

Three wise men – Alex MacLeod, Nick White and Trevor Maddock show just how hard bat counting can be. Alex and Trevor were involved in bat work in the 1970's. Their qualitative observations confirm the decline in population.



## NARACOORTE CAVES' BATS LISTED AS CRITICALLY ENDANGERED

- Steve Bourne

The Southern Bent-winged Bat *Miniopterus schreibersii bassanii* has recently been listed as critically endangered by the Minister of Environment.

Previously the subspecies was listed as conservation dependant and this new listing recognises the decline the bat has suffered over four decades. Only four mammals were placed in the critically endangered category, with three bats among these.

The information used for the nomination and subsequent listing has been the work of several researchers. Below is the advice provided Minister upon which the assessment as made. This uses 'Bent-wing' rather than the Australasian Bat Society endorsed 'Bent-winged' that we use in all literature on the park.

**Advice to the Minister for the Environment, Heritage and the Arts from the Threatened Species Scientific Committee (the Committee) on Amendments to the list of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

### **1. Scientific name (common name)**

*Miniopterus schreibersii bassanii* (Southern Bent-wing Bat)

### **2. Reason for Conservation Assessment by the Committee**

This advice follows assessment of information provided by a public nomination to transfer the Southern Bent-wing Bat from the conservation dependent category to the endangered category of the EPBC list of threatened species. This is the Committee's second assessment of the subspecies under the EPBC Act.

### **3. Summary of Conclusion**

The Committee judges that the subspecies has been demonstrated to have met sufficient elements of Criterion 1 to make it **eligible** for listing as **endangered**. The Committee judges that the subspecies has been demonstrated to have met sufficient elements of Criterion 2 to make it **eligible** for listing as **critically endangered**. The highest category for which the subspecies is eligible to be listed is **critically endangered**.

### **4. Taxonomy**

In Australia three subspecies of *Miniopterus schreibersii* are recognised: *Miniopterus schreibersii oriana*, *Miniopterus schreibersii oceanensis* and *Miniopterus schreibersii bassanii* (the Southern Bent-wing Bat). The Southern Bent-wing Bat is currently recognised as a subspecies (Cardinal and Christidis 2000; Reinhold *et al.* 2000) and its taxonomy is accepted.

Bec Wood has commenced a PhD with the aim of resolving the taxonomic status of the Southern Bent-winged Bat.



Bec Wood's project includes banding a small number of bats.



## 5. Description

The Southern Bent-wing Bat is an insectivorous cave-dwelling bat. The subspecies has dark reddish-brown to dark-brown fur on the back, slightly lighter on the belly. It has a distinctly short muzzle and domed head. The ears are short, rounded and roughly triangular. The last phalanx on the third finger of the wing is about four times the length of the middle phalanx, giving a bent wing appearance (Churchill 1998).

## 6. National Context

*Miniopterus schreibersii* is found across parts of Europe, Africa, the Middle East, Asia and Australia.

In Australia three subspecies are recognised. *Miniopterus schreibersii orianae* is found in the north of the Northern Territory and north-eastern Western Australia. *Miniopterus schreibersii oceanensis* is found along a coastal band on the east coast of Australia from Cape York in Queensland to Castlemaine in Victoria.

*Miniopterus schreibersii bassanii* (Southern Bent-wing Bat), is found in south-eastern South Australia and western Victoria (Cardinal and Christidis 2000).

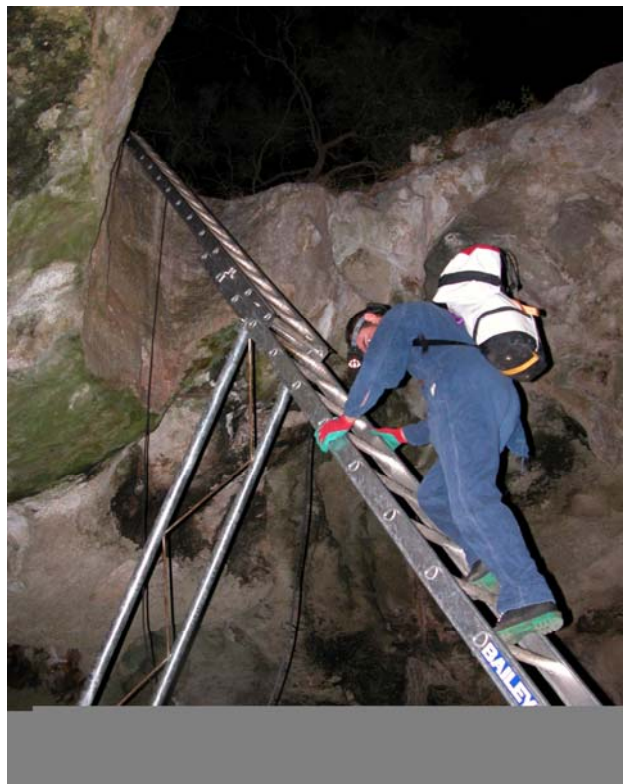
## 7. Relevant Biology/Ecology

The generation length for the Southern Bent-wing Bat is estimated to be 5–7 years. During the colder months of the year, April to August, the Southern Bent-wing Bat is dispersed over a wide region of south-eastern South Australia and western Victoria. Over 50 caves are known to be used as wintering sites.

Around late August, the bats commence their annual migration to one of two maternity caves, xxxx cave at Naracoorte in South Australia, and xxxx cave at Warrnambool, Victoria. xxxx Cave is currently protected within Naracoorte Caves National Park which has World Heritage status.

The subspecies is dependent on maternity caves which have specific structural characteristics which allow heat and humidity to build up so that conditions are suitable for the nursing of young babies (Duncan, Baker & Montgomery 1999). Almost the entire population, including males and females, will make the journey from wintering caves to the two maternity sites, stopping at transition caves along the way.

By October, the migration is complete. The majority of the bats (70% to 90% depending on the year) will go to xxxx Cave. Births occur from late October to late November at xxxx Cave and in early December at xxxx Cave. After 4–5 weeks, the young are fully furred and have developed to the stage of flying. At the end of the breeding season they disperse to the wintering sites.



A retractable ladder has been installed in Bat Cave that enable easy access for management and researchers but prevents unauthorised access.

Tim Moulds completed his PhD on the guanophylic invertebrates of Bat Cave



### 8. Description of Threats

Since European settlement, around 90% of the native vegetation over the Southern Bent-wing Bat's extent of occurrence has been cleared. The distribution of the Southern Bent-wing Bat in south-eastern Australia is associated with large natural wetlands and river basins.

In south eastern South Australia, a large artificial surface water drainage scheme, the use of groundwater for irrigation and other agricultural purposes has greatly reduced the area of wetlands available for foraging.

Causes for the observed Southern Bent-wing Bat population decline are not well understood. The discovery of toxic insecticides in bat guano present in the maternity chamber of xxxx Cave, as well as DDT and its metabolites in the bats themselves, suggest that pollutants may be involved.

Extended low rainfall and changes in agriculture patterns and land-use may also be factors. If the latter, some of these changes are not likely to be reversible in the short term, although recent data shows this species preferentially forages over native vegetation and wetlands (Grant 2004), suggesting revegetation programs to provide feeding habitat and corridors could mitigate the decline.

### 9. Public Consultation

The nomination was made available for public exhibition and comment for two months. The Committee has had regard to all public comment that was relevant to the survival of the species.

### 10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the subspecies is **eligible** for listing as **critically endangered** under the EPBC Act. The assessment against the criteria is as follows:

### Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers

Surveys over the species' distribution indicate that the total population size of the Southern Bent-wing Bat has declined. Average estimates of total population size from the 1963/4 counts (approx. 125 000) (Dwyer & Hamilton-Smith 1965), compared to the most recent total population estimates from 2003/4 counts (approx. 40 870) suggest a reduction in the population of approximately 67% within three generations (Reardon 2001a; Reardon 2001b; Reardon 2001c).

These surveys indicate that the population at xxxx Cave has, declined significantly which is of particular concern as 70–90% of bats breed at this site. The 1963/4 count estimated a population size of 112 500 at xxxx Cave, whilst the 2003/4 count estimated a population size of 29 350.



Chris Grant from Deakin University investigated where bats are feeding by attaching tiny transmitters to bats and tracking at night from a plane.



The population at xxxx Cave is also experiencing rapid decline with most recent population estimates in 2004/05 indicating a further decline of 20%. Considering the life history of the species (see Section 7), its reliance on xxxx Cave as a primary maternity site in particular, and the range of threats operating in the subspecies range (see Section 8), the Committee judges this reduction to have been severe. Therefore, the subspecies has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

**Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited**

The area of occupancy for this subspecies is equivalent to the combined area of the two maternity caves which is less than 1 km<sup>2</sup>. The two maternity caves are separated by 220 km, and are therefore severely fragmented. Migrations between the caves are extremely rare (Dwyer 1969), and it is unlikely that a colony would naturally re-establish if lost, even if the cave were intact/repaired. Therefore, the geographic distribution of the Southern Bent-wing Bat is very restricted.

The Southern Bent-wing Bat's extent of occurrence and area of occupancy have declined since European settlement, with the number of breeding colonies declining from the five documented breeding sites (and possibly more) to two breeding caves (see Section 7). Likely factors contributing to the decline include clearance of native bush and open woodlands in south-east South Australia and human disturbance (see Section 8). No re-colonisation of previous breeding caves has yet occurred despite the period since abandonment, highlighting the potential precariousness of the last two remaining breeding caves.

The Committee considers that the subspecies has a very restricted geographic distribution, which is precarious for the survival of the subspecies due to habitat clearance and loss of suitable foraging areas. Therefore, the subspecies has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.

**Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either (a) evidence suggests that the number will continue to decline at a particular rate; or (b) the number is likely to continue to decline and its geographic distribution is precarious for its survival**

As discussed under Criterion 1, the total population size for the Southern Bent-wing Bat is estimated to be approximately 40 870. The Committee does not consider the total number of mature individuals limited to a particular degree. Therefore the subspecies is not eligible for listing in any category under this criterion.

**Criterion 4: The estimated total number of mature individuals is extremely low, very low or low**

As discussed under Criterion 1, the total population size for the Southern Bent-wing Bat is estimated to be approximately 40 870. The Committee does not consider the total number of mature individuals extremely low, very low or low. Therefore the subspecies is not eligible for listing in any category under this criterion.

**Criterion 5: Probability of extinction in the wild that is at least:**

- a) 50% in the immediate future; or
- b) 20% in the near future; or
- c) 10% in the medium-term future.

There are insufficient data available to estimate a probability of extinction of the subspecies in the wild over a relevant timeframe. Therefore, as the subspecies has not been demonstrated to have met the required elements of Criterion 5, it is not eligible for listing in any category under this criterion.

**11. CONCLUSION**

*Miniopterus schreibersii bassanii* (Southern Bent-wing Bat) was nominated for transferring from the conservation dependent category to the critically endangered category of the list of threatened species referred to in section 178 of the EPBC Act. The Committee accepts that there has been a reduction in the Southern Bent-wing Bat population of approximately 67% within three generations. Considering the life history of the species (see Section 7), its reliance on xxxx Cave as a maternity site in particular, and the range of threats operating in the species range (see Section 8), the Committee judges this reduction to have been severe. Therefore, the subspecies has been demonstrated to have met the relevant elements of Criterion 1 to make it eligible for listing as **endangered**.

The Committee accepts that the species has a very restricted geographic distribution, which is precarious for the survival of the species due to habitat clearance and loss of suitable foraging areas. Therefore, the subspecies has been demonstrated to have met the relevant elements of Criterion 2 to make it eligible for listing as **critically endangered**. The highest category for which the subspecies is eligible to be listed is **critically endangered**. This conclusion is based on a review of new information only. Since the subspecies was listed as conservation dependent in 2001 the Committee has considered recent data from 2004 related to declines in population size. The data indicate that despite the current management program the subspecies is still experiencing a severe reduction in numbers. The Committee considers that the subspecies meets the requirements of criterion 1 as endangered and criterion 2 as critically endangered, and therefore the category of conservation dependent is no longer appropriate.

Terry Reardon (left) has been a champion for bats over a long period. His passion and flair captures the imagination of the public.



## 12. Recommendation

The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **transferring** from the **conservation dependent** category to the **critically endangered** category: *Miniopterus schreibersii bassanii* (**Southern Bent-wing Bat**)

### Key references used to assess the nomination

- Cardinal, B. R., & Christidis, L 2000, 'Mitochondrial DNA and morphology reveal three geographically distinct lineages of the large bentwing bat (*Miniopterus schreibersii*) in Australia', *Australian Journal of Zoology*, vol. 48, pp. 1-19.
- Churchill, S 1998. *Australian Bats*, New Holland Publishers, Sydney.
- Dwyer, P. D 1969, '*Miniopterus schreibersii* (Chiroptera) in south-eastern Australia', *Australian Journal of Zoology*, vol. 17, pp. 665-686.
- Dwyer, P. D. & Hamilton-Smith, E 1965, 'Breeding caves and maternity colonies of the Bentwinged Bat in south-eastern Australia', *Helictite*, vol.3, pp. 22.
- Grant, C. M. 2004, 'The conservation biology of the southern bent-wing bat, *Miniopterus schreibersii*' in *13th International Bat Research Conference*, Museum and Institute of Zoology, Warszawa, Mikolajki, Poland.
- Reardon, T. B. 2001, 'Population size estimates and conservation of the Southern Bentwing Bat (*Miniopterus bassanii*) in South Australia', *Report to Wildlife Conservation Fund Committee*, South Australian Museum, Adelaide.
- Reardon, T. B. 2001, Report to the Wildlife Conservation Fund Committee. South Australian National Parks and Wildlife Council, Adelaide.
- Reardon, T. B. 2001, unpublished data.
- Reinhold, L., T. B. Reardon, & Lara, M 2000, 'Molecular and morphological systematics of Australo-Papuan *Miniopterus* (Vespertilionidae: Chiroptera)', in *Australasian Bat Conference*, Tocal College, NSW.

*The xxx caves referred to are of course Bat Cave at Naracoorte and Starlight Cave at Warrnambool, well known to cave people.*

*Conservation advice has also been written and is as presented below. Work has commenced against most of the suggested actions and is summarised in italics.*

### Conservation Advice

This Conservation Advice has been developed by the Threatened Species Scientific Committee based on the best available information regarding the conservation status and threats to this species at the time of listing. However, this Conservation Advice should be used only as a guide for identifying priority conservation actions for this species, and is intended only as an interim measure prior to the development of a Recovery Plan.

The main potential threats to the Southern Bent-wing Bat include changes in agricultural patterns and land-use and associated reductions in suitable foraging habitat, the widespread use of pesticides, extended low rainfall, proximity to windfarm developments, and human disturbance at wintering caves. The local priority recovery and threat abatement actions required for this subspecies are suggested below.

### Habitat Loss, Disturbance and Modification

- Using non-intrusive methods, monitor known breeding, roosting and historic sites to identify key threats.

*Terry Reardon from the South Australian Museum and Chris Grant from Deakin University have conducted video counts at Bat Cave, Naracoorte from 2000 to 2006. Unfortunately a count was not made in January 2007 after the observed deaths of large numbers of pups. The 2008 count was unsuccessful with pups already flying and an accurate number of adults not obtained. Terry has been working with Lastek, an Adelaide based company to develop an automated counting system. This system uses a sheet of light across the entrance of Bat Cave and a computer recording when the light is broken by a flying bat. Further refinement is required however once in place would give daily counts throughout the year, hence not only recording total population but when bats move into and away from the maternity site.*

*Observation of wintering sites is more ad hoc. Mott and Aslin undertook a study of wintering sites in 2001 with the support of cavers, but this provided a snapshot across just one weekend. I have some records of wintering sites, but mostly when large numbers were seen in various caves rather than recording absence. A much more thorough approach is warranted.*

- Monitor known sites to identify any changes in numbers of individuals.

*Bat Cave is the best site for this to occur and the development of the automated system will be a huge bonus.*

- Control known sites in reserve areas to minimise unauthorised public access.

*Bat Cave has a retractable ladder in place that allows easy access for management or scientific purposes. Other caves in the visitor precinct at Naracoorte are also well protected during winter with the exception of Robertson Cave. This cave is about 15 km by road from the park office and adjacent to a well used country road. It is also well known to local residents. In 1994, a man made hole in the roof was repaired in an attempt to restore what is thought to once have been a maternity chamber. Conditions within this chamber began to change with rising temperature and humidity however the protection of a fossil excavation required the installation of a gate to restrict public access. Southern Bent-winged Bats are shy of gates and very few have been seen inside the protected chamber. With access difficult to control at present, it is perhaps not desirable for the bats to re-establish a maternity colony until greater protection can be guaranteed.*

- Minimise adverse impacts from changed land use at known sites.

*Some good work has been completed at several caves off park with large amounts of rubbish removed. This has previously been reported in the ACKMA journal. Although recording bat use is sporadic, bats are regularly seen in each site.*

The regional priority recovery and threat abatement actions required for this subspecies are to:

#### **Habitat Loss, Disturbance and Modification**

- Protect areas of native vegetation that contain populations of the subspecies or which could support populations in the future.
- Manage any changes to hydrology which may result in degraded foraging habitat for the subspecies.

*As the advice to the Minister states, the South east of South Australia is nearly 90% cleared and heavily drained. The need to reverse some of this early work is well understood and many plans are in place. This species will benefit along with many others with a whole of landscape approach to conservation.*

#### **Conservation Information**

- Raise awareness of the species within the local community.

*The Bat Observation Centre at Naracoorte is possibly the best bat interpretation centre anywhere. Recent upgrades in technology have further enhanced the experience. It is perplexing to me that the technology has not been used elsewhere, except at Mulu World Heritage Site where Brian Clark is replicating his Naracoorte system. There has been some recent interest from the United States so perhaps more such facilities are in the pipeline.*

*The Naracoorte Bat Observation Centre has significantly enhanced the visitor experience to the park and there is no doubt visitors leave with a new perspective of bats in general, not just the Southern Bent-winged Bat. The Friends of Naracoorte Caves held a successful Threatened Species Day event focussing of this species in 2002.*

- Investigate possible translocation of individuals to historic sites

*No work has been contemplated on this.*

- Investigate conservation covenants on private land

*Informal arrangement exist with several landowners however the issuing of covenants, perhaps with financial remuneration could enhance the protection of this species. The owners of Cave Park Cave, a significant wintering site, have been extremely supportive of conservation efforts and should be rewarded.*

This list does not encompass all actions that may be of benefit to this subspecies, but highlights those that are considered to be of highest priority at the time of listing.

#### **Priority for the development of recovery plan: High.**

The subspecies has experienced a severe reduction in numbers and is subject to ongoing threats, with one of two maternity caves and all wintering caves occurring on private property with no level of protection.

*This is the only part of the conservation advice that I take exception to. There are several important wintering sites for the Southern Bent-winged Bat within the Naracoorte Caves National Park; the twilight zone of Bat Cave itself, Cathedral, Blanche, Robertson and to a lesser extent, Stick Tomato Cave are all used over winter. Mount Burr Cave is on Forestry SA land although vulnerable. Cave Park and Joanna Bat Cave are on private land but excellent arrangements are in place with the landholders to protect the bats.*

#### **Where to now?**

The research effort to date has included investigating land use change, pesticide residues in bats and guano, guanophylic invertebrate studies, population counts and taxonomic work. The changes to the landscape and dry conditions for the past decade have no doubt had a negative impact on this species. The impact of pesticides remains equivocal and with primary producers much more conservative with chemical use now, it may be impossible to gather any evidence to directly implicate this as a contributing cause for the decline. Conservation efforts have included both on and off park sites. That the species is still in decline is a cause for concern that will require a concerted effort to hopefully halt and reverse.