

## *Nyctophilus corbeni* South-eastern Long-eared Bat

### Taxonomy

*Nyctophilus corbeni* Parnaby, 2009

Until relatively recently this taxon was included as a 'form' within the variable species *Nyctophilus timoriensis*; its specific status was recognised by Parnaby (2009). No subspecies are recognised.

### Current conservation status

Listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* as *Nyctophilus timoriensis* (SAC 2000).

Categorised as Endangered in the 2013 Advisory list of threatened vertebrate fauna in Victoria (DSE 2013).

### Proposed conservation status

Endangered in Victoria

Criteria A3bce+4bce; B2ab(i,ii,iii,iv,v)

This taxon is very rare in Victoria and has a highly restricted distribution. Historically there were a small number of records spread widely across northwestern Victoria, however it is possible that the taxon is now restricted to only one locality, which is in the Nowingi/Hattah Kulkyn NP area. Even within this area the bats appear to be at very low densities. Large areas of long unburnt mallee and woodland habitat appear to be essential for the continuing survival of this taxon. However, under climate change there is a higher greater risk of more extensive and more severe bushfires, which could severely impact both population numbers and habitat suitability for this taxon.

### Species Information

#### Description and Life History

The South-eastern Long-eared Bat is a relatively large solid bat with a broad, robust skull (Parnaby 2009; Schulz and Lumsden 2010). It has a head and body length of 50-75 mm, a forearm length of 40-50 mm and a tail length of 35-50 mm (Reardon 2012). Animals weigh between 11-21 g with females (14-21 g) typically heavier than males (11-15 g). They have long ears, approximately 30 mm in length, which are erect when the bat is alert but fold back when at rest. The fur is a light brown to a dark grey-brown.

This is one of the largest of the long-eared bats in Australia. It is rare in Victoria and little is known of its life history. It typically roosts in tree hollows where individuals typically roost solitarily for much of the year (Lumsden et al. 2008). No maternity colonies have yet been found in Victoria (Lumsden et al. 2011), but elsewhere in their range maternity colonies typically contain 10-20 individuals (Schulz and Lumsden 2012). Other than for maternity colonies, most individuals roost solitarily (Lumsden et al. 2008). Individuals may move frequently between roosts, with an average distance between successively-used roosts of nearly 2 km, which is much larger than for other species of long-eared bats (Lumsden et al. 2008). Home range size is probably large (Lumsden et al. 2008). Breeding is seasonal, with pregnant and lactating females reported in November. Twins are typical for long-eared bats (Reardon 2012).



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### Generation Length

The generation length of the South-eastern Long-eared Bat is estimated to be 4 to 5 years. This is based on reproductive maturity being typically about 10 months for insectivorous bats, and longevity about 8-10 years (Reardon 2012): generation length is taken as the midpoint of these values. A generation length of 4-5 years is also used in the Mammal Action Plan.

### Distribution

The South-eastern Long-eared Bat is widely distributed across inland south-eastern Australia, from central Queensland to far-eastern South Australia, with most of this range within the Murray Darling Basin (Turbill and Ellis 2006). It is absent from more arid areas of far north-western New South Wales (Turbill and Ellis 2006). In Victoria, it is confined to the north-west of the state. There are few records from Victoria, although these are from widely scattered locations across the Mallee and Northern Plains regions. At the majority of sites where it has been recorded there is just a single record, with the most recent being on the outskirts of Mildura in 2004, and along Bullock Creek southeast of Echuca in 1997 (with earlier records from Yarrock, north west of Kaniva in 1888 and from the Sunset Country in 1961). There are multiple records from only one area in Victoria, which is within the Hattah-Kulkyne National Park and adjacent Nowingi area in north-western Victoria (Lumsden 1994, Lumsden et al. 2008).

There have been extensive surveys throughout the taxon's range within Victoria over the past four decades. Extensive broad-scale bat surveys in the Mallee and Northern Plains regions throughout the range of this taxon in the 1980s and 1990s recorded only two individuals from a survey effort of 1,168 harp trap-nights and 622 mist net-hours, at a capture rate of 0.0009 individuals per harp trap-night and 0.0016 individuals per mist net-hour. These two captures represented 0.04% of the 5,267 bats caught. (Lumsden 1994). These two captures represented 0.04% of the 5,267 bats caught. In extensive, targeted trapping at a known locality for this species in 2007/08 in the Nowingi/Hattah Kulkyne NP area, 15 individuals were captured in 539 harp-trap-nights and 206 mist-net-hours, with this tally representing 1.6% of all bats captured (0.035 captures/trap-night and 0.005 captures/mist-net hour) (Lumsden et al. 2008). In the same area in 2010, only two individuals were captured in 205 harp-trap-nights (0.0098 captures/trap-night) (Lumsden et al. 2011). An area in the western section of the Murray Sunset National Park to the west of the known locations, which had similar long-unburnt stands of mallee as occurs in the Nowingi area was surveyed in 2010, however no South-eastern Long-eared Bats were captured (Lumsden et al. 2010). The trapping methods used during these surveys were highly effective in catching the closely related Lesser Long-eared Bat and so are considered suitable techniques for surveying this taxon, and so the apparent rarity is considered an accurate reflection of the abundance of the South-eastern Long-eared Bat as well.

### Habitat

Throughout its range, the South-eastern Long-eared Bat occurs in a wide range of woodland vegetation, but particularly in mallee and Callitris woodlands (Pennay et al. 2011). It is more abundant in large blocks of woodland than in smaller woodland patches (Turbill and Ellis 2006). In mallee areas, it is associated with long-unburnt vegetation (Lumsden et al. 2008); and even relatively mild fires have been reported to result in decreased availability of preferred tree hollows (Parnaby et al. 2010, 2011).

In Victoria it has been recorded roosting mostly in tree hollows, particularly in large mallee trees in areas that have been long unburnt (Lumsden et al. 2008). Old-growth vegetation appears to be a critical habitat component, with 28 of the 29 roost sites located in the Nowingi/Hattah-Kulkyne National Park/Nowingi NP area found in long unburnt mallee or woodland vegetation (Lumsden et al. 2008). The large hollows used by the bats as roost sites suggest that these mallee trees could be several centuries old (Lumsden et al. 2008). Roosts are mainly in dead trees or dead spouts of live trees but it has also been reported as roosting under loose bark, and in South Australia occasionally in dense foliage (Lumsden et al. 2008; Schulz and Lumsden 2012).

An exception to this pattern mallee/Callitris habitat preference was when one individual was trapped in a narrow strip of Black Box woodland along Bullock Creek southwest of Echuca (Lumsden 1994). No individuals have been trapped in Black Box woodland along the Murray River in north western Victoria (Lumsden and Bennett 1995).

### Threats

The clearing of the mallee and inland woodlands for wheat and sheep production is likely to have been a major factor in the decline of this taxon (Ellis et al. 1999). Habitat loss may also threaten the viability of remaining

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populations by fragmenting the remaining habitat, exacerbated by the impact of dryland salinity. This taxon has a preference for larger forest remnants (Pennay 2002 et al. 2011; Turbill and Ellis 2006; Law et al. 2016). Small isolated populations may be especially vulnerable to local extinction by a range of processes that may deplete the number of individuals or degrade the overall fitness of each population.

Inappropriate fire regimes, both as a result of bushfire and planned burning, is a major threat to the conservation of this taxon in terms of direct mortality and the loss of both roost sites in tree cavities and foraging habitat. In Victoria, this taxon appears to prefer long unburnt mallee, especially for roosting habitat (Lumsden et al. 2008). The threat from fire is likely to be exacerbated for South-eastern Long-eared Bats due to their habit of roosting in dead timber, often low to the ground (Lumsden et al. 2008).

Overgrazing by introduced taxa (such as Feral Goats *Capra hircus* and European Rabbits *Oryctolagus cuniculus*) may reduce foraging habitat through the removal of shrubs and by limiting regeneration. The impact of predation, by taxon such as feral cats and foxes, on roosting and foraging individuals of this species is unknown but likely to be a threat. There may also be competition for hollows from introduced taxa including bees.

Exposure to insecticides and other poisons may potentially impact populations occurring in, or adjacent to, agricultural areas, such as fruit growing areas in far northwestern Victoria and pasturelands aerially sprayed as part of Plague Locust *Chortoicetes terminifera* control programs (particularly in swarm years). In such areas, populations may be susceptible to exposure by direct application, through spray drift or via secondary poisoning, or impacted through the bio-accumulation of some chemicals.

Climate change may lead to the South-eastern Long-eared Bat reducing its distribution and abundance through changes in factors such as geographical range, population dynamics and survival, location of its habitats, and in the structure and composition of ecosystems and communities. Climate modelling predicts an increase in fire frequency and severity, which in addition to direct mortality, will accelerate the rate of collapse of hollow-bearing trees which is likely to reduce roosting habitat availability for the South-eastern Long-eared Bat (Parnaby et al. 2011).

### IUCN Criteria

Criterion A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>based on any of the following:</p> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>			

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### Evidence:

#### Eligible under Criterion A2 as Vulnerable

The population reduction over the past 12 to 15 years is suspected to be 40 to 50% (midpoint 45%), based on (b) and (c) above.

No targeted surveying for this taxon has occurred since 2010, so it is unknown how populations have changed over the last ten years. In the five years prior to this when intensive surveys were undertaken, there was a decline in the capture success rate for this taxon in its only known stronghold, from a capture rate of 0.035 individuals/trapnight in 2007/08 to 0.010 individuals/trapnight in 2010 (Lumsden et al. 2008, 2011). This period coincided with the end of the Millennium Drought, which may have caused a decline in the taxon's abundance. On this basis it is assumed that numbers were higher 15 years ago, although to what extent is speculative.

#### Eligible under Criterion A3 as Endangered

The population reduction over the next 12 to 15 years is suspected to be 33 to 60% (midpoint 47%), based on (b), (c) and (e) above.

It remains unclear why this taxon is so rare in Victoria, and so it is difficult to predict future trends. However, as it is dependent on long-unburnt mallee, with the increased risk of more extensive bushfires under climate change, it is highly likely the taxon will continue to decline. How much, however, is unknown. There appears to be a population of this taxon in just one area of Victoria, and if a bushfire was to impact this area, it could potentially cause the taxon to go extinct in Victoria, or to drop to extremely low levels.

#### Eligible under Criterion A4 as Endangered

The population reduction over any 12 to 15 year period, including both past and future, is suspected to be 40 to 65%, based on (b), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

This is based on the past and future threats, with a likelihood of greater loss into the future.

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy)			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

### Evidence:

#### Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 52 km<sup>2</sup>, based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

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It is estimated to have 3 locations, corresponding to the three subpopulations, as a single threatening event (such as inappropriate fire regimes) at any subpopulations could impact all individuals present.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the impacts of the identified threats, notably habitat loss and the effects of more frequent fires.

Criterion C. Small Population size and decline		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b)	Extreme fluctuations in the number of mature individuals			

### Evidence:

#### Ineligible under Criterion C

It is inferred that there are 250 to 1,500 (midpoint 500) mature individuals, but this qualifier is too weak.

Criterion D. Very small or restricted populations		Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)		< 50	< 250	< 1,000
D2. Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time.		-	-	D2. Typically: AoO: < 20 km <sup>2</sup> or number of locations ≤ 5

### Evidence:

#### Eligible under Criterion D2 as Vulnerable

The taxon is estimated to be very restricted.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.



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## References

- DSE (2013). *Advisory List of Threatened Vertebrate Fauna in Victoria - 2013*. Department of Sustainability and Environment, Melbourne
- Ellis, M., Lumsden, L., Schulz, M., Reardon, T., Richards, G. and Hoye, G. 1999. Eastern Long-eared Bat. Pp. 42-43. In: Duncan, A., Baker, G.B. and Montgomery, N. (Eds.). *The Action Plan for Australian Bats*. Environment Australia, Canberra.
- Law, B., Gonsalves, L., Chidel, M. and Brassil, T. (2016). Subtle use of a disturbance mosaic by the south-eastern long-eared bat (*Nyctophilus corbeni*): and extinction-prone, narrow-space bat. *Wildlife Research* 43: 153-168.
- Lumsden, L. F. (1994). The distribution, habitat and conservation status of the Greater Long-eared Bat *Nyctophilus timoriensis* in Victoria. *Victorian Naturalist* 111, 4-9.
- Lumsden, L., and Bennett, A. F. (1995). Bats of a semi-arid environment in south-eastern Australia: biogeography, ecology and conservation. *Wildlife Research* 22, 217-240.
- Lumsden, L., Chick, R. and Griffiths, S. (2010). *Survey for the South-eastern Long-eared Bat in the western section of the Murray Sunset National Park*. A report to the Mallee Catchment Management Authority. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Heidelberg.
- Lumsden, L., Nelson, J., Jemison, M. and Lennox, E. (2011). Survey of roost sites of the South-eastern Long-eared Bat at Nowingi. Unpublished report to the Mallee Catchment Management Authority. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Heidelberg, Victoria.
- Lumsden, L., Nelson, J., and Lindeman, M. (2008). Ecological research on the Eastern Long-eared Bat *Nyctophilus timoriensis* (south-eastern form). A report to the Mallee Catchment Management Authority. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Heidelberg.
- Parnaby, H. (2009). A taxonomic review of Australian greater long-eared bats previously known as *Nyctophilus timoriensis* (Chiroptera: Vespertilionidae) and some associated taxa. *Australian Zoologist* 35, 39-81.
- Parnaby, H., Lunney, D., Shannon, I., and Fleming, M. (2010). Collapse rates of hollow-bearing trees following low intensity prescription burns in the Pilliga forests, New South Wales. *Pacific Conservation Biology* 16, 209-220.
- Parnaby, H., Lunney, D., and Fleming, M. (2011). Four issues influencing the management of hollow-using bats of the Pilliga forests of inland New South Wales. In *The biology and conservation of Australasian bats* (Eds B. Law, P. Eby, D. Lunney, and L. Lumsden.) pp. 399-420. Royal Zoological Society of New South Wales: Sydney.
- Pennay, M., Law, B., and Lunney, D. (2011). The bat fauna of New South Wales and the Australian Capital Territory. In *The biology and conservation of Australasian bats*. (Eds B. Law, P. Eby, D. Lunney, and L. Lumsden.) pp. 226-256. Royal Zoological Society of New South Wales: Sydney.
- Reardon, T. (2012). South-eastern long-eared bat *Nyctophilus corbeni*. In *Queensland's threatened animals*. (Eds L. K. Curtis, A. J. Dennis, K. R. McDonald, P. M. Kyne and S. J. S. Debus.) pp. 386-387. CSIRO Publishing: Collingwood.
- SAC (2000). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 499 *Nyctophilus timoriensis*
- Schulz, M., and Lumsden, L. (2012). Draft national recovery plan for the South-eastern Long-eared Bat *Nyctophilus corbeni*. Victorian Government Department of Sustainability and Environment, Melbourne.
- Turbill, C. and Ellis, M. (2006). Distribution and abundance of the south eastern form of the Greater Long-eared Bat *Nyctophilus timoriensis*. *Australian Mammalogy* 28, 1-7.