Publication date: 9 August 2024

Notice and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the large-eared pied bat *Chalinolobus dwyeri* Ryan, 1966 as an ENDANGERED species in Part 2 of Schedule 1 of the Act and, as a consequence, to omit reference to *Chalinolobus dwyeri* Ryan, 1966 from Part 3 of Schedule 1 (Vulnerable species) of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that the large-eared pied bat *Chalinolobus dwyeri* Ryan, 1966 has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of Commonwealth DCCEEW (2023), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

Summary of Conservation Assessment

The large-eared pied bat *Chalinolobus dwyeri* Ryan, 1966 was found to be Endangered in accordance with the following provisions in the Biodiversity Conservation Regulation 2017: Endangered under 4.3 (b)(d)(e i,ii,iii,iv) because: i) the geographic distribution of the species is highly restricted based on the number of known maternity roosts (AOO <500 km^2); ii) it occurs in 5 threat-defined locations; and iii) there is an inferred continuing decline in the number of mature individuals as a result of the combined threats of habitat loss and fragmentation, adverse fire regimes, increased temperatures, increased frequency and severity of drought, and habitat disturbance by feral goats (*Capra hircus*). Continuing decline in the EOO, AOO, area, extent and quality of habitat and number of subpopulations is also inferred due to the loss of known roosting sites, ongoing habitat destruction and fragmentation, and the impacts of drought and bushfires.

The NSW Threatened Species Scientific Committee has found that:

1. *Chalinolobus dwyeri* Ryan, 1966 (family Vespertilionidae) is a medium-sized insectivorous bat approximately 100 mm in body length, including the head and tail, and weighing 7–12 g (Hoye and Dwyer 1995). It has shiny black fur on the body and a white stripe on the ventral side of the torso where it adjoins the wings and tail. The ears are large, and obvious lobes of skin adorn the lower lip and between the corner of the mouth and the bottom of the ear (DERM 2011). The species can be distinguished from little pied bat (*Chalinolobus picatus* (Gould, 1852)) and hoary wattled bat (*Chalinolobus nigrogriseus* (Gould, 1856)) by larger ears and longer forearms, and Gould's wattled bat (*Chalinolobus gouldii* (Gray, 1841)) by larger ears and white fringe between ventral body and wings (Hoye and Schulz 2008).

2. *Chalinolobus dwyeri* is patchily distributed in central-eastern New South Wales (NSW) and south-eastern and central Queensland (QLD), from the area bounded by Shoalwater Bay north of Rockhampton (QLD), south to Ulladulla, NSW (DERM 2011). The species' distribution is fragmented, as most individuals occur in small

and relatively isolated subpopulations due to specific requirements for foraging and roosting habitat (Pennay 2020). Individuals have been recorded from sea level to nearly 1500 m above sea level at the top of Mt Kaputar in NSW (Pennay 2020). The main strongholds are in the Sydney Sandstone region, Pilliga region and Central Queensland Sandstone Belt (DERM 2011; Woinarski *et al*. 2014). The species occurs on many conservation reserves and public lands, including Pilliga National Park (NP), Coolah Tops NP, and Morton NP in NSW.

3. In NSW, maternity roosts occur in Ukerbarley State Conservation Area near Coonabarabran (though this site has not been occupied since 2019; M. Pennay *in litt.* July 2022), Woodsreef asbestos mine near Barraba, Pilliga National Park and Nature Reserve, Ophir reserve near Orange (M. Irvin *in litt.* September 2022), and potentially near Ulan (M. Pennay pers. comm. November 2022). In Qld, there may be a maternity roost near Lamington NP (M. Venz *in litt.* July 2022), however, the population structure is poorly known and there are likely maternity roosts that have not been discovered.

4. There is no robust estimate of the *Chalinolobus dwyeri* population size, though expert estimations of the overall population have ranged from 10,000 (Pennay & Thomson 2008) to 20,000 individuals (Woinarski *et al*. 2014). Notably, the number of mature individuals would be substantially lower. The species is naturally rare, and analyses have found that it accounts for less than 1% of all bats reported across its range (Pennay 2011). In the area with its highest recorded density compared to other species, it only accounted for 6% of observations (Pennay 2011).

5. The extent of occurrence (EOO) for the current recorded *Chalinolobus dwyeri* distribution is 276,333 km^2 (range 276,333–279,734 km^2) and the area of occupancy (AOO) is estimated to be <500 km^2 (range 12–3,092 km^2) based on the number of maternity roosts. The EOO and AOO are inferred to be contracting due to ongoing loss of habitat through land clearing and loss of roosting sites. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Guidelines (2022).

6. *Chalinolobus dwyeri* is considered to occur in 1–2 threat-defined locations based on the threat of drought to maternity roosts. Based on the widespread distribution and frequency of droughts on the eastern coast of Australia in recent times (e.g., the millennium drought), it is likely that drought could affect a large proportion of the species' distribution over a short period. Singular or multiple drought events may impact multiple maternity roosts and lead to rapid decline in both the number of mature individuals and reproductive rate. Only 3–6 of these important roost sites are currently known, and any impact of drought on these sites would have severe impacts on the local population. The scale of drought is likely to increase in the future as climate change fuels extreme events. While it is difficult to infer the exact number of locations defined by drought, a precautionary approach has been taken as it is possible that the number of locations could be as low as 1 or 2 based on this threat.

7. Modelling of the distribution suggests that *Chalinolobus dwyeri* requires a combination of appropriate roosting and foraging habitat. It is usually found in areas

with cliffs, escarpments or rocky outcrops for roosting (typically sandstone but also rhyolite), although the presence of suitable caves, overhangs and cracks is likely more important than the precise geology (Pennay 2008, Pennay 2020). This roosting habitat is in close association with foraging habitat (Pennay 2008, Pennay 2020). *Chalinolobus dwyeri* has been recorded foraging in fertile valleys and plains, as well as areas with moderately tall to taller trees in woodland along watercourses (Pennay 2008, Pennay 2020). In more fertile/productive areas such as South-east QLD and North-east NSW, it may also use upper slopes and crests. For example, in the Scenic Rim of south-eastern QLD the species has been captured in high-elevation rainforest and open forest within several kilometres of major escarpments, allowing *C. dwyeri* to travel upslope from roosting habitat and forage along ridge crests and upper slopes (I. Gynther *in litt.* December 2022). Without both foraging and roosting habitat, the species is unlikely to occur. This is a relatively restricted combination of habitat factors, especially as the extent of woodlands on fertile soils within the known range has been greatly diminished by land clearing (Pennay 2008).

8. *Chalinolobus dwyeri* is dependent on the presence of diurnal roosts in cliffs, escarpment, cracks or rocky outcrops for shelter. Roosts are also used at night when bats are not feeding, as well as for raising young. The species is known to roost in caves, overhangs, disused mine shafts, and has also been observed roosting in abandoned Fairy Martin (*Petrochelidon ariel*) nests (Schulz 1998). The value of mine shafts and disused Fairy Martin nests as roost sites has not been evaluated but may offer supplementary roost sites in areas containing other suitable habitat. Williams and Thomson (2018) also identified that the species roosts in smaller cracks and crevices of cliff faces and rock faces that do not have deep or wide caves.

9. The structure of maternity roosts appears to be very specific, and the number of known maternity roosts is small (3–6). Caves need to have indentations in the roof and be high and deep enough to allow juvenile bats to learn to fly inside. Roosting bats cluster in the indentations, which most likely allow the capture of heat. These physical characteristics are uncommon in the landscape and their scarcity poses another limiting factor in the distribution of *Chalinolobus dwyeri* (Pennay 2008). The number of maternity roosts is poorly known, and they likely occur in un-surveyed, inaccessible areas.

10. Foraging habitat includes a range of vegetation types, such as grassy woodland, dry and wet sclerophyll forest, *Callitris* dominated forest, tall open eucalypt forest with a rainforest sub-canopy, subtropical rainforest and small clearings adjacent to rainforest, sub-alpine woodland, and sandstone outcrop country (Hoye and Dwyer 1995; Duncan *et al*. 1999; Pennay 2002; DECC 2007; Pennay 2008; Pennay 2020). Most records are from canopied habitat, suggesting a sensitivity to clearing, although narrow connecting riparian strips in otherwise cleared habitat are sometimes quite heavily used (DERM 2011). This may be because such riparian zones are highly productive. The occurrence of high-fertility forest or woodland near suitable roosting habitat is rare in the landscape, which implies that the species may always have been uncommon; however, preferential clearing of these fertile forests and woodlands has almost certainly reduced the amount of available foraging habitat (DECC 2007; Pennay 2008).

11. The generation length of *Chalinolobus dwyeri* is estimated at 4–5 years in Woinarski *et al*. (2014), based on a 10-month time to maturity and longevity of 8–10 years. The most recent IUCN assessment lists the generation length as 5.6 years (Pennay 2020).

12. The diet of *Chalinolobus dwyeri* has not been examined. Wing morphology shows that it is a relatively slow-flying manoeuvrable species, which would suggest it predominantly forages on small flying insects below the forest canopy (Hoye *et al*. 2018). Almost all records are within several kilometres of cliff lines or rocky terrain, and it is likely that critical foraging resources are also located in these areas (DERM 2011). A study by Williams and Thomson (2018) found *C. dwyeri* foraged along forest edges at mid-to-upper-canopy height and on the outer canopy of individual trees within the forest. Females had larger foraging areas than males, but both showed high fidelity to preferred foraging areas. Females roosted separately from males, showing less roost fidelity and roosting at a greater distance from the foraging area (Williams and Thomson 2018).

13. Breeding has been recorded as sporadic (e.g., at the type locality at Copeton, NSW, breeding was recorded during two summers with no breeding recorded for the following two years (Dwyer 1966)). Mating appears to occur early in winter. Females were pregnant in October, and by early December they had all given birth (to one or two young) and were lactating. The nursery colony was established in September by both adult females and males, with the majority of adult males leaving by the time the young were born in early summer. During late February and March, juveniles left the roost, with adult females leaving the roost after juveniles and the site being abandoned during the winter months. Females are able to breed at one year of age (DERM 2011). Females may return to the same maternity sites in successive years (Dwyer 1966; Pennay 2008). Caves visited in mid-November over several years had between 15 and 40 adult females and their young in a maternity roost (Pennay 2008). Another small group of lactating females and young were found in a disused gold mine tunnel near Barraba NSW (P. Spark. pers. comm. 2011, cited in DERM 2011). Post-lactating females (i.e., recently ceased lactating) have been captured in south-eastern QLD in January.

14. Breeding behaviour for *Chalinolobus dwyeri* and other insectivorous bats may be disrupted by abiotic conditions, including drought (M. Pennay *in litt.* July 2022). Observations from Ukerbarley in 2019 found no pregnant and lactating bats during peak birthing time. Other bat species were also observed to either not have bred or to have unseasonal young that must have been born in the winter, an unusual occurrence (M. Pennay *in litt.* July 2022). Notably, it is not certain that drought caused this disruption to reproduction and the observations from Ukerbarley may have been caused by other factors, though drought is the most likely explanation and the presumed cause.

15. *Chalinolobus dwyeri* is threatened by habitat loss and fragmentation, adverse fire regimes, increased temperatures, increased frequency and severity of drought, and habitat disturbance by Feral Goats (*Capra hircus*). ‘Clearing of native vegetation’, ‘High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition’, ‘Anthropogenic Climate

Change', and 'Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758' are listed as a Key Threatening Processes under the Act.

16. Agricultural, residential and commercial development and associated land clearing is inferred to be contributing to continuing decline in the extent and quality of habitat of *Chalinolobus dwyeri*. Clearing or harvesting of vegetation within foraging distance of roosts for agriculture, forestry, development and construction of infrastructure has the potential to affect the availability of roosting habitat and foraging resources for *C. dwyeri* (Pennay 2008; DERM 2011, DERM 2020). It may also lead to fragmentation of the surrounding vegetation. Clearing is likely to be particularly detrimental in the vicinity of maternity roosts, where pregnant and lactating females require close proximity to sufficient food resources to raise young. The microclimate within roosts may also be impacted by clearing and timber harvesting altering solar radiation and groundwater levels in the vicinity of roosts (DERM 2011).

17. Dam construction and waterway management is also contributing to continuing decline in the geographic distribution of, and extent and quality of habitat available for *Chalinolobus dwyeri*. The species is inferred to have undergone large historical declines in the number of individuals due to loss of available roosting habitat, often for construction of large dams. As a result of the species' dependence on some sites for shelter and breeding (maternity roosts), it is particularly vulnerable to threats that adversely affect these roosts. Relatively large numbers of individuals may be present at such roosts, possibly representing a substantial proportion of a local subpopulation (DERM 2011). In 1976, the flooding of the Copeton Dam destroyed the first known maternity roost of the species, likely leading to mortality and loss of habitat of many individuals in the region (Hoye 2005). Additionally, management of waterways and dam construction leading to drying of waterways may have an impact on *C. dwyeri* foraging, given that the species is known to forage heavily in some riparian zones.

18. Continuing decline in the extent and quality of habitat due to energy production and mining has been observed and is inferred to continue for *Chalinolobus dwyeri*. Interference with *C. dwyeri* roosts by energy extraction and mining developments is a key threat to the species, as resource extraction remains an important industry throughout certain parts of its distribution. The status of *C. dwyeri* as a listed threatened species leads to Environmental Impact Assessments for mining and energy production projects often listing it as a threatened species that may be affected by developments, particularly for mine site expansions. Furthermore, *C. dwyeri* was originally described from a subpopulation roosting within a disused diamond mine tunnel at Copeton, NSW, and is known to roost at other disused mine sites. Such roosts may be important, particularly in areas where caves are uncommon or may not be suitable for roosting. Notably, only mines with subterranean tunnels close to the surface that emulate natural roosts are suitable as roosts, and mines with open cut or deep tunnels are unsuitable for roosting. Reopening of old, disused mine tunnels that are close to the surface would almost certainly lead to loss of roosting habitat for large-eared pied bats (DERM 2011).

19. Adverse fire regimes are inferred to be causing continuing decline in the habitat and number of mature individuals of *Chalinolobus dwyeri*. In the short term, fire

intensity and frequency are likely to pose the greatest threats, as direct mortality is expected to be higher during high intensity fires or where fires occur frequently (DERM 2011). *Chalinolobus dwyeri* congregate to roost and raise young, which places a substantial proportion of a local subpopulation at a single site. Most known cave roosts are in shallow caves or in the outer reaches of deeper mines or caves. Therefore, individuals are potentially susceptible to direct mortality from heat and smoke from fires (Dickinson *et al*. 2010; O'Shea *et al*. 2016). The longer-term impacts of fire on *C. dwyeri* are unknown, though foraging resources may be impacted through changes in vegetation composition and structure. Factors potentially impacting prey species include changes in floristics, invasion of weed species and loss of a mosaic of vegetation (DERM 2011). In many areas, increasing fire frequency has direct impacts on the diversity and abundance of invertebrates, which leads to altered foraging conditions for predators (DAWE 2022) such as *C. dwyeri*. Low fire frequency may also negatively impact the species through increased clutter from understorey weeds such as Lantana (*Lantana camara*), which could indirectly affect the species through changes in associated resources and foraging (DAWE 2022; M. Pennay *in litt.* December 2022).

20. Increased temperatures and increased drought frequency and severity as a result of climate change are inferred to cause continuing decline in the geographic distribution and habitat extent and quality of *Chalinolobus dwyeri*. The response of *C. dwyeri* to drought has not been studied, though anecdotal evidence from Ukerbarley in November to December 2019 suggests that the species was badly affected by a drought in the area (M. Pennay *in litt.* July 2022). Breeding behaviour for *C. dwyeri* and most other insectivorous bats appeared disrupted and the maternity roost (which for past 20 years had been occupied every summer that it had been checked) was not occupied and has not been occupied since. Subsequent capture and acoustic observation rates were very low, and experts suspect this was due to the impact of drought (M. Pennay *in litt.* July 2022). 'Anthropogenic Climate Change' is listed as a Key Threatening Process under the Act.

21. Habitat disturbance by Feral Goats (*Capra hircus*) has been observed to be contributing to continuing decline in the quality and extent of habitat of *Chalinolobus dwyeri*. *C. dwyeri* roosts are increasingly inhabited by Feral Goats, which are becoming more common across the distribution. Feral Goats inhabiting roost caves is particularly prevalent in sandstone escarpment areas, where *C. dwyeri* roost for shelter. There is substantial evidence that Feral Goats destroy roost sites or disturb roosting bats in some cave and cliff locations (Pennay 2008; Dennis 2012 cited in Woinarski *et al*. 2014). Bats were observed abandoning one of the few known maternity caves after it was disturbed by macropods (DERM 2011), and suitable roosting caves in the Pilliga region have been used by Goats and other animals, which not only displaces *C. dwyeri* but may also prevent the species from roosting there in the future. Pennay (2008) observed that multiple caves on one property with signs of Goat activity were not inhabited by bats, whilst a cave that contained a *C. dwyeri* roost had no signs of goat activity. Another cave in the southern Pilliga that previously had been recorded as a *C. dwyeri* roosting site was empty during a survey in 2020, with observed Goat occupancy and signs of constant Goat use (M Schulz *in litt.* July 2022).

22. The large-eared pied bat *Chalinolobus dwyeri* Ryan, 1966 is not eligible to be listed as a Critically Endangered species.

23. The large-eared pied bat *Chalinolobus dwyeri* Ryan, 1966 is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a very high risk of extinction in Australia in the near future as determined in accordance with the following criteria as prescribed by the Biodiversity Conservation Regulation 2017:

Assessment against Biodiversity Conservation Regulation 2017 criteria
The Clauses used for assessment are listed below for reference.
Overall Assessment Outcome: Endangered under Clause 4.3 (b)(d)(e i,ii,iii,iv).

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Data deficient.

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 – Restricted geographic distribution of species and other conditions
(Equivalent to IUCN criterion B)
Assessment Outcome: Endangered under Clause 4.3 (b)(d)(e i,ii,iii,iv).

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,

		(iv)	the number of locations in which the species occurs or of populations of the species.
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 – Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion Clause C)
Assessment Outcome: Data deficient.

The estimated total number of mature individuals of the species is:						
	(a)	for critically endangered species				very low, or
	(b)	for endangered species				low, or
	(c)	for vulnerable species				moderately low.
and either of the following 2 conditions apply:						
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):				
		(i)	for critically endangered species			very large, or
		(ii)	for endangered species			large, or
		(iii)	for vulnerable species			moderate,
	(e)	both of the following apply:				
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and			
		(ii)	at least one of the following applies:			
			(A)	the number of individuals in each population of the species is:		
				(I)	for critically endangered species	extremely low, or
				(II)	for endangered species	very low, or
				(III)	for vulnerable species	low,
			(B)	all or nearly all mature individuals of the species occur within one population,		
			(C)	extreme fluctuations occur in an index of abundance appropriate to the species.		

Clause 4.5 – Low total numbers of mature individuals of species
(Equivalent to IUCN criterion D)
Assessment Outcome: Not met.

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 – Quantitative analysis of extinction probability
(Equivalent to IUCN criterion E)
Assessment Outcome: Data deficient.

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 – Very highly restricted geographic distribution of species– vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: Not met.

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.

Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023). Conservation Advice for *Chalinolobus dwyeri* (large-eared pied bat). Australian Government, Canberra, ACT.

References:

Department of Agriculture, Water and the Environment (DAWE) (2022) Fire regimes that cause biodiversity decline: amendments to the list of key threatening processes. Department of Agriculture, Water and the Environment, Canberra, February.

Department of Environment and Climate Change (DECC) (2007) Terrestrial vertebrate fauna of the Greater Southern Sydney region: Volume 2 Species of conservation concern and priority pest species. A joint project between the Sydney Catchment Authority and the Parks and Wildlife Division of the Department of Environment and Climate Change by the Information and Assessment Section, Metropolitan Branch, Climate Change and Environment Protection Group, Department of Environment and Climate Change, NSW.

Department of Environment and Resource Management (DERM) (2011) National recovery plan for the large-eared pied bat *Chalinolobus dwyeri*. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Dickinson MB, Norris JC, Bova AS, Kremens RL, Young V, Lacki MJ (2010). Effects of wildland fire smoke on a tree-roosting bat: integrating a plume model, field measurements, and mammalian dose–response relationships. *Canadian Journal of Forest Research* **40**, 2,187–2,203.

Duncan A, Baker GB, Montgomery N (1999) 'The Action Plan for Australian Bats.' (Environment Australia: Canberra, ACT)

Dwyer PD (1966) Observations on *Chalinolobus dwyeri* (Chiroptera: Vespertilionidae) in Australia. *Journal of Mammalogy* **47**, 716–718.

Hoye GA (2005) Recovery plan for the large-eared pied bat *Chalinolobus dwyeri*. Fly By Night Bat Surveys Pty Ltd. Queensland Parks and Wildlife Service. Brisbane

Hoye GA, Dwyer PD (1995) large-eared pied bat *Chalinolobus dwyeri*. In 'The Mammals of Australia.' (Ed. R. Strahan) pp.510–511 (Reed Books: Chatswood, NSW)

Hoye GA, Schulz M, Pennay M, Madden K (2018) large-eared pied bat *Chalinolobus dwyeri*. Unpublished species profile. Viewed: 19 August 2022.

Hoye GA, Schulz M (2008) large-eared Pied Bat *Chalinolobus dwyeri* Ryan, 1966. In 'The Mammals of Australia Third Edition.' (Eds S van Dyck and R Strahan) (Reed New Holland: Chatswood, NSW)

IUCN Standards and Petitions Subcommittee (2022) Guidelines for Using the IUCN Red List Categories and Criteria. Version 15.1 [Online]. Available at: http://www.iucnredlist.org/documents/RedListGuidelines.pdf (accessed on 13 January 2022)

O'Shea TJ, Cryan PM, Hayman DT, Plowright RK, Streicker DG (2016) Multiple mortality events in bats: a global review. *Mammal Review* **46**, 175–190.

Pennay M (2002) Large Pied Bat *Chalinolobus dwyeri*. Brigalow Belt South Stage 2 Vertebrate Fauna Survey, Analysis and Modelling Projects. Appendix 2. Resource and Conservation Division, Planning NSW, Sydney. pp 38–39.

Pennay M (2008) A maternity roost of the large-eared pied bat *Chalinolobus dwyeri* (Ryan) (Michrochiroptera: Vespertilionidae) in central New South Wales Australia. *Australian Zoologist* **34**, 564–569.

Pennay M (2020) *Chalinolobus dwyeri*. The IUCN Red List of Threatened Species 2020: e.T4414A21986274 (Online) Available at: https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T4414A21986274.en (accessed 26 August 2022)

Pennay M, Thomson B (2008) The IUCN Red List of Threatened Species Version 2011.2 (accessed 26 August 2022)

Schulz M (1998) Bats and other fauna in disused Fairy Martin *Hirundo ariel* nests. *Emu* **98**, 184–191

Williams ER and Thomson B (2018) Aspects of the foraging and roosting ecology of the large-eared pied bat (*Chalinolobus dwyeri*) in the western Blue Mountains, with implications for conservation. *Australian Mammalogy* **41** (2), 212–2019.

Woinarski J, Burbidge AA, Harrison PL (2014). 'The Action Plan for Australian Mammals 2012.' (CSIRO Publishing: Collingwood, NSW)