

# THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

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The Minister approved this conservation advice and included this species in the Endangered category, effective from 3/12/15

## Conservation Advice

### ***Hipposideros inornatus***

Arnhem leaf-nosed bat

*Note: The information contained in this conservation advice was primarily sourced from 'The Action Plan for Australian Mammals 2012' (Woinarski et al., 2014). Any substantive additions obtained during the consultation on the draft are cited within the advice. Readers may note that conservation advices resulting from the Action Plan for Australian Mammals show minor differences in formatting relative to other conservation advices. These reflect the desire to efficiently prepare a large number of advices by adopting the presentation approach of the Action Plan for Australian Mammals, and do not reflect any difference in the evidence used to develop the recommendation.*

#### **Taxonomy**

Conventionally accepted as *Hipposideros inornatus* (McKean, 1970).

This taxon was previously considered a subspecies of *H. diadema* (McKean 1970), and is still treated as such by some authorities. There has been no definitive analysis of its genetic and morphological distinctiveness, although Milne and Richards (2008) noted that 'preliminary investigations suggest a genetic distinction between the two Australian forms.' Churchill (2008) provided justification for recognising it at species level, and this interpretation is now generally supported (e.g. Reardon, 2009). No subspecies are recognised.

#### **Summary of assessment**

##### **Conservation status**

Endangered: Criterion 2 B1,B2,(a),(b)(i)(ii)(iv)(v)

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

##### **Reason for conservation assessment by the Threatened Species Scientific Committee**

This advice follows assessment of new information provided to the Committee to list *Hipposideros inornatus*.

##### **Public Consultation**

Notice of the proposed amendment and a consultation document was made available for public comment for 32 business days between 24 March 2015 and 8 May 2015. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

#### **Species Information**

##### **Description**

The Arnhem leaf-nosed bat is a moderately large insectivorous bat, with a head and body length of 66–77 mm and weighing 22–35 g. It is light brown or grey-brown (occasionally orange) above and slightly paler on the belly. It has large, acutely pointed ears and a well developed nose-leaf.

There are no similar species in the Northern Territory (Milne & Richards, 2008; NT DNREA, 2006).

## Distribution

The Arnhem leaf-nosed bat has one of the most limited distributions of any Australian bat taxon (Milne & Richards, 2008). Currently, it is known to occur only in the Kakadu escarpment and adjoining western edge of the Arnhem Land plateau (Deaf Adder Gorge and upper South Alligator River area), although large areas in the central and eastern parts of the Arnhem plateau remain unsurveyed (NT DNREA, 2006; Milne & Richards, 2008). In 1978, a population containing 15 individuals was discovered in a cave at Tolmer Falls, Litchfield National Park (McKean & Hertog, 1979). However, no bats have been recorded in this cave or the surrounding vicinity since 1983, despite several targeted searches in the area (Churchill, 1998; Milne & Richards, 2008).

## Relevant Biology/Ecology

The Arnhem leaf-nosed bat roosts in cool, draughty areas in caves in rugged sandstone formations during the day, particularly where these are close to water (Churchill, 1998). One roost site was found in an abandoned mine (Milne and Richards, 2008). At night it forages in a range of vegetation types, including monsoon rainforests, riparian vegetation and eucalypt woodlands (Churchill, 1998), but typically where these are close to escarpment areas (Milne et al., 2006). The diet of related species mostly comprises large insects, including beetles, moths, cockroaches and locusts (Churchill, 1998; Milne and Richards, 2008). There is no information available about the extent of movement of individuals between sites, or of any meta-population structuring, and the number of subpopulations is not known.

Generation length is estimated at 6–7 years and is derived from a mean of age at sexual maturity (estimated at 1–2 years) and longevity (probably around 12 years). This is based on information for other *Hipposideros* species (Jones, 2009), as no detailed information is available for this species.

## Threats

Threats to the Arnhem leaf-nosed bat are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Inappropriate fire regimes	Minor	Entire	Not demonstrated, but could have possible impacts on prey abundance. The habitat now has a very high fire frequency; changes in season and intensity may also be influential.
Disturbance at roost sites	Moderate	Minor	It is highly likely the species is sensitive to disturbance (Milne and Richards, 2008); human visitation may be a reason for the abandonment of the Tolmer Falls roost site (Woinarski et al., 2014)
Destruction or reduced accessibility of roost sites (old mine adits)	Moderate	Minor	Possible, but there have been records of use of only one mine adit.
Predation by feral cats	Minor	Minor	Not demonstrated, but it is possible that there may be some predation at roost sites and/or their entrances.

## How judged by the Committee in relation to the EPBC Act Criteria and Regulations

<b>Criterion 1. Population size reduction (reduction in total numbers)</b>			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	<b>Critically Endangered Very severe reduction</b>	<b>Endangered Severe reduction</b>	<b>Vulnerable Substantial reduction</b>
<b>A1</b>	<b>≥ 90%</b>	<b>≥ 70%</b>	<b>≥ 50%</b>
<b>A2, A3, A4</b>	<b>≥ 80%</b>	<b>≥ 50%</b>	<b>≥ 30%</b>
<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><i>based on any of the following:</i></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>		

### Evidence:

#### Insufficient data to determine eligibility

The Arnhem leaf-nosed bat is known only from a small number of sites and there is no robust estimate of population size or extent of occurrence. However, a decline in the number of subpopulations and population size is inferred from the loss of one subpopulation (in Litchfield National Park) sometime between 1983 and 1998 (Churchill, 1998). This subpopulation is relatively distant from other known subpopulations and would have markedly reduced the extent of occurrence (Woinarski et al., 2014).

Its population size is probably declining. Woinarski et al. (2014) consider that the rate of decline is unlikely to exceed 30% over an 18–21 year period. However, this estimate is not precise enough to determine whether or not the species meets the threshold for listing under this criterion. Milne and Pavey (2011) noted that an increasing use of bat detectors is helping to better define the species' distribution and abundance, and that the Arnhem leaf-nosed bats 'appear to be relatively secure', but no population surveys have been undertaken.

The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

<b>Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy</b>			
	<b>Critically Endangered Very restricted</b>	<b>Endangered Restricted</b>	<b>Vulnerable Limited</b>
B1. Extent of occurrence (EOO)	<b>&lt; 100 km<sup>2</sup></b>	<b>&lt; 5,000 km<sup>2</sup></b>	<b>&lt; 20,000 km<sup>2</sup></b>
B2. Area of occupancy (AOO)	<b>&lt; 10 km<sup>2</sup></b>	<b>&lt; 500 km<sup>2</sup></b>	<b>&lt; 2,000 km<sup>2</sup></b>
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 for listing as Endangered under Criterion 2 B1,B2 (a),(b)(i)(ii)(iv)(v)**

There is no robust estimate of extent of occurrence or area of occupancy. However, Woinarski et al. (2014) estimate the extent of occurrence to be 2100 km<sup>2</sup>. Based on the presumption that the Arnhem leaf-nosed bat roosts only in caves and mines, they estimate the area of occupancy (calculated from the area of maternity roost sites) to be 12 km<sup>2</sup>, but possibly <4 km<sup>2</sup> (using the IUCN method of 2 x 2 km grids for calculating area). Therefore, the species meets the threshold for a restricted extent of occurrence under Criterion B1 and a restricted area of occupancy under Criterion B2.

The species is currently known from two locations, which satisfies Criterion B1,B2(a) for a restricted number of locations. Both the extent of occurrence and area of occupancy are inferred to be declining based on the apparent loss of one subpopulation sometime between 1983 and 1998 (Woinarski et al., 2014). There is an inferred continuing decline in the number of subpopulations and population size (Woinarski et al., 2014). These inferred declines meet Criterion B1,B2(b)(i)(ii)(iv)(v).

The Committee considers that the species has been demonstrated to have met the relevant elements of Criterion 2 to make it eligible for listing as Endangered.

<b>Criterion 3. Population size and decline</b>			
	<b>Critically Endangered Very low</b>	<b>Endangered Low</b>	<b>Vulnerable Limited</b>
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	<b>Very high rate 25% in 3 years or 1 generation (whichever is longer)</b>	<b>High rate 20% in 5 years or 2 generation (whichever is longer)</b>	<b>Substantial rate 10% in 10 years or 3 generations (whichever is longer)</b>
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

**Evidence:**

**Insufficient data to determine eligibility**

There is no robust estimate of population size. Richards and Milne (2008) estimated the total number of mature individuals to be between 300 and 999, inferred from counts of mature individuals at the few known roosting sites. Counts include: 15 individuals at the previously-occupied Litchfield site (McKean & Hertog, 1979); a roost site containing 14 adults and eight young reported by Churchill (1998), and an observation of 92 individuals flying over a site near Deaf Adder Gorge in Kakadu National Park, also reported by Churchill (1998). There are no other known currently-occupied roost sites (Woinarski et al., 2014). However, there are many unexplored potential sites in the sandstone massif of western Arnhem Land, and the number of roosting sites is unknown (Woinarski et al., 2014). Considering the small number of records and lack of survey effort, no estimate of total population size can be made for this species.

The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

<b>Criterion 4. Number of mature individuals</b>			
	<b>Critically Endangered Extremely low</b>	<b>Endangered Very Low</b>	<b>Vulnerable Low</b>
Number of mature individuals	< 50	< 250	< 1,000

**Evidence:**

**Insufficient data to determine eligibility**

There is no robust estimate of population size (see Criterion 3).

The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

<b>Criterion 5. Quantitative Analysis</b>			
	<b>Critically Endangered Immediate future</b>	<b>Endangered Near future</b>	<b>Vulnerable Medium-term future</b>
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

**Evidence:**

**Not eligible**

Population viability analysis has not been undertaken.

## **Conservation Actions**

### **Recovery Plan**

The Committee recommends that there should not be a recovery plan for *Hipposideros inornatus* (Arnhem leaf-nosed bat), as approved conservation advice provides sufficient direction to implement priority actions and mitigate against key threats.

### **Conservation and Management Actions**

There is currently no specific management targeted at this species. However, most of the range is included in conservation reserves, where fire management is a priority. There has been some management of abandoned mines in the Kakadu area, including consideration of their use by bats (Corbett and Richards, 2002). Recommended management actions are outlined in the table below.

<b>Theme</b>	<b>Specific actions</b>	<b>Priority</b>
Active mitigation of threats	If needed, stabilise roost sites and constrain human visitation.	Medium
	Implement fire management measures that benefit this species.	Low-Medium
Captive breeding	n/a	
Quarantining isolated populations	n/a	
Translocation	n/a	
Community engagement	Involve Indigenous ranger groups in the survey, monitoring and management of this species.	Medium

### **Survey and monitoring priorities**

<b>Theme</b>	<b>Specific actions</b>	<b>Priority</b>
Survey to better define distribution	Undertake fine-scale sampling to identify and circumscribe important subpopulations (and roost sites), and assess the population size (or relative abundance) of these.	Medium-High
	Establish more efficient survey and monitoring techniques to detect this species and estimate its abundance.	Medium
Establish or enhance monitoring program	Establish an integrated monitoring program across its range, and at known roost sites.	High
	Implement an integrated monitoring program linked to the assessment of management effectiveness.	Medium

### **Information and research priorities**

<b>Theme</b>	<b>Specific actions</b>	<b>Priority</b>
Assess relative impacts of threats	Assess the structural viability and potential threats to all known roost sites.	Medium
	Identify the population-level responses to a range of fire regimes, and model	Low-Medium

	population viability across all fire scenarios.	
	Assess the abundance of feral cats in the range of this species, and the impact of predation on population viability.	Low
Assess effectiveness of threat mitigation options	Assess options and benefits for gating or other management of roost sites.	Medium
	Assess the efficacy of options for implementing optimal fire management	Low-Medium
	If cats are found to be a threat, assess the effectiveness of options for broad-scale control of feral cats, or of local-scale control at sites with important populations.	Low-Medium
Resolve taxonomic uncertainties	Establish the extent of genetic distinctiveness of this taxon.	Medium
Assess habitat requirements	Investigate seasonal and spatial patterning of foraging habitat use.	Medium
	Characterise roost (and maternity) site requirements.	Medium
Assess diet, life history	Investigate key components of diet.	Medium
	Assess the extent to which food availability may be affected by fire regimes.	Low-Medium

### **Recommendations**

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Endangered category:

*Hipposideros inornatus*

- (ii) The Committee recommends that there should not be a recovery plan for this species.

Threatened Species Scientific Committee

02/09/2015

### **References cited in the advice**

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