

Blind to bats

Traditional prejudices and today's bad press render bats invisible to public consciousness¹

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ABSTRACT

We have been struck by the paucity of coverage of bats in the media, even though they constitute a quarter of the Australian mammal fauna. The Microchiroptera are almost invisible to the public, but the Megachiroptera come to public attention mostly when camping in or near towns or in orchards. There is a public blindness to the reality of bats, their natural history, their ecology and conservation. Like most treatment of bats through the ages, *Dracula*, the 1897 novel by Irish author Bram Stoker featuring as its primary character the vampire Count Dracula, has left a legacy of a perception of bats as dark, evil, bloodsucking monsters. We gathered ancient and modern references to bats, from books, newspapers, radio and TV, the internet and other sources, to explore attitudes to bats. We examined a number of recent books and feel inspired at the change from the stereotypic images that have haunted so many books, especially children's books. There remains a pressing need for accurate information about bats to be entertainingly available to the public. The Australian Museum's 1999/2000 'Bats' exhibition filled this need, with a most appropriate headline: "Threatened and misunderstood". Our conclusion is that the public has a blindness to bats, and therefore to the issues surrounding their conservation and management. We did find that people do care about individual bats, and that education helps counter the negative perceptions. We turn to education and research as the primary formula for seeking to understand and manage bats. Rather than turn away from the rich heritage of prejudice about bats, it is our view that such bizarre interpretations of this magnificent order of animals can be the springboard to their salvation. There is also the critical matter of their keystone role in our native ecosystems. Bats are a fabulous subject for educational programs and a rich source of scientific investigation, from fossils and reflections on evolution to studies on their ecology in commercial contexts, and as support for the frontline fight to conserve our forests and our caves, and to live in a sustainable society for the next 1000 years.

Key words: flying-fox; bat education; bat research; bat books; bats in the media; bats in mythology.

Introduction

Consider the phrase 'blind as a bat'. Bats are not in fact blind, but the statement is part of our general way of thinking about bats. It is a negative statement about the person to whom it is applied. From 'bats in the belfry' to 'boring as bat shit', or just 'batty' (meaning silly, or even mad), and referring to an older woman as an 'old bat', we use bats as the symbol to generate negative, often dark, images, culminating in the association with 'vampires'. Even Batman presents a negative, as well as a positive, image – there is a vast suite of websites devoted to the dark side of Batman's persona, centred on bats, vampires and gothic evil (Batman is set in Gotham City). Another of many such examples is the well known witches'

incantation from Shakespeare's *Macbeth*, which also ties bats to the dark arts:

Fillet of a fenny snake,
In the cauldron boil and bake;
Eye of newt, and toe of frog,
Wool of bat and tongue of dog,
Adder's fork, and blind worm's sting,
Lizard's leg, and howlet's wing, –
For a charm of powerful trouble,
Like a hell-broth boil and bubble.

Bats are evocative animals in the public imagination, but the images are almost universally negative. In the introduction to his amusing book entitled, *The Compleat Cockroach: a comprehensive guide to the most despised (and least understood) creature on earth*², Gordon (1996) cites the March 1982 edition of the US journal *Pest Control*: "In 1981, when the U.S. Fish and Wildlife Service polled 3,107 adults, they learned that cockroaches were America's least favorite animals, followed by mosquitoes, rats, wasps, rattlesnakes, and bats." Robertson's (1990) *The Complete Bat*, makes no reference to other Compleat works, but the book is a valuable addition in support of bats. As stated on the back cover of the book: "Bats, through the ages, have had terrible press, but their

¹ This paper was prepared for the bat conference in April 2007, and it reflects the views and accumulated information to that time, although with revisions to clarify points and fill in gaps. Updating the paper would be readily possible, and we invite others to do so by writing their own version. There is plenty of new material, from the sustained controversies over flying-foxes to the imminent extinction of the Christmas Island pipistrelle *Pipistrellus murrayi* making headlines in 2009, but these examples primarily reinforce our general thesis that there is a blindness to bats that sustains superstition and neglect of this magnificent order of mammals.

greatest enemy is ignorance.” We agree, and support Robertson’s endeavour to dispel the myths, in his case by being practical, in our case, by examining the prejudices. Public attitudes to bats show extraordinary contrasts – bats from Hell (ancient Greece) and bats from Heaven (China), the horror of vampires and the incredible lightness of Strauss’ *Die Fledermaus* (central Europe), biblically unclean animals, and a feast for Aboriginal people. John Altringham (2007), from the University of Leeds, says in the preface to an amazing book on poems about bats (Baron 2007): “Because they are small and nocturnal, [micro]bats have largely escaped our notice, other than as a spark for myth and superstition. Yet they are one of evolution’s big success stories.”

A number of engaging books have examined the myths, such as Wootton (1986). He opened his section on bats by remarking that the mediaeval image of a bat must have seemed like that of a minion of the devil. After all, Wootton remarked, they flit about in the darkness, in silence, and were obvious hybrids of a fiendish mouse and the membranous wings of a dragon. Thus it was, concluded Wootton, that Satan himself was commonly depicted as having bat wings.

Thomas Bewick (1790) was clear, it was a quadruped. He opened his account of bats with the statement that; “This singular animal is distinguished from every other quadruped by being furnished with wings, and seems to possess a middle nature between four footed animals and birds; it is allied to the faculty of one by the faculty of flying only, to the other by both its external and internal structure.” He then added, “in each respect it has the appearance of an imperfect animal.” When describing the horseshoe bat, Bewick noted that it is very common in France, where is it one of seven distinct species, and they “are all equally harmless, diminutive, and obscure; shunning the light, and endeavouring to conceal themselves in holes and caverns. They never come out, but during the night, in quest of food; and return at daybreak to their dreary habitations.” Bewick then shifts from these reasonable accounts to one that is cluttered with myth, poor natural history, and no discernment that was noticeable in his descriptions of the microbats. Bewick was British, and worked in Newcastle, his greatest achievement being the *History of British Birds*, published after the history of the quadrupeds.

On the flyleaf of the 1980 reprint of Bewick’s 1790 book, the statement is made that “he clearly had to use references which were not too accurate”. Consider the following passage by Bewick: “under the influence of a warmer climate, the Bat assumes a very different character, and possesses powers which render it formidable to mankind,

and a scourge to those countries where it is found. Some of them are as large as well-grown pullet; and so numerous, that they frequently darken the sky as they fly. They are fond of blood, and will attack men whom they find asleep; they are said to introduce their sharp-pointed tongues into a vein, sucking the blood till they are satiated, without awakening the sufferer. The ancients had an imperfect knowledge of these species; and from their aptness to convert every object of terror into an imaginary being, it is probable that they had conceived the idea of Harpies, from the cruelty, voracity, and disgusting deformity of these creatures. These monsters inhabit Madagascar, and all the islands of the Indian Ocean: they likewise have been found in New Holland, the Friendly Isles, the New Hebrides, and New Caledonia.” There is a considerable body of bad bat biology here, and all of it seems to be second hand, where stories have merged and become confused. What is relevant to note is that these monsters were in New Holland, i.e. Australia, and since Bewick was published in 1790, that would have been the prevailing prejudice that was imported into Australia with the first phase of European settlement. This is such a low base, it is not so surprising that overtones of Bewick’s view persist, and blight our view of how to see and manage our flying-foxes.

In 1770, Joseph Banks had sailed with Cook along the east coast of Australia, and as a keen natural historian, he recorded some notes on bats. The first mention is benign: “Bats here are many. One small we took which was much like, if not identically the same, as that described by Buffon under the name *Fer de cheval*.” The book by Currey (2004), from which this material was taken, stated that it was a horseshoe bat, based on the scholarship in 1962 of John Beaglehole, who studied the full journal of Banks. The quote continued: “Another sort was as large or larger than a partridge, but of this species we were not fortunate enough to take one; we supposed it however to be either the *Rouquette* or *Rougette* of the same author.” Again, Currey cited Beaglehole that this animal was probably a flying-fox. Banks then mentioned some other animals, which he did not see and regarded the descriptions as unintelligible, Currey then quoted Banks: “Of these descriptions I shall insert one, as it is not unentertaining. A seaman who had been out on duty on his return declared that he had seen an animal about the size of, and much like, a one gallon keg; it was, says he, ‘as black as the Devil and had wings, indeed, I took it for the Devil, or I might easily have caught it, for it crawled very slowly through the grass’. After taking some pains I found out that the animal he had seen was no other than a Large Bat.” Currey (2004), referring to Beaglehole, said that this animal was probably a flying-fox. A number of features fly from this account. Bewick (1790) did not give a reference to his source of this being the monster from New Holland, but it would be readily possible to interpret that Banks may have been a source. It is also apparent that Banks was familiar with bats, both small and large, and was skilled enough in his interpretation of a seaman’s account of a flying-fox to call it ‘not unentertaining’. We thus have a fine naturalist being clear about bats, as well as their devil-like appearance to those without a keen interest in natural history. It portends the position we occupy today.

² We are sure that the literary search into bats will become more widespread as sound biological knowledge grows, and recent contributions, such as that by Gold (2009), show the source of this interest. His opening sentence: “Bats have been a greater source of horror and mystery in literature than any other living creature”, foreshadows his next novel *Bat out of hell*. Gold wrote his piece in the theme edition of the literary journal *Southerly*, with the theme basically dedicated to animal rights – itself a problematic area for zoologists. Gold stated that he intended to deal with the danger that bats are facing because of human influence and the ethical dilemmas from the competing rights of bats and humans.

Chiroptera is a well-chosen descriptive word for the mammal order that embraces the bats. Its origin is Greek, and it means 'hand wing'. Megachiroptera (the large bats) and microchiroptera (the small, insect-eating bats) reflect the two major divisions within the Order Chiroptera. The importance here is that the old world, especially Europe, has only the microchiroptera. The megachiroptera – the flying-foxes – are principally confined to south-east Asia and the Pacific, including India and Australia. Thus the mythological world of bats – Greek, Roman, Egyptian, the biblical lands – reflects views of the microchiroptera, although there is a fruit-eating bat in the Middle East. The universally used generic term 'bat' has allowed the transfer of cultural prejudices between groups, even though habitat needs, resource use, and ecological management are mostly unrelated between the two sub orders.

In our experience as bat researchers over the past thirty years, we have been struck by the lack of coverage of bats in the media. With the exception of the ABC, the little coverage there is has primarily been periodic expressions of fear and loathing of flying-foxes in local newspapers in districts where they occur. In Macdonald's (2009) encyclopedia of mammals, bats are noted as forming about one quarter of all living mammal species. For Australia, the proportions are the same, 1 in 4 of the native mammals, comprising 12 species of megachiroptera (also called megabats) and 71 species of microchiroptera (also called microbats) (compiled from Van Dyck and Strahan 2008 which lists 349 native mammal species). Such figures come as a great surprise to many non zoologists, apparently because bats do not loom that large in the public consciousness. It greatly concerns us that the general public seems blind to bats as an interesting and beneficial group of mammals. Conservation and management decisions have a large political component, and many reserves are declared, or protection actions taken, because of a high media profile and the political consequences of inaction (cf Koala, Tasmanian Devil, Swift Parrot, dolphins). Without the spotlight, and as a result of generally bad press, bats are missing out. This is particularly true of the microchiroptera, which are almost universally ignored by the media.

In the Australian press we have usually encountered a deep dislike and suspicion of bats – possibly inherited from our European roots, though this was almost all directed to flying-foxes, a group mostly unknown to Europeans. Microchiroptera are almost invisible to the public – mostly nocturnal, but can be seen at dusk, small, silent and predominantly non urban. Megachiroptera frequently come to attention when too visible – camping in or near towns, or even the city centre in Botanical Gardens, raiding orchards or, as alleged, travelling in vast 'noisy' swarms. In fact, flying-foxes make almost no noise during the evening flyout or when returning to camp before dawn. At these times, local newspapers are often full of sensational headlines and vitriolic letters to the editor, occasionally accompanied by equally passionate letters from 'bat-lovers' defending the bats. While these local skirmishes rarely make national news, with the exception of the Sydney/Melbourne Botanic Gardens flying-fox camps, they have recurred sporadically for decades in papers such as the *Coffs Coast Advocate* and *Bellingen Courier-sun* (both reporting ongoing flying-fox

issues at time of writing), the Lismore *Northern Star* and Grafton *Daily Examiner* (Maclean flying-fox camp). Even the south coast *Bega District News* has had a recent bout of flying-fox reporting, with a new flying-fox camp in town.

Our concern is that the general community, and the political decision-makers, biodiversity bureaucrats such as policy writers and conservation managers, and many conservation groups and scientists, remain largely ignorant of bats, their ecology, status and management needs, despite the much greater interest and knowledge of a wider range of fauna in scientific and conservation circles. Some information of assorted quality is freely available on the internet, but the mainstream media – print, TV and commercial radio – is mostly devoid of the sort of information that we as bat researchers and managers would like to see disseminated. There is a selection of books that embrace bats as valuable animals, including children's books, and a careful reading of them puts bats in a much better light. However, to be drawn to read such books does depend, it seems to us, on a lifting of the general blindness to bats. This paper was written in that spirit.

We pursued this enquiry by looking at some historical aspects of the prejudices about bats, including touching on other views on bats from different cultures, and then asking: a) what the impact is of existing views of bats on their public image in Australia; b) whether there is a peculiarly Australian twist to these perceptions, and c) whether bats can lead a revolution in conserving both major and minor ecosystems. We then tackle the issue of what steps we could take as a society to shed this blindness.

Our search pattern for public perceptions of bats

In looking at how bats are [un]popularly perceived, and at how much good information is readily accessible to the public, we pursued a number of different lines of enquiry. They included scouring our own extensive newspaper files and other recent Australian newspapers (including a set of newspaper clippings from the Royal Botanic Gardens in Sydney relating to their flying-fox issues), searching the internet, searching the ABC website, scanning books on bats as well as our own set of bat texts and scientific papers which include our own work with bats for the last quarter of a century, discussions with colleagues, discussions that followed from our poster presentation at the Bat Conference in April 2007, examining books on mythology, examining the biblical injunctions, and casting a long look across the literature on humans and animals, all with an eye out for positive images. We also sought literary and colloquial uses of bats, educational material and the imagery used in the theatre and film world. In short, we poked and prodded odd corners of the visual, literary and day-to-day world to see how bats have been represented and how they are still portrayed.

The essence of the analysis was to dissect out the bat material, decide which was good or bad bat biology, and look at the cultural symbols to determine whether they reflected fear, dislike or just lack of information. The final step in our investigation was to draw the threads together

and consider whether the imagery has been harmful to bats, or whether there is just a cultural blindness that leaves bats in the dark from a conservation perspective. This is the gist of the questions that we defined in our introduction. Our search was never an exhaustive survey of available material in any of the categories mentioned, rather we looked for (hopefully fairly typical or interesting) examples to present for the purpose of discussion and examination. We did find some delightful things in odd corners, and we are sure that there are lines of enquiry that we missed. We ask you, dear reader, to bring them to the public's attention in your next work on bats.

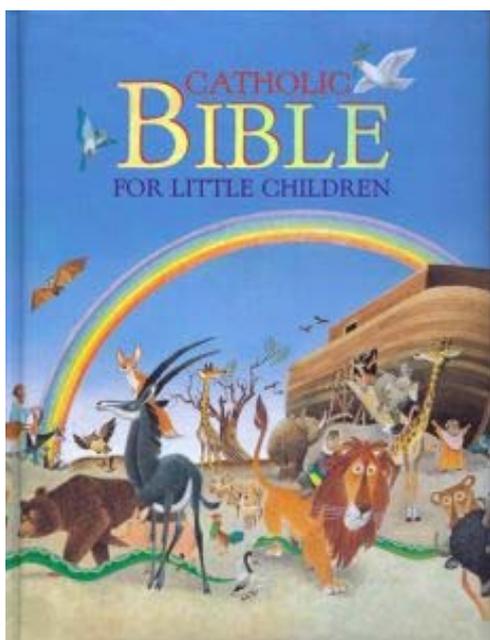
The Biblical view of bats

In the beginning we looked at biblical references to bats. The bible is a key source because of its sustained influence in the English culture that colonised Australia. From Leviticus 11 (NIV):

The LORD said to Moses and Aaron, "Say to the Israelites: 'Of all the animals that live on land, these are the ones you may eat: You may eat any animal that has a split hoof completely divided and that chews the cud.

"These are the birds you are to detest and not eat because they are detestable: the eagle, the vulture, the black vulture, the red kite, any kind of black kite, any kind of raven, the horned owl, the screech owl, the gull, any kind of hawk, the little owl, the cormorant, the great owl, the white owl, the desert owl, the osprey, the stork, any kind of heron, the hoopoe and the bat'."

We wonder why these ancient writers distinguished between clean and unclean meats – were microbats considered a health hazard? Bats were not just the detestable creatures of Leviticus. For example, we found reports that, in ancient Macedonia, people carried bat bones as amulets because bats were the luckiest of all animals, and bearers of their bones were sure to be happy.



Most Things Bright and Beautiful

Bats in other cultural traditions

Bright (2006), in his study of the animals in the Bible, noted that bats make very few appearances, and twice appear to be confused with birds.³ He noted that the bat has a bad reputation, and has been a magical creature, often associated with evil. Bright considered that at the time of the Authorised Version of the Bible, i.e. the King James translation of 1611, the bat was thought to cohabit with witches and warlocks and to possess demonic powers. Bright commented that the tradition had even older roots, as can be seen in the bat's role in the last days: "In that day a man shall cast his idols of silver, and his idols of gold, which they make each one for himself to worship, to the moles and to the bats (Isaiah 2:20)". The bat in the Bible, says Bright, refers to the microbats, of which he stated, there are about 20 species living in the Bible lands. He gave the name of one species, the short-tailed bat *Pipistrellus kublui*, and recounted that Tristram found it in the caves under the Temple of Jerusalem and in the Cave of Adullam in Judah. The populations roosting here were so great that they made it difficult for Tristram's party to keep their naked torches alight when crawling through the tunnels. Bright added that it now stakes out streetlights and grabs moths attracted to the glow. Bright also stated that fruit bats, i.e. flying-foxes (megachiroptera), are also present in the region. He stated that the fruit bats can be pests to crops, such as apricots, and that they fly by day, whereas, he says, the microbats mainly fly by night. Being about by night, commented Bright, and roosting in damp dark places, such as caves, bats have inevitably been aligned with the devil and witches, and like many of the animals mentioned in the bible, were thought, said Bright, to have unusual medical properties.

In our literary wanderings we found reports that flying-foxes feature prominently in traditional art in many parts of Asia and Australasia because the people believe that eating them relieves ailments like asthma and arthritis, that in Asia they are eaten to stave off colds and their dung is used to cure baldness, that Solomon Islanders make kites from dried bat skins, and that Chinese people believe bats bring good luck.

A *Daily Telegraph* (7/2/07) article, about a north coast man who was scratched by a flying-fox, was accompanied by a picture of a microbat with the caption "Bat out of hell". The same paper, on 25/6/07, carried the headline "Like bats out of hell – endangered creature swoops on park land" (Parramatta Park, western Sydney). *Bat Out of Hell* was a popular 1977 music album by Meat Loaf, but the phrase can be traced back to the Greek playwright Aristophanes' 414 BC work entitled *The Birds*, containing what is believed to be the first reference to a bat out of Hell:

"Near by the land of the Sciapodes there is a marsh, from the borders whereof the unwashed Socrates evokes the souls of men. Pisander came one day to see his soul, which he had left there when still alive. He offered a little victim, a camel, slit his throat and, following the

³ Ley (1968) in his work on the dawn of zoology, noted that bats were still classified with birds in the 14th century by Conrad Meigenberg, and by the 16th century Conrad Gresner had considered that the "bat is a middle animal between a bird and a mouse so that it may be called a flying mouse."

example of Odysseus, stepped one pace backwards. Then that bat of a Chaecephon [Socrates' assistant, despised by Aristophanes, who nicknamed him 'the bat'] came up from hell to drink the camel's blood."

In contrast, what struck us as odd was that Toynbee (1973) did not mention bats in her comprehensive treatment *Animals in Roman life and Art*. Yet, in his work on the *Animal World of the Pharaohs*, Houlihan (1996) mentioned bats. He recorded that one of the most insightful sources of information on the ancient Egyptian bird world comes from the Eleventh Dynasty rock-tomb of monarch Baket III at Beni Hasan. Also present, Houlihan reported, are three bats of two kinds – large and small – drawn with deft certainty. The ancient Egyptians, Houlihan noted, seem to have classified this winged mammal as some type of bird. He also noted that this was much the same as their classification of the turtle and the crocodile along with fish. Houlihan presented a photograph of a figured limestone ostrakon, about the size of a human hand, with a black ink drawing of a bat, and he commented that it was a rarely portrayed beast.



"Like a bat out of hell I'll be gone when the morning comes" Meatloaf 1977

Allen (1939), a zoologist, in his illuminating and early book of the modern era of bat biology, simply entitled *Bats*, described folklore on bats in his opening chapter. Being from the US, he included Indian myths. He noted, in the next chapter on 'bats, gods and men', that the Bat God was a powerful deity with the ancient Mayas in Central America. Allen also drew heavily on European traditions. He commented on Aesop's use of bats in two of his fables. He also reproduced a drawing of bats from *Hortus Sanitatis* (Garden of Health, published in Mainz in 1491) where the bats are flying around a leg of ham. Allen stated that all the older natural history books mention this supposed fondness of bats for bacon, a taste reflected in their German name *Speckmaus*. Allen recounted Pliny's version of the tradition that if a live bat is carried thrice around the house, then nailed head downward over the window it acts as a charm to ward off evil. Pliny's version is that this is especially done in the case of a sheepfold. Allen then added that "the poor creature is hung by the feet above the lintel as protection." In recounting the

ancient custom, we noted Allen inserted his view by saying "the poor creature". Allen then recounted, with surprise, that, "Even in England, this tradition still persists, and Dawson (1925)⁴ tells that in 1922 he found a Sussex farmer nailing a bat, head downward, above the entrance to his barn!" The range of Allen's accounts shows that there is a long history of bats integrated into cultural traditions that do not make zoological sense, and included cruelty. Should we be surprised? David Marr, reported in the *Sydney Morning Herald* 18–20 December 2009, under the heading "Our faith today", that 68% of the 1000 people in the Nielsen poll of the previous week had a belief in God. Further, 22% believed in witches, 41% in astrology, 63% believed in miracles, 27% accept that the holy book is literally true, and 42% in evolution. Marr noted that most Australians believe that God played a part in the process. Marr also noted that in the year in which the 200th anniversary of Darwin's birth was celebrated around the world, only 12% of Australian Christians believe his theory of natural selection. Marr reported that the figures in the US are more dramatic – only 14% of the US population preferred Darwin to God. We are not particularly surprised, when we look at such figures, at our cultural blindness to bats.



China – A bat descends from heaven

The picture above, painted c. 1770 by a Japanese artist named Shuseki, shows a beggar watching a bat. The Chinese often use sound and pictures to convey a meaning: in this instance a bat is a symbol of happiness

⁴ The reference to Dawson is not in Allen's considerable bibliography, in fact, there are no entries for D. Most odd.

because the Chinese word 'fu' as bat sounds the same as the Chinese 'fu' as happiness. Allen (1939) noted, in the splendid collection of Chinese art in the Victoria and Albert Museum, London, the frequency with which carved or painted bats are worked into the design to carry "good fortune". As a result a bat has from antiquity been a symbol of happiness, and bats may be found painted on teacups, embroidered on clothing, and featured in greeting cards, as well as lurking in old paintings.

Bats are also apparently not well regarded in Afghanistan, according to Senator Andrew Bartlett's web diary, 28/12/05 (accessed 15/8/07), quoting Malalia Joya, 27, newly elected to the Afghan Parliament:

"I see the future of this Parliament as very dark because of the presence of warlords, drug lords and those whose hands are stained with the blood of the people" she told reporters. "The men and women of my country are like broken-winged pigeons caught in the claws of blood-sucking bats after being released from the Taliban cages" Joya said after the swearing-in ceremony attended by US Vice President Dick Cheney. "Most of these bats are in the Parliament now."

Of particular interest to us was the outlook of Aboriginal people in Australia at the time of European settlement. Byrne (1987) reported that, in NSW at least, "... flying-foxes were taken [by Aborigines for food] in a systematic and often large-scale manner ... all specific accounts relate that they were attacked in their rainforest roost trees ... Dawson (1830), in the Karuah valley, NSW, encountered 'a large group of Aborigines sitting around their fires, roasting and eating the flying-foxes, which they had speared from the trees in the jungle by the side of the creek.'" The likelihood that the flying-fox was, at least occasionally, a feasting food is underlined by another source that commented that Aborigines in south-east Queensland ... "used to catch great numbers, almost living entirely on them now and then". Byrne lists these flying-foxes as being *Pteropus poliocephalus*, and that is the most likely species in the Karuah Valley NSW, although it may also have included *P. scapulatus*, but in south-east Queensland the diet could reasonably have included *P. alecto*, and sometimes *P. scapulatus*.

Bats in modern Western culture

By modern here, we include the 19th century, looking at images, language and superstition in how bats have been represented. Our searches included music, film, books and the internet.

Die Fledermaus

Set in Vienna in the 1890s, *Die Fledermaus* is a rare use of the bat as other than a dark symbol. An excerpt of the elaborate plot has been described as follows: "It appears that in their youth von Eisenstein and Dr. Falke both attended a fancy-dress ball in a country house two miles from town. Von Eisenstein went as a butterfly and Dr. Falke as a bat (Fledermaus), tightly sewn up in a brown skin, with long claws, broad wings and a yellow beak. When morning came Dr. Falke had drunk more than was good for him, and on the way home through the woods von Eisenstein, assisted by the coachman, lifted him out of the carriage and placed him under a tree and left him sleeping, unconscious of his fate. When he woke, the poor man had to walk home, still in fancy dress, through the town in broad daylight, to

the joy of all the street arabs, and after that he was always known in the district as 'Dr. Bat.'" (<http://www.theatrehistory.com/misc/diefledermaus.html>, accessed 8 August 2007). While the situation is comic, the appellation of Dr Bat is meant as mockery. Nevertheless, the bat does break from its evil mode and is more an object of derision – after all, who in high society would want to be known as a bat? Quite a few of those attending the joint ABS/RZS forum in April 2007 would have been happy with the label, but they are the exception. It is still much more attractive to be called a lion.

Bats getting stuck in your hair

In a rare example of humour about bats, we quote part of Ogden Nash's 1952 poem 'The Bat' (as it appears in Baron 2007):

Myself, I rather like the bat,
It's not a mouse, it's not a rat.
It zigzags through the evening air
And never lands on ladies' hair,
A fact of which men spend their lives
Attempting to convince their wives.

The poem alludes to the difficulty of dispelling myths about bats, in this instance, that they get caught in people's hair. The following item was retrieved from an archaeological website. It restates either a real problem – bats getting stuck in your hair – or re-iterates a common prejudice which seems to be international. In our opinion and experience of working in the field, bats fly deftly in the dark, and do not become entangled in vegetation, trees, people or hair. In fact, it takes considerable skill to trap a bat, and just sitting in the bush waiting for a bat to be entangled in your hair would be a long and lonely exercise. However, in a more built up environment it is possible to see how this myth arose, a myth held by Harry Parnaby's rural grandmother. In Parnaby's view, bats, when they flew into rural houses at night (before fly-wire was common), would try to alight on walls, or people's heads, to rest. Attempts to land are so fast that people often mistake this for a collision. Parnaby and Hamilton-Smith (2004) are also in the mythbusting business with their polemic on the 'adaptable bat'. Parnaby has observed this behaviour, and also witnessed bats trying to land on his [then] hair. People experiencing this action would be, as Parnaby points out, fearful of entanglement. Nevertheless, the mythical elements persist, as set out in the following extracts from commentary about a book on an Egyptian tomb:

Professor Kent Weeks has an approach to his subject that might be considered irreverent by some. Like it or not, the discovery of the huge tomb of the sons of Ramesses II, KV5, is one of those dramatic events that captures the public attention, and since the world first heard about it in 1995, interest has scarcely died down. Weeks knows how to tell a story, whether his own or that of the tomb. He brings the daily headaches of excavating in the Valley of the Kings to vivid life and his gift for dialogue suggests that should he ever wish to leave his chosen field of Egyptology (unlikely) he could always find a place as a novelist. Here's an example: 'Wata-weet! Nubie shouted the Arabic word for bats. 'They will get stuck in your hair! I hate them!' He rolled over and lay face down on the ground, covering his head with his hands. It took several minutes before things began to quiet down. Not all the bats had left the tomb by any means, but

several thousands of them had, and the air was thick with the stench of the fine dust they had stirred up.

The Lost Tomb, by Professor Kent Weeks 1999, published by Weidenfeld and Nicolson

<<http://www.ancientegyptmagazine.com/reviews01.htm>
accessed 8 August 2007>

To us as bat biologists, Professor Kent Weeks did not produce any evidence of bats becoming stuck in the hair of those who worked in tombs. It seems to us more likely that he had moved into novelist mode in his framing of the story of the scare caused by bats. If the Arabic word for bats is Wata-weet, we need a better interpretation of how this subject has been viewed over the millennia in the Arab lands. The stench of the bat guano is understandable, and no doubt that triggers the abhorrence of the environment, but compounding it with the bats being so inept at flying within their cave (the tomb) to us is not believable as presented. Harry Parnaby nevertheless gives the story some credibility because bats have collided with him in a cave. He considers that it is not that bats are inept, but it is simply a fact that bats can collide with people in a cave, when there is a cloud of bats in a confined space. Weeks' *The Lost Tomb* does bats no service. It is irritating that a myth buster, the archaeologist, is also a myth perpetuator off his discipline. Bats do suffer that collateral damage. Yet Egypt too is becoming the focus of bat research. Consider the following piece by Christian Dietz in 2005 (Illustrated identification key to the bats of Egypt, www.uni-tuebingen.de/tierphys/Kontakt/mitarbeiter_seiten/, accessed 12/8/07). He states in his preface: "For the last three decades bats have been in the focus of many research projects and the knowledge in the field of taxonomy, ecology and distribution of species has increased extraordinarily. ... But unfortunately the bat fauna of Egypt is still little known. ... The aim of the illustrated identification key presented here is to encourage young Egyptian scientists to take up the study of bats and to contribute to the knowledge about these fascinating animals." An engaging inclusion in this piece was in the acknowledgements: "I am also grateful to the staff of the National Parks of Egypt for giving permissions to capture bats, for their help in logistics and in finding roosts. Also many thanks to all the Bedouin guides for their enthusiasm and perfect help in all respects." This inclusion notes that both modern and traditional information will add to the picture and that the modern bat biologist is open to all sources of information and ideas.

All these views have a very modern ring, and it could apply to so many countries around the world. It applied to Australia at the outset of our study of bats in Mumbulla State Forest in the 1980s, and to flying-foxes in the 1980s (Lunney and Moon 1988, 1997). At that stage so many of us relied on so few bat biologists, and the Hall and Richards (1979) field guide was indispensable. The style of the 'Professor Weeks of the Tombs' was, until recently, the self-styled expert in Australia in managing wildlife, forests, and so many bat habitats from rainforests to caves. The consequences of such biased expertise are well exposed in a tough piece with the heavily ironic title 'adaptable bat' (Parnaby and Hamilton-Smith 2004). The Australian cultural blindness to bats is lifting, but only at a modest rate. Our concern is that the rate of cure is far slower than the avalanche of new problems besetting bats, from habitat loss to the failure to fund bat research from

the fundamental level of taxonomic studies to habitat selection and management plans. Some of the few documents that do exist fall well short on how to manage this issue, of which the flaws in the national bat action plan have been exposed, but not rectified (Lunney *et al.* 2003). A primary concern with this document is that it holds its focus, and thus recommendations for funding, on a few endangered species, but not on threatening processes. The best point of the national plan was arguably that it gave prominence to the plight of the grey-headed flying-fox.

Bacardi Rum

Bacardi Rum has a fruit-bat as an emblem. Stories (from Google) vary as to the origin of the emblem. It seems that, in Cuba where Bacardi rum was founded, and where rum-making was common, bats would crawl into the vats during the night to drink the fermenting sugarcane, and be found drowned in the rum by dawn. The first thing the rum workers would do every morning was fish the dead bats out of the vats. In 1862 Bacardi purchased a tin roofed factory building for a distillery. In the roof of the building lived a family of fruit bats, considered to be a good luck omen in Cuban mythology, and the fruit bat was made the official logo of the Bacardi Company.

In **Bats** (newsletter of Bat Conservation International and the Chiroptera Specialist Group, Feb 1984) we read that the makers of Bacardi Rum "didn't just use bats, but actively promoted the values of bats to the public". Bacardi Imports published an educational brochure to introduce people to 'the truth about bats', including this quote: "after, all, bats are one of man's best friends. Really. Bats were around a long time before D.D.T. and they prove a lot more effective. No chance of immunity for the bugs! In the normal course of things, one bat can consume thousands of insects in a night. To put it another way, if the world wasn't batty, it might be buggy." This raises an alternative view, namely the existence of a long term, widely-held view that microbats are good because they keep insects down – a positive mythology in our culture.



Dr. Merlin Tuttle, President of Bat Conservation International, is assisted by one of his favorite bats in accepting a generous contribution from Bacardi Imports, presented by Bill Walker, President and Chief Executive Officer.

Mr. Bill Walker, President and Chief Executive Officer of Bacardi Imports, read an article by Bat Conservation International in the *Wall Street Journal* on the importance and plight of bats, and subsequently gave a donation in support of BCI's conservation efforts (photo).

A separate article in the same edition of *Bats* confirms the persistence of popular prejudice against bats: “In October 1983, *Reader’s Digest* requested and received extensive material on bats, their value and plight from BCI. A member of the *Reader’s Digest* editorial staff even spent more than an hour personally interviewing Dr. Tuttle. Yet their January 1984 issue included a story titled ‘Twinkle Twinkle Little Bat’ in which no major myths are dispelled, and readers are left mostly with a negative image. Vampire damage to cattle is emphasised. No values are admitted, and blood-drinking is mentioned at the beginning, in the middle, and at the end. Finally we are informed that “The real hazard these winged mammals pose is from rabies. In the United States bats transmit more rabies than dogs do’ [article then strongly refutes this].

Merlin Tuttle, BCI and the educational/popular journal *Bats* have done a great deal indeed, both in the USA and the world, to present bats in a good light. We have contributed to *Bats*, and so have many other Australians. Merlin Tuttle visited Australia in the mid 1980s carrying the banner for enlightenment towards bats. He had an audience in 1986 with the then NSW Minister for the Environment and Planning, Bob Carr, and a few of us, as public servants, were pleased to be part of that discussion. Dedee Woodside also put the case strongly in support of Merlin Tuttle. Both the late John Barker and one of us (DL), of the then National Parks and Wildlife Service (NPWS), now part of DECCW, had taken the view that it is better wildlife management policy to protect a species, then issue licences for its management, including shooting, so that records of place, time and numbers were recorded. This had been the substance of departmental submissions on the subject. Bob Carr announced that he had ordered the removal of flying-foxes from the schedule of unprotected fauna under the *National Parks and Wildlife Act 1974*. Henceforth, flying-foxes became a responsibility of NPWS, whereas previously they were of no concern to any department, although cruelty was always covered by the *Prevention of Cruelty to Animals Act 1979*. This meeting was a fortunate co-incidence of events, and Merlin Tuttle remains a vital element in that equation. His guiding skills are still needed. There is little peace in the flying-fox management matters as evidenced by the forum in 2001 (Eby and Lunney 2002) and the recent debate in NSW, the Royal Botanic Gardens and the local newspapers⁵ of coastal NSW. Tuttle’s (2005) book *America’s Neighborhood Bats*.

⁵ The issue of the flying-fox camp adjacent to the High School at Maclean, and the camp in Burdekin Park in Singleton, were regularly reported as conflicts through 2009, as was the issue at the Royal Botanic Gardens in Sydney. In the *Grafton Daily Examiner* of 11 November 2009, the headline was “Maclean High students walk out over bats”. David Bancroft reported that, “Frustrated students will stage a mass walk out of Maclean High School tomorrow in a desperate bid to get authorities to remedy problems caused by a bat colony adjacent to the school.” Malcolm Holland, in the *Daily Telegraph* of 13 November 2009, reported, under the headline “Try playing like a bat out of hell”, that, “A truck fitted with large speakers pumping out ‘truly annoying sounds, would circle the Botanic Gardens’ flying-fox colony each afternoon in the latest desperate bid to drive them away. The colony of 22,000 grey-headed flying-foxes is devastating the garden’s historic trees.” The considerable file of articles on this matter all point to conflict, underpinned by a lack of understanding of flying-foxes, and thus disagreements on how to manage the issue.

Understanding and Learning to Live in Harmony with Them demonstrates the value of remaining on this theme, and that combining science with education and publication has great merit indeed.

Films about bats (horror movies, naturally)

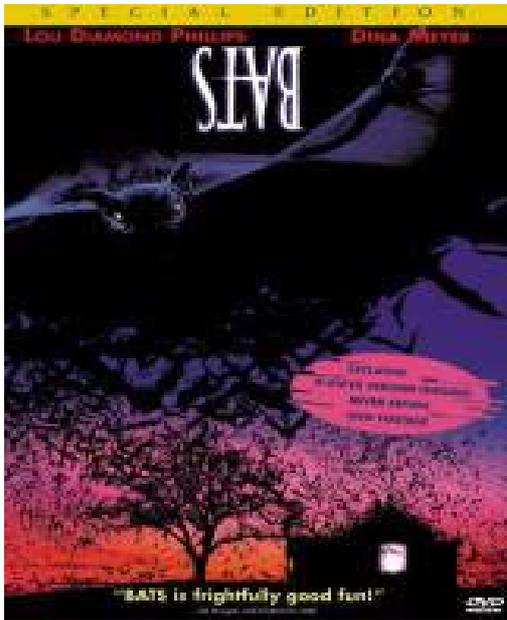
Dracula is an 1897 novel by Irish author Bram Stoker, featuring as its primary character the vampire Count Dracula. No matter that “Stoker’s novel deals in general with the conflict between the world of the past – full of folklore, legend, and religious piety – and the emerging modern world of technology, logical positivism and secularism” (<http://en.wikipedia.org/wiki/Dracula>, accessed 1/8/07) – the book’s and film’s legacy is a perception of bats as dark, evil, bloodsucking monsters. If Martin Cruz Smith’s (1977) novel *Nightwing* were to follow in this path from novel to film, with the added mystical dimension of Hopi Indians, then we can predict a harder life for bats to gain acceptance in the public imagination. In fact, that part of the world, south-western USA, has recently released a film in that horror genre.



1931 film poster, promoting Bela Lugosi’s genre-defining role as Dracula. Note the reinforced message from the spider-web background.

Bats is a 1999 horror film. Dr Sheila Casper is summoned to the sleepy desert town of Gallup, Texas USA, where unexplained bat attacks had caused several grisly deaths. When night creeps in, swarming hordes of bats fill the darkening sky and invade the town. The bats swoop down and attack every living thing in their path, turning the town into a living nightmare where everyone is a target and there is nowhere to hide. Sheila and her assistant team up with the local Sheriff Emmett Kimsey to try to find a way to stop the bats. They discover that Dr Alexander McCabe has infected the bats with a virus (quote: “we’re scientists...that’s what we do”), causing the usually harmless mammals to become vicious killers. They catch and tag one of the bats, hoping it will lead them to their lair. However, these bats are too cunning. Seeking shelter from the dark, the team holes up in an abandoned high school when the bats unleash an unrelenting and vicious assault, seemingly in a co-ordinated attack. When the sun gives them safety, Sheila and Kimsey locate the bats’ roost inside an abandoned mine. With no way to defeat the bats’ sheer numbers and power of flight, Sheila and Kimsey must bravely descend

into the mine, where the bats hang from the mine ceiling asleep. If they can't stop the bats, night will fall, the bat colony will grow, the virus will spread, and the bats will take flight in search of more and more prey.



Development and bat conservation

One report we found is worth mentioning here as an enlightened Western response to bat conservation issues. Because disturbing bats [microchiroptera, mostly *Rhinolophidae* and *Vespertilionidae*] and their roosts can be illegal in the UK, Fenn (2002) looked at problems caused by bats for the construction industry, including prosecutions and the role of education and training in the industry, and he outlined construction techniques sympathetic to bats in two areas: programming to minimise disturbance, and the use of materials and techniques beneficial, or at least benign, to bats. This paper, expressed in matter-of-fact terms, shows that industry can begin to accommodate bats. It is an encouraging sign. It also points to the value of having a legal instrument as part of the management tool kit.

Bats in modern literature, including children's books

We examined a number of recently published books to see what images and information were being presented to children and interested citizens. We have now read many such books and feel inspired at the change from the stereotypic images that have haunted so many books, especially children's books. The most striking was a children's book entitled *Misunderstood Bats* (L'Hommedieu 1997). It opens with the statement: "Fear of the unknown has led bats to be among the most misunderstood animals in the world. They remain mysterious because of their nocturnal lifestyle. Greater understanding can help us to love and respect these shy creatures that now need our protection." The message is unmistakable, new, and much welcomed. However, it was not the text that first captured our attention. It was the remarkable paper engineering that was so captivating.

The book opens and the bats fly out as the book is expanded like a concertina. It is a sheer delight to have it open on your desk. *Amazing Bats* (Simon 2005), *The Bat that Loves the Night* (Davies 2004), *Shadows of Night. The hidden world of the Little Brown Bat* (Bash 1993), *How do bats see in the dark?* (Berger 2000), *Animal Neighbours, Bats* (Savage 2004), and simply *Bats* (Mason 2003), as well as more general texts, such as by Pickering (1999) on nature, myth and spirit are great new books that give new hope to our understanding of bats. More advanced books are the *Beginner's Guide to Bats* (Williams and Mies 2002), *Bats of the World, a Golden Guide* (Graham 1994), *Bats in Question. The Smithsonian answer book* (Wilson 1997), *Bats. A portrait of the animal world* (Cleave 1999), *Bats* (Hutson 2000) and *Bats* (Fenton 2001). We admire the effort, the quality of the text and the message these books project. With these books one can sense that the tide may be slowly turning. We agree with Tony Hutson (2000) when he stated that "...legislation is not enough. Public awareness and an appreciation of their value to humans and the environment are all-important. A change in attitude develops slowly..." We need to promote these books, encourage all-Australian versions, and assist authors when asked. Certainly the home-grown *Raising Archie* by Richard Morecroft (1991), *A Cloud of Bats* by Sue Hand (1993) and Pamela Condor's (1994) *With Wings on their Fingers*, with its rich paintings, bring Australian bats into the public arena as fascinating animals. White's (1997) practical text on caring for Australian wildlife includes bats, and such inclusion assists in their path to cultural rehabilitation. Churchill's (2008) *Australian Bats* is both scholarly and an invaluable guide to our bats, as is Hall's *Bats* (2009). There is ample scope for all sorts of books tackling the subject from all sorts of angles. There is a long way to go before such books catch those on the koala in both popularity or number.

The wonderful habits of that extraordinary little creature, the bat

One book from our collection stood out as worthy of special mention – a landmark book, way ahead of its time. Published in the USA in 1925, Charles Campbell wrote to the evocative title *Bats, Mosquitoes and Dollars*. In the preface, he wrote:

The newspapers and the popular magazines have done the world in general, and this country in particular, an inestimable service in diffusing the knowledge of the danger from mosquitoes, for which we owe them, indeed, an undying debt of gratitude." "It is not a matter of surprise that someone long ago has not studied and brought to light the wonderful habits of that extraordinary little creature, the bat, when we consider the unpopularity of such an undertaking; for who would undertake the cultivation of bats, except some individual whose stability of intellect might be questioned? – besides, the hard and expensive nocturnal work, coupled with derision and the accusation of being 'batty', would alone suffice to account for the fact that this most valuable creature, who deserves to occupy such a high pedestal in the domain of preventive medicine, was passed up by the bearers of the torches of learning. The value of the bat as a mosquito destroyer was never doubted nor questioned, as we see men high in scientific circles extolling their wonderful and valuable habits; but to attempt their cultivation was a matter that such men left severely alone.

In a three-volume publication by the Carnegie Institution of Washington, Washington, D. C., entitled *The Mosquitoes of North and Central America and the West Indies* by Howard [L. O. Howard, Chief of the Bureau of Entomology, United States Department of Agriculture.], Dyar, & Knab (1912) on page 179 appears the following:

Bats as mosquito destroyers. Bats are important mosquito-destroying animals. Plying at dusk and after dark and capturing all flying insects upon the wing, they devour large numbers of mosquitoes in times of mosquito prevalence. Mr. C. Few Seiss at a meeting of the Feldman Collecting Social in Philadelphia, June 19th, 1901, stated that he had dissected a specimen of the common brown bat (*EPTESICUS FUSCUS*) and had found its stomach full of mosquitoes. The suggestion has been made by Mr. A. C. Weeks of Brooklyn that an attempt be made to breed bats artificially on account of their importance as mosquito destroyers, but no one seems to have taken the matter up. Greatly impressed with the value of bats as mosquito destroyers Dr. Chas. A. R. Campbell, formerly city bacteriologist of San Antonio, Texas, has erected a novel bat-breeding house six miles south of that city. His idea is that the bats will rapidly become so numerous with this admirably-adapted nesting place as to rid the neighborhood of night-flying mosquitoes; and that, at the same time, the entire expense will be more than paid for by having the structure built in such a manner that the bat guano can be readily collected and taken away.

(<http://www.soilandhealth.org/03sov/0302hsted/030212campbell/campbelltoc.htm>, accessed 8/8/07)

The high level of advocacy of bats as consumers of insects, in this case the deadly malarial mosquito, gave bats pride of place as urban animals, as part of a sustainable ecosystem approach to pest management, and it showed a real skill in interdisciplinary research. Campbell's bat house was ahead of its time, yet he was well aware that the label of being 'batty' meant that you would be passed up by the bearers of the torches of learning. We well recognise that view, and we survive by also studying marsupials, going one step further than Mike Archer by specializing in koalas. It is our form of being batty. It was, however, a long wait before the image of bats began to have some benign edges in society.

Bats in modern Australian contexts

Australian Newspapers

As we have done so productively before, we examined a number of newspapers which were available to us at the time of writing, looking for articles or letters to the editor which made reference to bats.

We had checked, for another project on human-animal interactions (Lunney and Moon 2008), the *Sydney Morning Herald* (SMH), *Sun Herald* and Fairfax website for the period 7/10/05 to 9/10/06 for any articles or letters about any wildlife. The data set was used for this paper on bats in the media. We also obtained a collection of newspaper clippings about flying-foxes, spanning 15 years, from the Royal Botanic Gardens in Sydney, where a camp of Grey-headed flying-foxes *Pteropus poliocephalus* has become established and is both an attraction and a nuisance.

Local rural newspapers, which often publish almost any available local material or trivial news, are a good place for local views and issues to be aired, and headlines can betray

the bias in the papers' attitudes to bats. We examined local newspapers in two principal locations, Bega on the NSW south coast, and Bellingen on the NSW north coast. We obtained bat-related articles from a number of other districts as well, in particular from the *Coffs* [Harbour, NSW] *Coast Advocate*.

We scanned the papers for content, the issues, the conflict, the dates, and any photos. We looked at these papers from the point of view that this would constitute most of the information going to local residents, and the choice of words here matters a great deal.

Sydney newspapers

The *Sydney Morning Herald* contained no articles about bats between 7/10/05 and 9/10/06. The paper gives regular coverage to nature stories, as evidenced by the 287 articles from this period cited for our paper in the Royal Zoological Society forum 'Too Close for Comfort', including about 2 dozen on native and exotic endangered species (Lunney and Moon 2008). In contrast to this neglect of bats, our Fairfax file for this 12 month period included numerous articles on other terrestrial mammals (61), marine mammals (32), other marine creatures (30), birds (21), invertebrates (14), reptiles (10) and amphibians (6) (not including the 86 articles about Steve Irwin's life and death).

During this period the [also Fairfax] *Sun Herald* did contain an article ("Council wages war on ibises" 15/1/06) about ibises' "toxic droppings killing thousands of flying foxes" in Fairfield. More obliquely, Sophie Gee's review (SMH 28/7/07) of the new Harry Potter book included a sketch (by John Shakespeare) with 3 bats in the background, and since the original book's cover was batless, the artist has added them gratuitously thus making the conceptual link with dark magic, a clear example of the prevailing prejudice. However, the Harry Potter books do contain bat imagery. A later SMH article on 18/8/07 did contain a photo of a flying-fox cooling off in Cabramatta Creek on the heatwave day in 2006 that killed 1000s of others. Rather than having an interest in bats *per se*, the article was actually reporting finalists for New Scientist's Eureka Prize for Science Photography. Similarly, a story about microbats in Ireland refusing to utilise a state-of-the-art bat shelter built to rehouse a bat colony threatened by a highway development was a pretext to run the amusing headline "Bats out of heaven" (14/8/07).

Flying-foxes in city areas present different issues, and to some extent evoke different responses, to those in rural areas. When 2000 bats arrived in Parramatta Park, the *Parramatta Advertiser* (27/9/06) made the story front-page news with a stunning photograph – "Flying high in Parramatta", and a story inside headed "Park the place to camp". However the *Daily Telegraph* (25/6/07) presented the story with a darker headline, "Like bats out of Hell – Endangered creature swoops on park land", and a second article which asked "How do you stop an endangered species from endangering another species?" Then we have the concern for the welfare of an individual flying-fox orphan as portrayed in an inner-western Sydney weekly – "Zorro's Christmas miracle. Our baby bat, rescued from his dead mother's chest earlier this year, has now learnt to fly." (*The Glebe*, 22/

12/06) [editor's note, photo is on file, but not included here].

Flying-foxes arrived at the Royal Botanic Gardens in central Sydney around 1989/90 (e.g. SMH 9/9/92), and the colony has been growing ever since. They roost in some trees which have high botanical or historical value, and damage others. The RBG has used a number of methods to deter the bats from roosting, but success has been mixed. They have kept a file of newspaper clippings on the issue since about 1992, and much of our discussion above and below has also utilised this file.

The threat to heritage values on their front doorstep caught the interest of the Sydney based newspapers for a while in 1992. The *Sydney Morning Herald* ran articles about: bat damage in the Botanic Gardens (23/4/92); 2 'Column 8' pieces about how to cook flying-foxes (24/4/92); an article on Araucarias which mentioned the plastic bags used to deter Botanic Gardens flying-foxes by sending "messages through their sonar systems" (Good Living 11/8/92); "**Bothersome bats in for a bagging as gardeners act**" (9/9/92); "**Flying foxes sounded out**" – efforts to drive bats away, including beating a 44 gallon drum (21/10/92), and *New Scientist* (27/6/92) ran a story entitled "**Eviction order for Sydney's squatting bats**".

The Gardens' press clipping file then has a gap of 13 years, except for a letter in the [Melbourne] *Age* (11/4/01) "**Shame, Melbourne, shame**" claiming that unlike the Melbourne Botanic Gardens, Sydney treats their bats as a priceless natural asset. The issue resurfaced in the *Daily Telegraph* (30/3/05) as "**Outfoxing nature: it's bats or trees. Numbers up as gardens looks for noise solution**". The article also states that the bats have roosted in the Gardens site since the beginning of white settlement, and mentions most of the methods – sprinklers, python poo, chilli and shrimp paste and noise [also plastic bags] used in the effort to remove them. An article in *The Australian* (10/3/06) "**Gardens bats keep hangin' around**" – mentioned that about 200 bats have been feeding there since the 1890s. The *Daily Telegraph* published a letter ((27/4/06) headed "**Harmful bats**", and posted an article on its website (14/5/07) headed "**Flying squad's nightly victims**" (i.e. heritage trees). The site also had a straw poll question 'Are bats a problem in your area?' Even the *Bulletin* (19/6/07) published "**Great Flying fox hunt**", about the latest efforts to move the Botanic Gardens bats, but the journalist's bias was evident in the early line "The smell is appalling".

North Coast Newspapers

While bats inhabit all of NSW, flying-foxes are found in greatest numbers in northern coastal areas, which also have fast-growing human populations. Human contact with flying foxes, especially their camps, as the colonial roost sites are known in Australia, can generate heated local controversy, particularly around conservation, health and amenity issues.

A local area in which we have had a long-term interest is Bellingen, near Coffs Harbour on the north coast of NSW. The region has a long and miserable history of declaring war on flying-foxes, with massive clearing of habitat and over a century of shooting in flying-fox camps (Lunney and Moon 1997). The *Bellingen Courier-Sun*

services the Bellingen Valley, from the Dorrigo Plateau to Urunga on the coast. There is a long-standing flying-fox camp on Bellingen Island, on the bank of the Bellingen River near the centre of Bellingen town, and flying-foxes are abundant with three recorded species (Grey-headed, Black *P. alecto*, Little Red *P. scapulatus*). It is not uncommon for *P. poliocephalus*, and much more recently *P. alecto*, to overwinter in the camp. The Bellingen community has a lot of 'tree changers' and a large 'new age' community (pro-conservation) as well as a traditional rural community base, and the debate about flying-fox issues allows the *Courier-sun* to publish, including letters to the Editor, the full range of views of government, Council, landowners and residents (mostly trying not to offend either side of a polarised community). Issues for the years 1999–[April]2007 were checked for bat references, although our collection was incomplete.

The *Bellingen Courier-Sun* frequently contained bat stories (flying-foxes, not microchiroptera) during the 8 1/2 years of issues reviewed by us. The *Courier-sun* generally produces 49 or 50 issues per year, but not at Christmas and Easter. Our collection ranged from 23 to 43 issues per year, depending on the holiday schedule of our local collector (missing issues noted in discussion below). Since these were often in the summer months, when bat numbers may be at their highest, we may have missed some bat articles, but our collection (290 issues, averaging 34/year, 62 bat-related articles, letters, editorials and advertisements) nevertheless tells the local story. The (relatively) high number of articles reflects the fact that there is a flying-fox camp in the town, and the *Courier-sun's* coverage of flying foxes mirrors fluctuations in the size of the local bat population. Bellingen caravan park (now closed) was sited adjacent to Bellingen Island, and when flying-fox numbers were high, bats would overflow into the park and nearby residents' backyards (e.g. "**Park owners going batty**" [25/4/01]). About 23 (40%) of the articles related to disputes about the caravan park, which closed the access to Bellingen Island citing public liability concerns, and made applications to remove bats and the trees they were using as roosts.

The debate warmed in 2001 with 7 bat articles from our 39 issues (Jan–Feb missing), as bats occupied several trees in the caravan park, and Council entered the debate ("**Move to reduce 'vulnerable' bats**" [Mayor wants NPWS to help reduce bats on Bat Island]). Coverage then subsided for almost three years, with only a dozen or so articles, touching on bat research, Lyssavirus, bat-watching in canoes and the closure of access to Bellingen Island through the caravan park. We found no bat references in the 37 issues we checked for the year 1999, and five in 2000 (Jan–May missing). These included claims (letter, 21/6/00) by a long-term local resident that bats were destroying the Bellingen Island rainforest, a rebuttal from Gwen Parry-Jones (letter, 12/7/00), and an article on the NSW *Threatened Species Conservation Act 1995* listing of Grey-headed Flying-foxes as Vulnerable (22/11/00).

The year 2004 started dramatically for bats with the 14/1/04 front page headlined "**Heat kills bats**" (thousands of flying-foxes died in 42° heat). Another front page article "**Caravan park to close**" (4/2/04) was accompanied by an editorial asserting that bats are the caravan park's

problem. The arrival of thousands of Little Red Flying-foxes in Crown land adjacent to the railway in Urunga was next week's front page headline story (11/2/04), along with 3 letters, 1 supporting the Bellingen caravan park, 1 supporting closure, and 1 denying flying-fox damage to rainforest on Bellingen Island. The Urunga bats provoked a public meeting "Call to relocate Urunga bats" (3/3/04), but 2 weeks later the bats' departure earned only a small article on page 16, "Urunga bats may have moved" (17/3/04).

The conflict over flying-foxes next to the caravan park dominated bat coverage for the next 3 years, until the drought-induced high flying-fox numbers across the north coast in early 2007 reawakened the anti-bat rhetoric (e.g. "Flying fox audit needed urgently" – Coffs Harbour MLA Andrew Fraser calls for an audit of flying-fox numbers and species on the north coast [28/3/07]).

While the *Courier-sun's* coverage of bats (flying-foxes) has been extensive, it has mostly been generated by conflict with humans, and the tone of coverage has contained none of the warmth afforded to coverage of other wildlife, or the local environment generally. We found that this mostly negative reporting has also been a feature of other north coast newspapers.

The 2006/2007 drought brought unusually high numbers of flying-foxes into a number of normally minor camp sites along the NSW north coast. In Coffs Harbour, the long-simmering local resentment about the Coffs Creek bats erupted, culminating in a speech on the subject in the NSW Legislative Assembly by Andrew Fraser, the National Party Member for Coffs Harbour, including (from Hansard 27/6/07) "... problems associated with fruit bat colonies, the stage has been reached at which solutions offered by councils and the government to resolve this problem are totally unacceptable to the residents of the Coffs Harbour electorate...".

The *Coffs Coast Advocate* editorial line was philosophical, even somewhat sympathetic to the bats ("No easy fix for bat problem" [11/1/07]; "Let nature run its course" [17/1/07]), but many local residents were vitriolic in their expressions of opinion (e.g.: "You have to live with it or move ... of all the negatives that come with living with [flying-foxes] the stench has to be the worst" [11/1/07]; "Defenders should try living with the bats" [19/1/07]; "Flying foxes filthy" [13/2/07]; "Bat situation is really bad" [20/2/07]).

Further north, in the Northern Rivers, 2006 was a memorable year for flying-fox conflicts. The *Grafton Daily Examiner* covered the Cave Street, Iluka, bats from the residents' viewpoint, with headlines such as: "A battle to remove Iluka bats" (23/2/06); "Going batty – residents fired up for removal of bats" (24/2/06); "Managing the bats – residents to be polled about solutions" (17/3/06); "Iluka bats have rights – NPWS" (3/4/06) and "Survey to gauge the impact [on people's lifestyles] of Iluka bats" (5/7/06), while the Lismore-based *Northern Star* chipped in with "96% of respondents to postal survey want Iluka bats removed" (18/5/06) and "Iluka mum wants bats tested for fatal disease [hendraj]", following a Queensland National Party call for such tests (4/7/06).

Murwillumbah, Lismore, Casino and Ballina also had flying-fox conflicts during 2006, with the *Gold Coast Bulletin* crossing the border to report "Residents driven batty – Tweed Council votes to help fight 'flying-fox plague' [Dallis Park, Murwillumbah]" (24/5/06), and the Tweed-based *Daily News* reporting: "Carers keen to protect colony" (26/5/06); "Hard road ahead to get rid of bats... NPWS is putting creatures before people" (27/5/06), and the tragic "Bats burnt out" – DECC investigating destruction of bat camp site at Dulguigan, near Murwillumbah, which "will put more pressure on Dallis Park" (26/7/07).

In Lismore, the *Northern Star* reported: "Flying foxes driving Casino people batty ... plague of bats" in Casino (1/3/06); "King hit for flying foxes" – Lismore mayor wants to relocate Rotary Park bats (16/3/06); "Gamble to shoo bat colony" (10/3/07) – moving Rotary Park bats will cost \$125,000, and "Residents say they're going batty" (25/4/07) – complaints to council, NPWS about noisy flying-foxes "falling on deaf ears", about flying-foxes at Little Fishery Creek, Ballina.

Even Singleton, in the Hunter Valley, has an ongoing flying-fox issue in the local Burdekin Park, as described in the *Singleton Argus* (26/6/06) "Bats take another victim" (100 year-old pine tree 'eaten out' by bats); the *Newcastle Herald* (6/2/07) "Shots fired over gun ban on bats" – Singleton Council angry they can't use guns to scare bats, and the *Hunter Valley News* (14/2/07) "Bats maintain hold at park" – about Singleton Council's latest efforts to remove flying-foxes from Burdekin Park.

Bega

Around Bega, in the Eden woodchip catchment of south-east NSW, wildlife has endured unceasing loss and attrition since settlement of the district in 1830 (Lunney 2005, Lunney and Leary 1988, Lunney and Moon 1988, Lunney and Matthews 2002). The *Bega District News* services the Bega Valley and surrounding districts from the escarpment to the coast, an area considered to be towards the southern end of the range of the Grey-headed Flying-fox, although these bats also recently became controversial and unwelcome residents of the Melbourne Botanical Gardens. All issues of the BDN for the years 2003 to 2006 were checked for bat references. There were only four articles mentioning bats over the 4 year period. None were news stories, but all were provided from external sources, including Health Department warnings about Lyssavirus, a WIRES story, and an article about the estimated 18,000 Grey-headed Flying-foxes in Yattah Yattah Nature Reserve. However recent summer visits by flying-foxes to Glebe Park near Bega soon elicited the headlines "Flying foxes raise the ire of nearby residents" (19/1/07) and "Don't approach injured bats" (26/1/07), and letters to the editor: one defending them as vulnerable to extinction and essential forest pollinators (23/1/07), and another suggesting that the Bega Gun Club should cull them (20/2/07).

Consider the coastal forests to the north-east of Bega, around Mumbulla Mountain. These forests contain 16 species of bats, only one of which is the Grey-headed Flying-fox. The other bats are microchiroptera. Two species dwell in caves or old mine shafts, whereas the others are dependent on hollows in old trees (Lunney and

Barker 1986, 1987; Slade and Law 2007). Forests, such as Mumbulla State Forest, have a long history of commercial use (logging) but the forest has never been cleared and converted to farmland (Lunney and Moon 1988). Yet the continuing woodchip operations are taking an ever increasing proportion of the large old trees that most of these bats are vitally dependent upon. Their plight is out of sight for most people and, in large measure, also for those who manage the forests or write policy on this subject. It does require specialist knowledge to see bat habitat, to determine which species live in what locations, and then work out how a forest might be managed for bat habitat in the light of a logging operation. There are two ways of looking at this problem. One is that the general blindness to bats precludes such discussions forming, essential research programs being initiated, and appropriate management guidelines being written, or understood even if produced. The other is that managers have had specialist input since the late 1980s, and the message has been relatively simple: most bats depend on hollows, and hollows take a long time to form. It had become clear by the late 1970s that possums depend on hollows in old trees (widely known as habitat trees), so the bat dependence on tree hollows became a variant on that previous history of management needs for hollow-dependent arboreal mammals. It follows that the managers and policy writers had, by the mid 1990s, grasped that bats also required old growth elements, but simply considered bats to be unworthy of special conservation effort. In that sense, the blindness applies to the need to apply the emerging science about the needs of bats in forests. Even after 35 years of bitter conservation-woodchip battle in the Eden region, an analysis of the role of the newspapers showed little acknowledgement of the importance of wildlife, and bats were even more in the dark as a matter of public concern (Lunney and Moon 1987; Lunney 2005). It seems to us that it will take decades yet before the subject of bats is high on the agenda of those crafting policy and management guidelines for wildlife conservation in commercially logged forest. Thus the 40% of the mammal fauna of these forests near Bega - that is, the bats - will have to wait until well into the middle of the 21st century before they come into their deserved focus. The blindness, as it is cured, will leave many blinking as the subject is dragged out into the light of day as those taking up the call for bat conservation increase in strength and numbers.

Lyssavirus

The discovery, following two human deaths, of the rabies-like Lyssavirus in both flying-foxes and microchiroptera in the mid 1990s galvanised the news media and fuelled anti-bat sentiment across Australia. Government Health Departments regularly, and quite rightly, issue warnings about handling bats, but this also serves to keep a negative view of bats in the public consciousness. Our press file includes the following reports relating to Lyssavirus: *Daily Telegraph* (29/6/96) “**Deadly ‘rabies’ virus found in fruit bats**” (*P. alecto*); *The Land* (24/11/05) “**Tissue analysis – dead bat had rabies**” (*P. poliocephalus* near Maitland); *Daily News* (Tweed Heads) (27/6/06) “**Hendra virus death boosts fears over bat disease**” (refers to Murwillumbah); *Coffs Coast Advocate*

(6/2/07) “**Good deed could have proved fatal, say experts**” (Public Health Unit warning about a recent case where a north coast man rescued a flying-fox & was scratched); *The Armidale Express* (9/2/07) “**In a flap over bad bat bites**” (warning from Hunter New England Health); *Grafton Daily Examiner* (12/2/07) “**Beware bat bites**”; *Goulburn Post* (2/3/07) “**Bat bites could be deadly**”; *Daily Telegraph* (website, 7/2/07) “**Rabies scare after bat bite**” [other papers reported scratch, not bite], including a picture of a microbat with the caption “**Bat out of hell**”. In the hard copy of the newspaper the following day the headline had been changed to “**Bat attack rabies fear**”.

Microbats

Microbats get virtually no mention in the mainstream press. We found a story on the *Daily Telegraph* website (http://optuszoo.news.ninemsm.com.au/article.aspx?id=264455&rss=yes+_cobr=optus) dated 1/5/07, entitled “**Bats have school in a flap**”. A south-west Brisbane school was ‘forced’ to hold classes in demountables because microbats were roosting in the walls of older buildings. In a more balanced response than to most flying-fox incursions, the P&C, parents and elderly local residents claimed the bats had been in the buildings for about 100 years without problems. However, Education Queensland, citing health and safety reasons, moved the students, and was seeking ways to remove the bats.

The phrase ‘bat out of hell’ is widely enough known to allow the *Sydney Morning Herald* (14/8/07) to run a minor headline “**Bats out of heaven**”, for a story about *Rhinolophus hipposiderus* in Ireland refusing to utilise a \$285,000, state-of-the-art, bat shelter built to rehouse a bat colony threatened by a highway development.

Discussion of newspaper coverage of bats

To a large extent Australians have inherited the European cultural aversion to bats. In particular, flying-foxes are disliked by many people in northern and eastern rural Australia because they damage fruit crops, causing an estimated \$20 million damage each year, and sometimes establish ‘noisy, smelly’ camps adjacent to human habitation or in towns. Sometimes this dislike can become extreme, as in “**Bats burnt out – Environmental vandals destroy flying fox home**” (*Daily News* 26/7/07) – a report of locals using chain saws and fire to destroy a campsite hosting some 4000 flying-foxes at Dulguigan, near Murwillumbah in northern NSW. That flying-foxes are major pollinators and seed dispersers, and insectivorous bats are major insect pest regulators, does not seem to make them likeable to the general public.

From the foregoing newspaper analysis, a series of issues fly out as germane to our thesis. Not only is the *Sydney Morning Herald* largely blind to bats, except for the conspicuous problem with the large flying-fox camp in the Royal Botanic Gardens, but local papers are also blind. However, they too are alive with flying-fox controversies. Flying-foxes come in for attention as a matter of human conflict, with the bats struggling to fight off the label of being a pest, whether in rural NSW or the centre of Sydney. The issue of how to deal with

overabundant native fauna has become increasingly recognized as a matter that is not a set of unrelated problems, but rather something where all 50 overabundant native faunal species can be seen in a cohesive management context, including the need for an ethical code of practice in dealing with the range of issues (Lunney *et al.* 2007). With respect to flying-foxes, the dilemma is compounded by these bats being a threatened species as well as being seen as a pest both on crops and where they camp. In fact, it is their camps that attract most of the adverse publicity. Managing these megabats remains the unresolved problem identified when the Grey-headed Flying-fox became both a NSW and a nationally threatened species in May and December 2001 respectively (Eby and Lunney 2002). That debate is more conspicuous in the public domain because of the repeated attention to flying-foxes, but the small microchiroptera are beyond seeing.

Other media

We collected Australian bat references from various places other than those discussed above, including TV and radio shows, conservation, educational and tourist material, and internet searches.

Australian Broadcasting Corporation

ABC radio and television were the best sources of varied and informative bat stories that we found. In particular, **Radio National**⁶ has provided regular, interesting stories about bats covering topics from Ebola to bat courtship, beneficial features and fruit-raiding. This is the one place where bats have been given the coverage that we believe they merit.

ABC TV's **Catalyst** has featured bats from time to time, most notably stories on: Australians' ignorance of microbats even though they make up a nearly a quarter of our native mammal species (<http://www.abc.net.au/catalyst/stories/s1603936.htm> [30/3/06]); how microbats cope with winter (<http://www.abc.net.au/catalyst/stories/s910031.htm>[24/7/03]); and "**Is the flying fox a cute, intelligent mammal in need of protection, or a devastating pest that should be shot?**" (<http://www.abc.net.au/catalyst/stories/s648661.htm> [15/8/02]).

A story appeared in **Catalyst** on 30/8/07, as we were drafting our view of the public's blindness to bats, titled: "**The life saving qualities of Vampire Bats**". The lead line was: "Vampire Bats have copped a fair bit of press, but new research suggests that a protein found in the saliva of these blood-sucking creatures may actually hold the key to treating victims of stroke." The **Catalyst** reporter, Graham Phillips, visited "world renowned blood-clot expert Professor Robert Medcalf whose team is turning this remarkable discovery into a treatment for a devastating affliction that strikes, on average, 1 Australian every 10 minutes." The account proceeded with the details of the laboratory side of the matter, and the entire account finished with the most brilliant of quotes by professor Christopher Bladin: "Well vampire bats you have to love them I mean they've got a range of novel pharmaceutical drugs inside them ... so they're an

animal dear to my heart and more importantly dear to my brain." (<http://www.abc.net.au/catalyst/stories/s2019362.htm>, accessed 1/9/07).

A search for bat stories on **The Science Show** elicited 5 stories dedicated to bats (1998, 1998, 2002, 2003, 2003), covering bat diseases, flying-fox sex and Papua-New Guinea bats, as well as quite a number of incidental references (accessed 3/1/09). **Ockham's Razor** also makes occasional references to bats in the context of many more general themes (<http://www.abc.net.au/rn/ockhamsrazor/>), as does the discontinued **Earthbeat**.

The Internet

We searched [Internet Search Engine] Google Australian sites on 3/8/07 for the terms 'bats', 'flying fox' and 'fruit bat'. Some other material cited in this paper was obtained through a world Google search for 'bats' or 'batman'.

'**Bats**' produced 476,000 hits. Sponsored links were Bat World Sanctuary, WIRES, Halloween bat and owl information for kids (audubon.org) and bargain baseball and cricket bats. The first 5 pages listed 50 sites, of which 31 related to living bats, and the rest to unrelated uses such as cricket pages.

'**Flying fox**' produced 167,000 hits. Sponsored link was eBay site. The first 5 pages listed 49 sites, of which 35 relate to *Pteropus* and the rest to unrelated uses of the term, e.g. Flying Fox Backpackers, Katoomba etc.

'**Fruit bat**' elicited only 14,800 hits, with no sponsored links. The first two pages indicated that all (most) hits were relevant. Sites included government and conservation/information, but there was a greater proportion of 'non-authoritative' sites brought up by the perhaps more colloquial term.

Sites listed by Google included: government departments and authorities (Commonwealth Department of Environment and Heritage [multiple sites], CSIRO [multiple sites], NSW NPWS, Dept. Primary Industry and Wildlife Tasmania [multiple sites], Queensland Parks and Wildlife Service, Australian Museum [multiple sites], Qld EPA, DSE Vic., nrm.nsw.gov.au, Coffs Harbour City Council [draft Coffs Creek flying-fox camp strategy] and Victorian Museum); educational institutions (CSU, ANU, JCU, UNSW, UQ, NT Uni, Vic. Dept. Education); media (ABC/science, The Age, Brisbane Courier-Mail.); conservation groups (Ku-ring-gai Bat Conservation Society Inc., WWF, Noah's Ark.org, bellingon.com/flying-foxes, austrop.org, australianfauna.com); a reptile park, and Cadbury.com. We also found, for kids, sites such as www.abc.net.au/schoolstv/animals/FRUITBATS.

It is an important point that authoritative information is available from a wide variety of sources at the click of a button, but the mainstream media seem not to use it (or even misuse it, e.g. see Martin 2003).

Burke's Backyard

Infotainment also has a very important role to play as, for example, in the following quote from *Burke's Backyard*: ([http://www.burkesbackyard.com.au/1999/archives/25/conservation and the environment/ bats in your backyard](http://www.burkesbackyard.com.au/1999/archives/25/conservation%20and%20the%20environment/bats%20in%20your%20backyard), accessed 16/8/07).

⁶ <http://www.abc.net.au/rn/scienceshow/>

Further information

The bat is a fascinating creature that has appeared in the belief systems, art, literature, film and even recipes of people for centuries. You might not realise it, but bats will probably have visited your backyard at some stage this year. There are 966 species of bat in the world, and 90 of those are found in Australia. They come in all sizes, from a tiny Malaysian bat the size of a bumble-bee, to a huge bat from New Guinea with a wing span of almost 2 metres (6'). The fossil record shows that bats evolved as flying animals at least 60 million years ago. They are the only mammals that can fly, and the bone structure of their wings resembles that of an elongated human arm and hand. Bats are divided into two major groups, the megabats and the microbats.

Australian bats have the potential to carry the deadly lyssavirus that can be transmitted to people through blood or saliva. Anyone handling bats should be vaccinated. If you're bitten or scratched wash the wound immediately with soap and water and seek medical advice.

If you want to know more about these amazing creatures visit **Bats**, a major exhibition on now at the Australian Museum and continuing until 12 February 2000."

Bat Tourism

Nature tourism has a role to play. Below are some extracts from many examples of bat-based informative ecotourism. The potential for attitude improvement is huge, but limited to those who seek sometimes remote, nature-based, tourist experiences.

Bats liven up night-time tourism: They are associated commonly with vampires but those little understood creatures of the night, bats, could be destined to make an impact in Australia's burgeoning industry of night time tourism. In the far west of New South Wales and the Flinders Ranges, German researcher Isabelle Wolf [PhD student, currently at Fowlers Gap Research Station north of Broken Hill, doing a thesis related to night time tourism and its impact on wildlife] says [echo location] technology allows tourists to spot bats in the wild more accurately. She says it provides a thrill for tourists out in the field." (Andrew Collins, ABC Rural, SA, 08/05/07)

In Naracoorte Caves National Park there are daily guided tours of three caves – focusing respectively on fossils, limestone formations, and bats. Much thought has gone into the way the caves are managed and made available for public access. Some tours are widely accessible: in the Alexandra

Cave, the steps and slopes are easy, the tour is short, and the commentary is suitable for kids. The Bat Tour includes the wheelchair-accessible Bat Observation Centre, at which visitors can sit comfortably watching, courtesy of infra-red cameras, the daily activities in the colony of Southern Bentwing Bats.

(*The Adelaide Review*, April 2004)

One of the most spectacular falls [in Litchfield National Park], Tolmer Falls cascades over two high escarpments into a distant, deep, plunge pool. The bottom of the Falls is home to several colonies of rare Ghost Bats and Orange Horseshoe Bats. Open year round. No camping is available.

(<http://www.tourismtopend.com.au>, accessed 4/8/07)

In Undara Volcanic National Park visitors tour the world-renowned Undara lava tubes, formed by a massive eruption 190,000 years ago resulting in the longest flow of lava from a single volcano. Throughout the year, insectivorous microbats live in the Lava Tubes and on occasion come out to feed at night. The emergence of many thousands of bats on dusk is an amazing experience. Imagine thousands of tiny creatures flying past you at incredible speed, using their radar so that even in pitch darkness they will never run into you. In the warmer months (Dec – March), the number of bats increases. In a spectacular sight, Brown Tree Snakes (also called Night-Tigers) lie in wait in the trees, and reach out to catch the bats as they fly out of the Lava Tubes en-masse to feed.

(<http://publicityship.com.au/newsroom/hidden-jewel-winners-release/>, accessed 4/8/07)

Capricorn Cave Tour is the premier nature based attraction in Central Queensland. Here you can explore spectacular caves in a limestone ridge and spot little insectivorous bats in certain seasons. These magnificent caves are located north of Rockhampton and winner of many major tourism and environment awards and eco-tourism accreditation. After your tour, enjoy refreshments at the Caves Kiosk or a drink from the licensed Bat Bar, a swim in the pool or cook up a barbecue. A visitor centre provides fascinating information about the local geology, bats and community history. (queenslandholidays.com.au, accessed 4/8/07)

But ... a warning note about bat ecotourism from Charles Sturt University batcall website (accessed 4/8/07):

Unfortunately many [bat] roost sites are today threatened by disturbance from tourism, recreational caving, mineral exploration and mining activities. Safety concerns and the management of visitors in old mine sites is a major issue for land management agencies and has, in the past, been



Bat tourism is an essential part of efforts to dispel myths and change public attitudes to bats

addressed by the relevant agency through the rehabilitation of sites which often involved the destruction or sealing of old mines, sometimes at the expense of any bat populations which may have been resident.

Bat-minded: the bat exhibition at the Australian Museum in 1999–2000

There is always a need for authoritative, scientifically based information about bats to be easily and entertainingly available to the public. The Australian Museum's 1999/2000 'Bats' exhibition filled this need, billed as: "Threatened and misunderstood, bats are the subject of the Museum's latest exhibition." This statement was next to the dramatic photo of a flying-fox in *Muse*, the magazine of the Australian Museum Society (TAMS) of the October–November 1999 edition. The cover featured a brilliant photo of a grey-headed flying-fox and inside the cover was an amusing piece by the then director, Michael Archer. It reads as follows: "The Australian Museum is about to go batty, in the nicest possible way. Although a dedicated devotee of the pouch, the irresistible charms of bats have frequently come close to seducing me away from my love affair with marsupials. No other group of mammals has such a vast range of beguiling, fascinating, even incredible faces." "The Australian Museum has had many staff and associates whose research wrapped loving wings around bats. Ellis Troughton, Basil Marlow, Dr Tim Flannery, Dr Harry Parnaby and many others working with the Mammal Section have discovered and named dozens of new and beautiful species as well as populations of rare and endangered kinds. While a 'chiropterophile' herself, Dr Suzanne Hand, the bat exhibition's Scientific Consultant, has spent years exploring Australia's ancient rocks in an amazingly successful search for the ancestors of our living bats, discovering a weird array that spans 55 million years."... "as Sydney will see in September, the members of the Production Team for 'Bats' have created a simply stunning experience." The magnificent photos, the engaging writing by Mike Archer, and the succinct statement "threatened and misunderstood", made for a great lure to the exhibition. It too was a great success, including a wonderful display of live flying-foxes. Such exhibitions, and publications such as the *Muse* edition foreshadowing the exhibition, are among the very best ways to shift public opinion about bats.

Educational opportunities based on the best research by active researchers, and skilled exhibitors and educators, are rare, hard to prepare and hard to assess. Besides the opinion of the writers of this paper, who remain deeply appreciative of the exhibition and what it achieved, there was a study at the Australian Museum on education that drew on the bat exhibition. It too is instructive. Unlike the bat exhibition, the education item remains on the web. If one were to read the paper out of the context of the exhibition, or the previous paragraph, the comments would not be as telling. When we reread these education

notes, we became even more convinced of the immense contribution of this exhibition to curing the blindness to bats that is so pervasive in our society. We need the exhibition to be redone, made permanent (and updated) and designed to travel through rural NSW. Here are excerpts from this education paper in relation to the bat exhibition.

Making a Difference: What Have We Learned About Visitor Learning?

Learning is a key issue for museums to address. The [Australian] Museum aims to excite visitors' minds about natural history, cultural heritage and the interaction of human cultures with the environment. The Museum has implemented a vigorous program of audience research over the past five years using a variety of quantitative and qualitative methodologies, including visitor surveys, depth interviews, focus groups, tracking and observational studies (Kelly, 2000a).

Learning is facilitated by 'real stuff' and living exhibits. In a front end study for an exhibition on bats (1999) visitors thought that live bats were essential to get up close to these creatures to see more about how they behave and, therefore, enhance learning.

Learning is new information. 92% of visitors surveyed for the Bats exhibition could name facts that they learned relating to diversity, cultural aspects of bats, vampire bats, live bats, biology and behaviour: "[I'm] surprised that they do have sight."

Learning is changing your point of view. 43% of visitors to Bats said that their views about bats had changed – they liked or understood them more after visiting the exhibition: "[I'm] not so afraid, they're gentler than I thought, only usually see them overhead."; "[I have] more knowledge and understanding of their role in ecology."; "[there's a] bat colony at home I disliked, now I've changed my perception." Interestingly, 54% of visitors said that their views about bats had not changed because they already knew things about bats or had a positive attitude towards them.

(Lynda Kelly, April 2000 (© Australian Museum Audience Research Centre), www.austmus.gov.au/amarc/pdf/research/learning_web.pdf accessed 8/8/07).

The conclusion we draw is that the Australian Museum did go batty in the nicest possible way in September 1999. We ask you, dear reader, are you one of the 43% that would have changed your views, or among the 54% that already had a positive attitude towards bats? Such exhibitions should be in courses for foresters, indeed all land managers, and catchment managers, environmental officers in councils, and biology teachers.

There is hope for a turnaround in public attitudes to bats. Bats are part of a growing awareness and interest in urban wildlife, and because they can fly, both megachiroptera and microchiroptera frequent urban areas. This interest in bats in backyards is consistent with the sterling work of the Ku-ring-gai Bat Conservation Society, see <http://www.sydneybats.org.au/cms/>.



Discussion

When we began our investigation, we thought that we would be entering a long, dark tunnel with a few barely discernible bits of information. We found scant attention to bats (especially microchiropterans) in the mainstream press. The little coverage there is has primarily been periodic negative campaigns against flying-foxes, especially in local newspapers in districts where they occur. Microchiroptera are rarely mentioned, although the Ghost Bat has appeared on an Australian stamp. We were not surprised that bats are under-reported, particularly in major newspapers and on TV, nor at the sustained dislike of flying-foxes in rural NSW, but we were surprised at how rich is the international spread of ideas, images and cluttered thinking. Bats are part of our cultural tradition, and when we held our focus on bats, we found glimpses in all sorts of places. We trust our story begins to peel back our Australian cultural blindness to bats.

It is clear that the public's attention is not directed to bats, particularly microchiroptera, by the print media, unless there is a local conflict, and the coverage then contains large amounts of negative, hate-filled and misinformed opinion from those who dislike or fear bats. People looking for information about bats would do well to look beyond traditional media sources. The internet provides the depth and breadth of information which we would wish to be available to the general community, however, for bats, this search mechanism is haphazard and lacks quality control. We found almost a million 'hits' were generated by Google (Australia) to the search terms 'bats', 'flying-fox' and 'fruit bat'. Sites listed included government departments and authorities, CSIRO, education institutions, conservation groups, media, fauna parks, Bacardi.com and Cadbury.com. Links contained within the abovementioned Google sites multiply the number of sources of information through the world-wide web.

Books and scientific papers about bats in Australia are available, but there is a gulf between the scientific community with its academic papers, and the popular vision. Some children's books are remarkably good at conveying an honest portrait of the lives of bats, but this benefit is countered by the negative images abounding in kid's entertainment. e.g. Sesame Street's Count (à la Dracula), and even the review of the latest Harry Potter book commented on above (SMH 28/7/07).

The nature of the perceptions of bats in the old world (Europe) has been the major influence on the perceptions of bats in Australia. The difference in Australia has been the presence of flying-foxes, but their vast numbers ranked them, with other Australian wildlife that was a threat to rural interests, as pests with little inherent value. The treatment of human-bat conflicts as media events rather than a scientific problem is unproductive. The distinction between microchiroptera and flying-foxes is blurred by the generic use of the term bats, and both suffer from any negative press which the other group gets. As bat researchers and wildlife managers, however, we are dealing with two different groups of mammals, with different problems and different solutions.

Changing attitudes to bats is, we think, a generational change issue, as existing prejudices may be rusted on to those who hold them. We may never make a significant

dent in the perceptions of those living alongside flying-fox camps. These vitriolic local battles do more harm than good to the public image of flying-foxes, promote bad policy, and also take away attention from the bigger management picture of protecting and increasing habitats away from human settlements. Studies into the sociology of bats would prove to be rewarding, and would show that the link between mythology and bat biology is tenuous indeed. There is a rich international culture here to draw upon. Further, a media analysis, using sociological methods, would yield much in the analysis of flying-foxes, and give some clues as to what it is about bats that raises such a barrier to careful thought by a public that is increasingly interested in conserving biodiversity.

While bats (microchiroptera) have long been known to be potential carriers of rabies in the northern hemisphere, the discovery of Bat Lyssavirus in both flying-foxes and insectivorous bats in the late 1990s, following two human deaths, and the subsequent publicity by health authorities, has further damaged the image of bats in Australia. The issue resurfaces regularly, particularly in the context of reporting human-bat conflicts. The tabloid press's lack of basic bat knowledge is exemplified in the comment "The [lyssa]virus is common in fruit bats in Europe ..." (*Daily Telegraph* 29/6/96).

Conclusions

Our conclusion is that the public has a blindness to bats, and therefore to the issues surrounding their conservation and management. We did find that people do care about individual bats, and that education helps counter the negative perceptions. Our concern is that the general community, and consequently policy writers and land managers, remain largely ignorant of bats, their ecology, status and management needs, despite the much greater interest and knowledge in scientific and conservation circles.

These conclusions will not be new or surprising for those who have been involved with bats for any length of time. As Wilson (1997) put it: "Bats elicit an immediate and strong reaction from most people. Historically, that reaction has been almost uniformly negative, and bat populations have suffered as a result." What is new is the finding that little progress is being made in the battle for better press for bats, despite the ready availability of good information in the scientific literature, the internet and on kids' bookshelves.

We return to education and research as the primary formula for seeking to understand and manage bats. This approach has been recognized and tested for half a century in relation to wildlife in NSW. Bats have remained one of the harder cases. The cryptic nature of the small, nocturnal microchiroptera (small, dark, noiseless to the human ear), and the acknowledged grandness but sometimes irritating nature of flying-foxes, especially their camps, has proved beyond the scope of the standard education programs to date to redress the prejudice about bats. The little that has been done in Australia has been brilliant, such as the 1999 Australian Museum exhibit and the sustained effort on flying-foxes by the Ku-ring-gai Bat Conservation Society, but the total effort has been

so far below the threshold for the long-term survival of bats that there needs to be major initiatives in education and research for bats to be assured of their continuing place as part of Australia's complement of native fauna. It is readily conceivable that many species will continue to decline, and some become extinct, without there being any record.

Rather than turn away from the rich heritage of prejudice about bats, it is our view that such bizarre interpretations of this magnificent order of animals can be the springboard to their salvation. This could be the basis of a range of education programs, the reason to set up studies of their ecology and management, and the mainstay of public relations programs, perhaps administered by a foundation set up for this purpose. This will, we admit, take courage. There has been far too little novelty in our collective attempts as a nation to see our bats, to appreciate their evolutionary history and breath-taking adaptations to life in our forests, caves, rainforests and riparian strips on our arid zone rivers. There is also the critical matter of their keystone role in our native ecosystems. Flying-foxes disperse rainforest seeds, pollinate native plants and thereby provide a vital ecosystem service that, if costed, would be a multimillion dollar contribution to an ecologically sustainable Australia.

Research on bats should not be stalled by the general blindness to bats, yet researchers need to take care to explain how their research contributes to conservation issues across the board. While a burden does fall on researchers to let others know of their work and its implications for conserving biodiversity, land and forest management and policy development, there is also a need for non-bat biologists, policy writers and land managers, as well as teachers, to gain a little more insight and appreciate the evolutionary place of bats as the only flying mammals, considering that a quarter of Australia's mammal fauna is bats. In this context, societies, particularly the Australasian Bat Society, are a major

contributor and represent the interests and ideas of our bat researchers and bat conservation specialists (<http://batcall.csu.edu.au/abs/absmain.htm>, last accessed 25.01.10)

Research into bats in Australia has rested on the shoulders of so few people that we can list them easily, and we are all indebted to such pioneers as Les Hall, Greg Richards and Elery Hamilton-Smith who were present and active at the April 2007 ABS-RZS bat conference. There are others, such as Peter Dwyer, who put Australia on the international map in the 1960s, and Dedee Woodside who, with Greg Richards, convened the first national bat conference. This conference, in 1980, was the catalyst for us to tackle bats as a group of native fauna likely to be affected by woodchipping. The studies in the 1970s on the effect of woodchipping on the fauna did not include bats, and for us to have left them out would have been acceptable at the time. With hindsight, studying them provided great insight into the ecology of the forest and the impact of the intensive logging operations (Lunney and Moon 1988). The point here is not to cover the logging story, but to highlight that one definite act by one person, or small group, can inspire others to take up the cause and, in doing so, produce sound science, conserve bats and attract others to the subject. The book in which this paper sits is yet another endeavour to promote the conservation of bats through research and education. The writing of this paper was, in fact, motivated to assist in this cause. We have enjoyed the research, laughed out loud at some of the zany things we found, and gritted our teeth as blind prejudice has harmed the cause of bat conservation. We conclude that there is now a growing band of good bat biologists to help advance the cause: that bats are a fabulous subject for educational programs and a rich source of scientific investigation, from fossils and reflections on evolution to ecology in commercial contexts, to support the frontline fight to conserve our forests and our caves, and to live in a sustainable society for the next 1000 years.

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References

- Allen, G. M. 1939. *Bats*. Dover Publications, New York, USA.
- Altringham, J. 2007. *Preface. On a bat's wing. Poems about bats* edited by M. Baron. Five Leaves Publications, Nottingham, UK.
- Baron, M. (ed.). 2007. *On a bat's wing. Poems about bats*. Five Leaves Publications, Nottingham, UK.
- Bash, B. 1993. *Shadows of night. The hidden world of the Little Brown Bat*. Sierra Club books for Children, San Francisco, USA.
- Berger, M. and Berger, G. 2000. *How do bats see in the dark?* Scholastic, Broadway NY, USA.
- Bewick, T. 1790. *A general history of quadrupeds*. A Windward reprint 1980, W.H. Smith and Sons, London, UK.
- Bright, M. 2006. *Beasts of the field. The revealing natural history of animals in the Bible*. Robson Books, London, UK.
- Byrne, D. 1987. The Aboriginal and archaeological significance of the New South Wales rainforests. A report to the Forestry Commission of New South Wales and The Australian Heritage Commission. Forestry Commission of New South Wales.
- Campbell, C. A. R. 1925. *Bats, Mosquitoes and Dollars*. Reproduced by Photo-lithography 1955 by Lee foundation for nutritional research Milwaukee 3, Wisconsin, USA.

- Churchill, S. 2008. *Australian bats (second edition)*. Jacana/New Holland, Crows Nest, NSW, Australia.
- Cleave, A. 1999. *Bats. A portrait of the animal world*. Todtri publishing, New York, USA.
- Condor, P. 1994. *With wings on their fingers: an intimate view of the flying fox*. Angus & Robertson, Sydney.
- Currey, J. 2004. *Joseph Banks. Some account of that part of New Holland now called New South Wales*. Edited, with an introduction by John Currey. The Banks Society, Colony Press, Malvern Victoria, Australia.
- Davies, N. 2004. *The Bat that loves the Night*. Candlewick Press, Cambridge Massachusetts, USA.
- Eby, P. and Lunney, D. (eds). 2002. *Managing the Grey-beaded Flying-fox as a threatened species in NSW*. Royal Zoological Society of New South Wales, Mosman, NSW.
- Fenn, P. 2002. An investigation of the issues raised for the construction industry in the United Kingdom by bats. RICS Foundation, London. Electronic Ref. PS0411.
- Fenton, M. B. 2001. *Bats (revised edition)*. Checkmark Books, New York, USA.
- Gold, A. 2009. Destroying species: a literary perspective. *Southerly* 69: 113–122
- Gordon, D. G. 1996. *The Compleat Cockroach: a comprehensive guide to the most despised (and least understood) creature on earth*. Ten Speed Press, Berkeley, California, USA.
- Graham, G. 1994. *Bats of the World*. A Golden Guide. St Martin's Press, NY, USA.
- Hall, L. 2009. *Bats*. Steve Parish publishing, Archerfield, Queensland, Australia.
- Hall, L. S. and Richards. G. C. 1979. *Bats of eastern Australia*. Queensland Museum booklet No 12, Brisbane, Queensland, Australia.
- Hand, S. J., 1993. *A Cloud of Bats*. Ashton Scholastic: Lisarow, NSW.
- Hutson, T. 2000. *Bats*. Voyageur Press, Stillwater MN USA.
- L'Hommedieu, A. J. 1997. *Misunderstood: Bats*. Child's Play (International Ltd.) Swindon.
- Houlihan, P. 1996. *The animal world of the Pharaohs*. Thames and Hudson, New York, USA.
- Ley, W. 1968. *Dawn of zoology*. Prentice Hall International, London, UK.
- Lunney, D. 2005. The Eden woodchip debate, part 2 (1987–2004). Pp 265–324 in Proceedings of the 6th National Conference of the Australian Forest History Society, edited by M. Calver *et al.* Millpress, Rotterdam, Netherlands.
- Lunney, D., and Barker, J. 1986. Mammals of the coastal forests near Bega, New South Wales. I. Survey. *Australian Zoologist* 23:19–28.
- Lunney, D., and Barker, J. 1987. Mammals of the coastal forests near Bega, New South Wales. II. Annotated checklist. *Australian Zoologist* 23:41–49.
- Lunney, D. and Leary, T. 1988. The impact on native mammals of land-use changes and exotic species in the Bega District (New South Wales) since settlement. *Australian Journal of Ecology* 13: 67–92
- Lunney, D. and Moon, C. 1988. An ecological view of the history of logging and fire in Mumbulla State Forest on the south coast of New South Wales. In: *Australia's Ever Changing Forests: Proc. 1st Nat. Conf. on Australian Forest History*, edited by K. Frawley and N. Semple. Australian Defence Forces Academy, Campbell, ACT.
- Lunney, D. and Moon C. 1997. Flying-foxes and their camps in the remnant rainforests of north-eastern New South Wales. In: *Australia's Ever Changing Forests III: Proc. 3rd Nat. Conf. on Australian Forest History*, edited by K. Frawley, J. Dargavel. C.R.E.S., A.N.U., Canberra.
- Lunney, D., Reid, A. and Matthews, A. 2002. Community perceptions of flying-foxes in New South Wales. Pp 160–75 in *Managing the Grey-beaded Flying-fox as a threatened species in NSW* edited by P. Eby and D. Lunney. Royal Zoological Society of New South Wales, Mosman, NSW.
- Lunney, D. and Matthews, A. 2002. Ecological changes to forests in the Eden region of New South Wales. Pp 289–310 in J. Dargavel, D. Gaughwin and B. Libbis (eds) *Australia's ever-changing forests V: proceedings of the Fifth National Conference on Australian Forest History*. Centre for Resource and Environmental Studies, Australian National University, Canberra.
- Lunney, D., Matthews, A., Stein, J. A. and Lunney, H. W. M. 2003. Australian bat research: the limitations of *The Action Plan for Australian Bats* in determining the direction of research. *Pacific Conservation Biology* 8: 255–260.
- Lunney, D. Baker, J., Matthews, A., Waples, K., Dickman, C. and Cogger, H. 2007. Overabundant native vertebrates in New South Wales: characterising populations, gauging perceptions and developing an ethical management framework. Pp 158–73 in Pest or Guest. The zoology of overabundance, edited by D. Lunney, P. Eby, P. Hutchings and S. Burgin. Royal Zoological Society of NSW, Mosman, NSW.
- Lunney, D. and Moon, C. 2008. The portrayal of human-wildlife interactions in the print media. Pp 52–64 in *Too close for comfort: Contentious issue in human-wildlife encounters*, edited by D. Lunney, A. Munn and W. Meikle. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.
- Macdonald, D. W. (ed.) 2009. *The encyclopedia of mammals*. Oxford University Press, Oxford, UK.
- Martin, L. 2003. On the transmission of bat diseases by the media – a view from the trenches. *Australian Zoologist* 32: 298–315, in the proceedings of the *Zoology and the Media* forum, edited by D. Lunney, A. Matthews and P. Wilson. *Australian Zoologist* Vol 32, No 2, 2003.
- Mason, A. 2003. *Bats*. Kid Can Press, Toronto, Canada.
- Morecroft, R. 1991. *Raising Archie: the story of Richard Morecroft and his flying fox*. Simon and Schuster, East Roseville NSW and the ABC, Australia.
- Parnaby, H. and Hamilton-Smith, E. 2004. The remarkable “Adaptable Bat”: a challenge to ecological concepts in the management of Australian forest bats. Pp 81–93 in *Conservation of Australia's Forest Fauna* (Second edition). Royal Zoological Society of New South Wales, Mosman, NSW, Australia.
- Pickering, F. 1999. *Encyclopedia of animals in nature, myth and spirit*. Element children's book, Dorset, UK.
- Robertson, J. 1990. *The complete bat*. Chatto and Windus, London, UK.
- Savage, S. 2004. *Animal Neighbours. Bats*. Hodder Wayland, Hove UK.
- Simon, S. 2005. *Amazing Bats*. Sea Star Books, San Francisco, USA.

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- Slade, C. and Law, B.** 2007. Seasonal changes in bats at a derelict mine in southern New South Wales. *Australian Zoologist* 34:173–180.
- Smith, M. C.** 1977. *Nightwing*. Book Club Associates, London, UK.
- Stoker, B.** 1897. *Dracula*. Originally published by Archibald Constable and Co, UK, but now available in facsimile editions.
- Toynbee, J. M. C.** 1973. *Animals in Roman life and art*. John Hopkins University Press, Baltimore, Maryland, USA.
- Tuttle, M. D.** 2005. *America's Neighborhood Bats*. (Second edition). University of Texas Press, Austin, Texas, USA.
- Van Dyck, S. and Strahan, R. (eds).** 2008. *The mammals of Australia*. (third edition). New Holland, Chatswood, NSW, Australia.
- White, S.** 1997. *Caring for Australian wildlife*. Australian Geographic, Terrey Hills, NSW, Australia.
- Williams, K. and Mies, R.** 2002. *Beginner's Guide to Bats*. Little, Brown and Co. NY, USA.
- Wilson, D. E.** 1997. *Bats in Question. The Smithsonian answer book*. CSIRO publishing, Collingwood, Victoria, Australia.
- Wootton, A.** 1986. *Animal folklore, myth and legend*. Blandford Press, Dorset, UK.

