and environment agencies;
- State agriculture and environment agencies including WHA Coordinators, Environment contacts and biosecurity emergency management experts from South Australia, Victoria and NSW (the states identified as highest risk for WNS);
- Australasian Bat Society – bat ecology experts [*Justin Welbergen, Terry Reardon and Lindy Lumsden were there from the ABS*];
- Universities - wildlife disease experts and epidemiologists;
- Animal Health Australia;
- Wildlife Health Australia.

A range of response options were presented and discussed. The preferred options will depend on the situation, but may include a combination of:

- Activities to prevent further WNS transmission by humans and bats;
- Surveillance to detect the extent of the disease;
- Stakeholder identification and engagement to inform and facilitate response activities;
- Communication and education to assist with early detection and prevention of spread;
- Support for infected bats e.g. conservation activities and environmental modification.

WHA will use the outcomes of the workshop to prepare draft response guidelines for consideration by key stakeholders.

It was recognised at the workshop that further research is required, to provide additional information to assist with decision making.

The workshop was an excellent opportunity for a discussion across a range of roles, expertise and jurisdictions on the response to an exotic wildlife disease incursion, and was a good model for future preparedness activities for wildlife diseases in Australia.

For additional new information on WNS see the Department of Agriculture and Water Resources website:

White nose syndrome in cave-hibernating bats – advice for Australia
<http://agriculture.gov.au/pests-diseases-weeds/animal/white-nose-syndrome>

Protecting Australian bats from fatal fungus (article in *Biosecurity Matters*)
<http://www.agriculture.gov.au/biosecurity/australia/reports-pubs/biosecurity-matters/2016-06>



Photo: Terry Reardon, Southern Bent-wing Bat – the Australian bat considered most at risk from the introduction of white-nose syndrome



Bat talk to “eco-link” year 7 students from Bacchus Marsh 14 Oct 2016

Robert Bender

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Ecolinc was set up in Bacchus Marsh, 70 km NW of Melbourne, to offer “sustainable environment” science education to all school levels from prep to year 12, and offers professional development programs for teachers. On Friday 14 Oct., they organised a group of 25 year 7 students from Bacchus Marsh College, who were bused to

Organ Pipes NP on Melbourne’s western fringe, to hear a talk about bat research.

Tristan Factor, head ranger at OPNP, gave a brief introduction about the work of rangers and the mission of Parks Victoria, then I gave a Powerpoint presentation for an hour about the research work done on bats at Organ Pipes – introductory material about bats and their varieties, echolocation and the spectrum of kHz of the range of Australian bat species, growth of the bat population using boxes, breeding cycles, lifespan, what is measured, etc. Several of them asked intelligent questions, and all seemed alert and attentive. At the end I distributed a pile of the Bat Facts sheets via their teacher.

Afterwards, we all went for a walk down to look at the basalt columns, and for a further talk about their formation, why they are protected in a national park and the “hot spot” view of the line of volcanoes from southern Queensland to western Victoria. We finished up detouring to look at a couple of the bat boxes and why they have underside slits rather than circular holes on the side. Then they were all off to a workshop to assemble six boxes their teacher, Bob Hartmann, had prepared as precut packages for them, the boxes to go on trees around their school.



Bat night at Clarinda 6 July 2016

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Friends of the Grange Heathland Reserve in Clayton South, a south-eastern Melbourne suburb, held their AGM at the nearby Clarinda Library on 6 July. It was a small group of 12 dedicated conservation volunteers who look after a rare remnant block of heath vegetation, with a rich assortment of fauna, in the “sand belt” of Melbourne. I set out several books about bats, and a sample bat box, as well as a display of the ABS Bat Facts sheets. I had been invited by the Conservation Officer of Kingston Council, Matt Kovac (photo below), a crew leader for Parks in the city of Kingston.

Bats and Halloween

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Hallows' Eve seems to have originally been a pagan harvest festival, Christianised into a celebration of saints and the recently dead, whose souls needed praying for to ensure their arrival in heaven. Its shift to North America has involved turning it into a celebration of ghoulish themes associated with horror stories and death.

My local greengrocer has decided to have a bit of fun decorating his shop with Halloween symbols, including the Grim Reaper complete with scythe, a black cat and various skeletons, some of which are really bizarre and, of course, a bat, because they come out of hell and are associated with death and horror, aren't they? The ears look a bit mousey, like a cross between a bat and Mickey Mouse. It's a Vespertilionid.

One of the skeletons is of a spider – a bit of black humour, giving an invertebrate a bony skeleton. The eyes are light globes and can glow. And of course the irresistible invitation to try the pate (as in Monty Python's "Meaning of Life"), or perhaps a warning that the nicely-packed strawberries behind it have gone off, or the Black Death is about to return.



The group has been led for many years by its president, Thelma Spice, below.



Plus its Treasurer, Gloria Fleming (above). Following the AGM, I gave a Powerpoint presentation for over an hour, on bats and their lives, and on my bat box projects. There were quite a few questions from the audience, and it was all followed by a supper of tea/coffee and cakes. They are very keen to find out what bats occupy their bit of heathland. Surveys have been done, but not yet analysed. Their display on the Kingston website says there are two bat species, unnamed.





Batting in Scotland

Robert Bender

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During a 23-day holiday touring around Scotland, my wife and I visited Dunblane for two days, and stayed with Anne Youngman, of the Bat Conservation Trust (BCT) <http://www.bats.org.uk/>, hoping to learn about what volunteers and organisations do to study and protect bats there. The Trust is a charity and has 35 employees, Anne being the only one in Scotland. The Trust's work includes:

- Running a helpline (with help from volunteers);
- Monitoring bats (via the National Bat Monitoring program);
- Involvement in scientific research;
- Landscape protection for bats;
- Giving advice on buildings, planning and development (e.g. by publishing survey Guidelines) *though not on individual cases*;
- Lobbying;
- Working in partnership with others;
- Developing and delivering training to a range of audiences, from architects to pest controllers.

BCT produces a range of website and hard copy resources, e.g. booklets and leaflets about bats (rather like our Bat Facts Pack) give many talks to educate schools and community groups and recruit more volunteers to replace dropouts to keep the survey work going. It has a budget of around £1,000,000 p.a., obtained from several quango organisations: Scottish Natural Heritage <http://www.snh.gov.uk/>, (a statutory nature conservation organisation that advises government on policy issues), Environment Wales <http://www.environment-wales.org/> and Natural England. <https://www.gov.uk/government/organisations/natural-england>

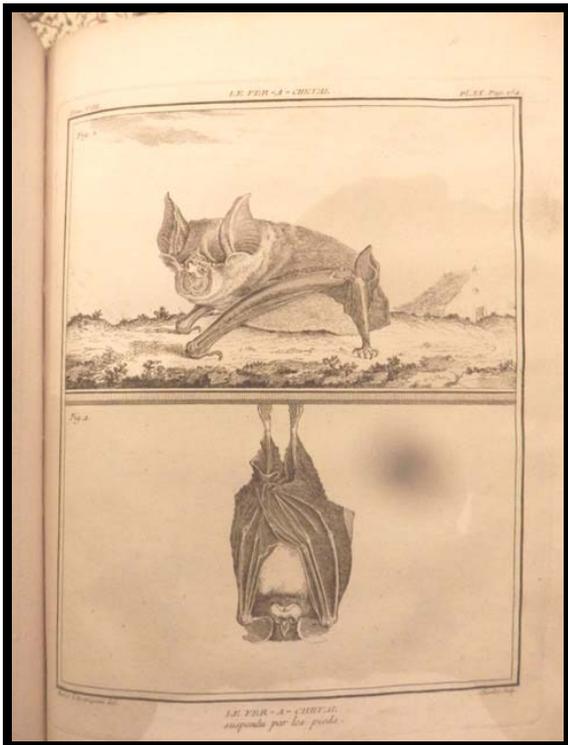
There is a wide range of programs and resources on the Trust website.

Anne had very generously planned a little itinerary, starting with a visit to the nearby magnificent Dunblane Cathedral, a mix of 11th and 15th century styles, with wonderfully various carvings on the choir seats, including a 15th century effort to depict a bat.



We then progressed to the local Leighton library, established by the local archbishop in the 1780s to hold his collection. It is full of leather-bound books over 200 years old. Among their collection is a full set of the 14-volume *Histoire Naturelle* of Comte de Buffon (1707 – 1788), one volume of which, published in 1760, has detailed descriptions, measurements and illustrations of a dozen bat species.

The librarian was most generous in keeping the library open past the usual closing time to accommodate us and tell us about the collection.



Anne had asked me to give a talk to a local bat group, with 30 people promising to attend, but that night the weather was cold, windy and wet, so only four turned up.



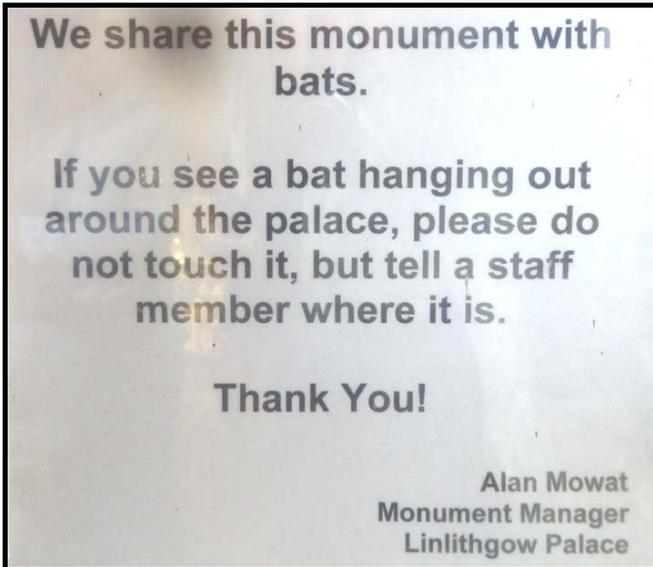
Lindy had given me two copies of the latest 3 ABS newsletters to distribute and I took a copy of Churchill's Australian Bats – everyone took something home to read about what we do here.



By the end of my presentation, the rain had eased to light drizzle, so four of us went for a walk down to the river, Allan Water, where an old stone bridge crosses it, with several bat detectors, which picked up Daubenton's, Common Pipistrelles and Soprano Pipistrelles.



What I learned from Anne seems to be that government commitment to conservation at many levels is taken far more seriously in Scotland than here – in training people wanting to work as environmental consultants, ensuring there is adequate data on distribution patterns of all their bat species, public education, regulation of building restoration work to protect bat roosts, involvement of volunteers in government-funded survey work and support for a large cohort of paid employees to manage the large workload. As one indicator, at Linlithgow palace, a very damaged 15th century building restored in parts, we saw this notice in the ticket office:



And as another, at Loch Leven, a small castle on an island in a small loch, another notice was displayed outside the ticket office, with a prominent photo of a Daubenton's bat foraging. There were encouraging signs all over the country of a far greater consciousness of the natural world and the need to look after it, than I find in Australia, where it seems to be an awareness by a small minority of people.

A visit to the Birnam museum to see a display about Beatrix Potter had a section on her wildlife

painting, including a couple of bats (image below). She explored becoming a serious scientist, writing a paper on fungi, which she was not allowed to present to the local scientific society as they didn't accept women, and refused her membership application.

The Bat Conservation Trust website has much fascinating information about their work and how they involve volunteers. They try hard to involve volunteers in an ongoing national survey, much as I found in Ireland a few years ago.

Ninety bat groups across the UK with around 10 active in Scotland, conduct surveys, monitor sets of boxes and undertake public education.

Volunteers not only do surveys but also assist with the Bat Helpline, supplementing paid staff on evenings and weekends May to September (summer).

Somewhat similar to our Bat Night, they participate in a Europe-wide weekend of activities: walks and talks among other things.



Counting bats in Commonwealth Park

Susan.lamb@epa.nsw.gov.au

(script from hand written letter on right, by Audrey Hickman, age 9):

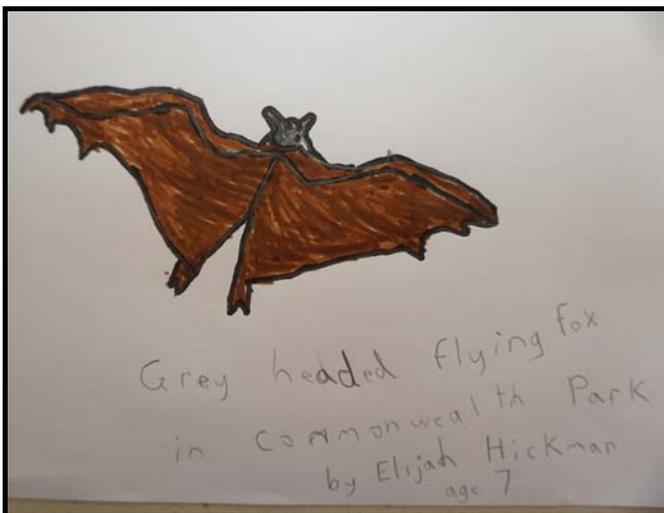
"Commonwealth Park in Canberra has a small area where flying-foxes roost. We were lucky enough to be invited by Suzie and Belinda to go and count them. Suzie told us that Australia has three different types of flying-fox. She told us that these were Grey Headed Flying Foxes. When we arrived we could see there was a lot of bats in the trees.

So how did we count them? Well we counted them by each choosing a tree and counting how many were in each tree. A few of them had none but most of them had around 20. When we had counted each tree Belinda added them together. In total there were 269.

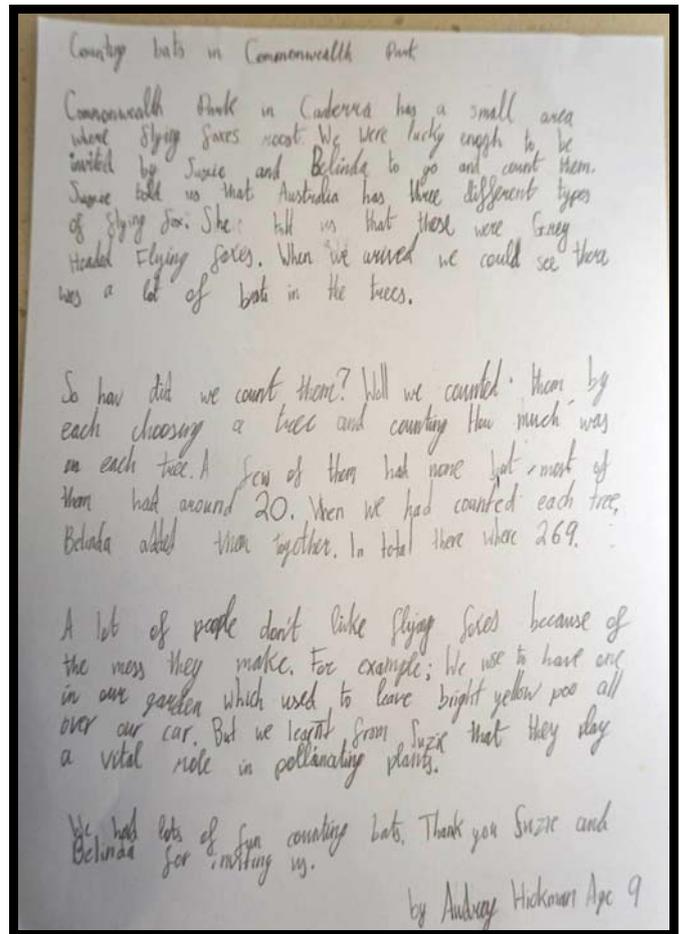
A lot of people don't like flying foxes because of the mess they make. For example; we used to have one in our garden which used to leave bright yellow poo all over our car. But we learnt from Suzie that they play a vital role in pollinating plants.

We had a lot of fun counting bats. Thank you Suzie and Belinda for inviting us.

by Audrey Hickman, Age 9"



Grey-headed Flying-fox in Commonwealth Park illustration by Elijah Hickman, age 7.



Hand-written letter by Audrey Hickman, age 9



Two budget bat detectors

Peter Shute

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I recently became interested in bats, specifically microbats, and therefore needed to obtain a detector, but wanted to spend as little as possible initially in case my interest waned. Below is a description of a couple of cheap detectors I tried. They may be of interest to others like myself, or those needing low cost devices for educational purposes. Please note that these are the only detectors I've used, so I've no idea how they compare to the more commonly used brands.

I came across a posting in the bats forum on birdforum.net about a toy heterodyne detector, and hunted one down on eBay. The Discovery Kids Ultrasonic Detector was about \$30 including delivery.

It's very basic, but seems to do the job well. It's bulkier than it needs to be, having been given a curved shape supposedly attractive to young children. There's just an on/off/volume dial and a frequency dial, the latter being calibrated in 20 kHz intervals from 20 to 100 kHz. The built in speaker can be turned up very loud.

The detector has no headphone jack for recording. I opened it up and soldered one in across the speaker terminals, and that worked fine with my Sony M10 recorder.

I suspect I'm as interested in bat detectors as I am in bats, because I also came across a low cost frequency division detector on eBay, and bought that. The Batseeker 3 appears to be of Canadian origin, and homemade.

Used in conjunction with my heterodyne detector, it seems to pick up whatever the heterodyne detector does, possibly from a greater distance. I find the sound of it unpleasant compared to the heterodyne, but I suspect that's probably normal for frequency division. It sounds similar to samples I've heard from a Batbox Baton. My

intention is to use it to detect bats out of the range of the current setting on the heterodyne, to help me tune it in.

I particularly don't like the seemingly random noises it makes in the wind. Wind on the heterodyne detector at least sounds a bit like wind. This could also be a typical frequency division problem. It has no volume control, just an on/off switch.

The case is all black, and appears to be 3D printed, which gives it a non-reflective texture and makes it hard to find the switch in the dark. The latest model is now black and orange, making the switch easy to see.

The microphone is on one side up the end and the speaker is on the other side, up the other end. This means it works best held up in front of you towards the bat, which can be awkward. The volume isn't that loud, so I prefer to have the speaker facing me.

It cost me about \$75 at the time (early 2016), but I see they're now down to \$55.

Hopefully these beginner's notes will be of use to someone looking to buy a detector.



Above images provided by Kim Van Dyk showing Buchan kindergarten children learning about bat box preparation and installation at their kindy by Neil the carpenter.

– News and Announcements –

Nature Conservation Award recipient – Terry Reardon

Thank you to Topa Petit for sharing the fantastic news that ‘our supreme batto’ (Topa’s words..) was presented with the Nature Conservation Award from the Field Naturalists Society of South Australia. The silver medallion recognizes his amazing work and selfless dedication over decades.

Congratulations Terry!



Melbourne’s hippest neighborhoods

Robert Reid’s writing for National Geographic on his time in Melbourne includes a paragraph on the flying-foxes at Yarra Bend. Many thanks to Robert Bender for accompanying Mr Reid during his time experiencing the delights of this urban colony.

<http://www.nationalgeographic.com/travel/destinations/australia-and-the-pacific/australia/melbourne-australia-best-neighborhoods/>



EPBC category changes

Three species of bats have recently had their EPBC Act status transferred from Endangered or Critically Endangered, to Vulnerable: Semon’s Leaf-nosed Bat *Hipposideros semoni*, Greater Large-eared Horseshoe Bat *Rhinolophus robertsi* and Bare-rumped Sheath-tail Bat *Saccolaimus saccolaimus nudicluniatu*s.

<http://www.environment.gov.au/news/2016/12/07/nine-species-8-mammals-1-bird-are-listed-threatened-species-under-epbc-act-have-been>



The twelve days of Bats...

Ed: Everyone loves a good limerick, but I’m excited to open up the challenge further. Our own Tallulah Cunningham, whose ‘flying fox in a pear tree..’ appears on this edition’s cover, has invited the ABS Membership to help her complete the ‘Twelve days of Bats’ challenge. I’m sure you all know the tune, to help out, Tallulah has come up with the first six days:

“On the sixth day of field work my harp nets caught for meeeee:

**Six vampire bats,
Five koumori-eee [*the Japanese word for bats*]
Four fledder mauses,
Three pipistrelles,
Two freetail bats
And a flying fox in a pear tree....”**

Tallulah is seeking help with the rest of the lyrics, with plans to then illustrate each line with one of her beautiful pieces of artwork.

In Tallulah’s words:

“Perhaps we could open the floor for a mini competition/challenge for the ABS readership in this edition asking for suggestions for other lines for the song (with a prompt to keep in mind it needs to scan without every other line having the specific word “bats” in every line and without bogging down in Linnaeus nomenclature) with the idea of it being illuminated for next years end of year magazine. I’m happy to send a signed copy of the picture to whoever has the best ideas.”

So put pens to paper! Send your suggestions directly to editor@ausbats.org.au or Tallulah.Cunningham@uon.edu.au



Australasian Bat Night, March, April and May 2017



Time to start thinking about Bat Night!

Australasian Bat Night is happening again in 2017: March, April and May



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 60 events all over Australia and New Zealand occurred during 2016 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 2017 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, landcare 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, April and May 2017, 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.org.au. 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 biscuit baking session or bake sale at your kindergarten or school! (You can buy bat shaped pastry cutters from Tolga Bat Hospital). 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, Men's 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 Bat Night presentation templates to help you, and can help source extra photos. You can download kids' batty activities and ideas for bat games from the ABS website.

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 ABS web manager and Twitter and FaceBook team through batnight@ausbats.org.au

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.

Don't forget to register your event to batnight@ausbats.org.au

Join the Bat Night team

If you are interested in joining the Bat Night team, contact Maree on batnight@ausbats.org.au

Right: An arresting image of a Ghost Bat *Macroderma gigas* taken by Bruce Thompson on Kings Plain Station. This area of karst is managed by the South Endeavor Trust and at time of writing was subject to a mining application.



– Recent Literature –

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

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Eastern Tube-nosed
Bat *Nyctimene
robinsoni* on Iron
Range National Park.
Image thanks to Julie
Broken-Brow.

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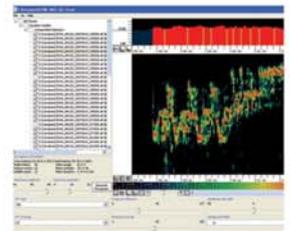
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