



Consultation Document on Listing Eligibility

Pipistrellus murrayi (Christmas Island Pipistrelle)



Image: *Pipistrellus murrayi* (Christmas Island Pipistrelle, Lindy Lumsden 2007)

You are invited to provide your views and supporting reasons related to the eligibility of *Pipistrellus murrayi* (Christmas Island Pipistrelle) for inclusion on the EPBC Act threatened species list in the Extinct category.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing either by email to: MigratorySpecies@awe.gov.au

or by mail to:

The Director
Migratory Species Section
Biodiversity Conservation Division
Department of Agriculture, Water and the Environment
PO Box 787
Canberra ACT 2601

Responses are required to be submitted by date 11 September 2020.

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General background information about listing threatened species

Public nominations to list threatened species under the EPBC Act are received annually by the Department. In order to determine if a species is eligible for listing as Extinct, under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing as Extinct.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at:

<http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the Privacy Act 1988 (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the '[common assessment method](#)'. As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: <http://environment.gov.au/privacy-policy>.

Information about this consultation process

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this

information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

Pipistrellus murrayi

Christmas Island Pipistrelle

Taxonomy

First described as *Pipistrellus murrayi*, by Andrews (1900). Genetic studies by Schulz and Lumsden (2004) concluded that further taxonomic studies were required for *Pipistrellus murrayi*. Further work unequivocally determined that *Pipistrellus murrayi* was a distinct species and was endemic to Christmas Island (Helgen et al. 2009).

Species Information

Description

The Christmas Island Pipistrelle was a small-sized bat, weighing between 3–4.5 g and with a forearm length of 30–32mm (Churchill 1998). It had slightly unkempt fur, which was mostly dark brown but blondish-red in parts (Woinarski 2018).

Distribution

This bat was formerly widespread and common across Christmas Island, in the Indian Ocean, including in primary and secondary rainforest and the settlement.

In the mid-1980s the species was considered to be widespread and common across all of Christmas Island (135 km²) and Tidemann (1985) concluded that its status was secure. Two studies in the 1990s indicated a marked reduction in abundance and a westward range contraction in its distribution (Lumsden & Cherry 1997, Lumsden et al. 1999). By 1998 bats were no longer recorded in the north-east section of the island (Lumsden et al. 1999) and by 2004 were no longer found in more than 80% of its former range (James 2004, 2005). Monitoring undertaken between 2004 and 2006 found the species at only three sites in the west of the island, mostly at low densities (DoNP 2008).

Relevant Biology/Ecology

The Christmas Island Pipistrelle was a small insectivorous bat that fed on a wide range of small (mostly < 1cm long) flying insects using echolocation (Tidemann 1985). It was an edge specialist that favoured vegetation ecotones, tracks and other small gaps within primary forest. While commuting or foraging, pipistrelles ranged into adjacent habitats, including secondary regrowth, minefield rehabilitation sites and the settlement area of Christmas Island (Lumsden et al. 1999).

All roosts of the Christmas Island Pipistrelle were located within primary rainforest. (Lumsden et al. 1999, Lumsden & Tidemann 1999). The species had been observed roosting in a variety of locations including under the bark of dead trees, under the fronds of palms and in the hollow of a *Syzygium nervosum* (Lumsden et al. 1999).

Christmas Island Pipistrelle females gave birth at the start of the wet season, in December, when insect numbers are high (Tidemann 1985). Most males trapped in May and June 1998 had partially enlarged testes, indicating they were approaching peak reproductive condition, and that mating was likely in the next few months (Lumsden et al. 1999). Tidemann (1985) suggested that pregnancy was likely to commence during September with a single young born in December. In December 2005 82% of females trapped had either just given birth or were heavily pregnant (Lumsden et al. 2007). Lactation lasted for about four weeks into mid or late January. All individuals examined by Tidemann (1985) appeared to be in reproductive synchrony. Therefore, it was likely there was only a single breeding season, and each female was likely to produce only one young a year. Tidemann (1985) demonstrated sperm storage in female Christmas Island Pipistrelles, and a delay between mating and ovulation.

Extinction Date

An assessment of population size undertaken in January 2009 found that only four individuals were known to be alive in the west of the island and estimated that total population size may have been as low as 20 individuals (Lumsden & Schulz 2009). In early August 2009 acoustic detectors were used for three weeks to determine the location of the remaining pipistrelles and detected only one individual. This individual was last recorded on 26 August 2009 and surveys undertaken since that time have failed to detect the species again.

Table 1: A summary of studies and surveys undertaken since 1984 that describe the range contraction of the Christmas Island Pipistrelle and changes in its abundance.

Year	Summary of survey or study	Reference
1984	The Christmas Island Pipistrelle was widespread and commonly found across the island in primary and secondary rainforest and the settlement.	Tidemann 1985
1994	A brief study found that it appeared there had been a reduction in numbers and distribution of the Christmas Island Pipistrelle.	Lumsden and Cherry 1997
1998	Surveys indicated an east to west range contraction and 33% reduction in abundance of Christmas Island Pipistrelle at benchmark sited established in 1994, however, this was not statistically significant result.	Lumsden et al. 1999
2002	Surveys observed an increased east to west range contraction and detected a decline in abundance of 58% between 1994 and 2002.	Corbett et al. 2003
2004-2006	A study detected a 25% reduction in pipistrelle abundance between 1998 and 2004, a further 25% reduction between 2004 and 2005 and 30% in 2006.	James and Retallick 2007
2006-2009	Christmas Island National Park staff undertook monthly surveys using acoustic detectors from January 2006 until January 2009. This work detected a decline of 99.4% in the population size over less than 3 years. By the end only four individuals were known to be alive and the total population size was likely to be less than 20 individuals.	Lumsden and Schulz 2009
August 2009	As part of a mission to capture Christmas Island Pipistrelles to commence a captive breeding program, acoustic detectors were used to locate Pipistrelle individuals. Only one individual was detected each night for three weeks and it was last heard on 26 August 2009.	Lumsden 2009

Likely Causes of Decline and Extinction

Table 2: Threats which likely led to the extinction of the Christmas Island Pipistrelle based on available evidence. Predation by the Wolf Snake is considered to have had the greatest impact, followed by combination of the remaining threats.

Number	Threat factor	Threat type and status	Evidence base
1.0	Invasive species		
1.1	Predation by the wolf snake (<i>Lycodon capucinus</i>)	Suspected past	The wolf snake was introduced onto Christmas Island in 1987 (Smith 1988) following which it spread across most of the island (James 2005). On Christmas Island the wolf snake was found to prey on both lizards and mammals (Rumpff 1992, James & Retallick 2007) and so pipistrelles may have fallen into the prey range of this species (Woinarski 2018). Studies using automatic cameras undertaken in 2006 showed that wolf snakes were not detected on known roost trees however subsequent monitoring did detect one wolf snake in one roost tree in early 2007 (James & Retallick 2007). While this does not provide irrevocable evidence of the wolf snake being the main cause of the pipistrelles' extinction Woinarski (2018) points out that it may not have needed many snakes to cause substantial mortality of pipistrelles. Targeted predation at communal maternity roosts would result in large numbers of baby bats being consumed in a single night.
1.2	Predation by the giant centipede (<i>Scolopendra subspinipes</i>)	Suspected past	The giant centipede is widespread and abundant on Christmas Island and it was recorded on the island prior to 1900 (Andrews 1900). Automated camera work showed that giant centipedes were using roost trees (James & Retallick 2007). While trends in abundance are not available anecdotal evidence suggests a substantial increase in centipede numbers occurred in recent decades (Beeton et al. 2010). This increase is thought to have been the consequence of growing impacts associated with yellow crazy ants (<i>Anoplolepis gracilipes</i>). Yellow crazy ants reduce the abundance of red crabs which results in increasing leaves and litter on the forest floor so providing more habitat for centipedes (Woinarski 2018). Despite this the pattern of decline in Christmas Island Pipistrelles (east to west) and the increase in ant super colonies do not align and it is unlikely that centipedes could have consumed large numbers of pipistrelles (Woinarski 2018).
1.3	Predation by black rats (<i>Rattus rattus</i>)	Suspected past	Black rats are widespread and common on Christmas Island (Algar & Johnston 2010). Like the giant centipede, James and Retallick (2007) detected this species using pipistrelle roost trees

			during automated camera monitoring in 2006. Black rats arrived on the island soon after settlement and there is no evidence to suggest black rat numbers increased at the time there was a sharp decrease in the abundance of the Christmas Island Pipistrelle (Woinarski 2018).
1.4	Predation by feral cats (<i>Felis Catus</i>)	Suspected past	Feral cats were widespread and common on Christmas Island at the time the pipistrelle declined (Algar and Johnston 2010) and they have been implicated in the extinction of many mammal species in Australia (Woinarski et al. 2015). While there is evidence that shows cats prey upon bats, Woinarski (2018) concluded feral cats were not likely to be the cause of the sudden decline of the pipistrelle on Christmas Island.
2.0	Habitat loss and degradation		
2.1	Habitat loss due to vegetation clearing and severe storm events	Known past	Clearing of 25% of rainforest habitat on Christmas Island in the years up to 1987 reduced the availability of suitable roosting habitat. Subsequent to this, storms and other activities have further reduced available habitat. The loss of this habitat would have resulted in a population decline but is not considered to be the cause of the rapid decline that was observed from 1994 onwards (Schulz & Lumsden 2004)
2.2	Habitat degradation due to yellow crazy ants (<i>Anoplolepis gracilipes</i>)	Suspected past	In 1998 a study indicated a reduced abundance of the Christmas Island Pipistrelle in areas where yellow crazy ant super colonies had formed (Lumsden et al. 1999). With the introduction of yellow crazy ants (<i>Anoplolepis gracilipes</i>), the Christmas Island Pipistrelle may have moved roosting sites from live to dead trees to avoid yellow crazy ants as they reached the canopy (James & Retallick 2007, Lumsden et al. 2007). Yellow crazy ant super colonies also alter the diversity and abundance of invertebrates which were likely to have affected prey abundance for the pipistrelle (Schulz & Lumsden 2004).

Woinarski (2018) reviewed all likely threats to the Christmas Island Pipistrelle to determine the most plausible explanation of its extinction and presented two possibilities. The first is predation by the wolf snake because the pattern of the snakes' introduction and spread correlate with the pipistrelle's reduction in abundance and distribution. The second explanation is more complex and starts with a high rate of habitat loss in the 1970's and early 1980's. This is followed by a severe storm in 1988 which led to further habitat loss and was followed by an increase in the number of yellow crazy ant super colonies. This then led to Christmas Island Pipistrelles

occupying less favourable habitat to avoid the ants, putting them at greater risk of roost collapse and predation and disturbance from species such the giant centipede.

Assessment of available information in relation to the EPBC Act Criterion and Regulations

A native species is eligible to be included in the **Extinct** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.

The decline of the Christmas Island Pipistrelle was well-documented. The first extensive study of the distribution, in 1984, demonstrated the Christmas Island Pipistrelle was widespread with the species commonly found in primary and secondary rainforest and the Christmas Island settlement (Tidemann 1985). A brief study undertaken in 1994 noted there appeared to have been a reduction in numbers and distribution of the species (Lumsden & Cherry 1997). Surveys undertaken in 1998 indicated a 33% reduction in abundance of pipistrelles at benchmark sites identified in 1994, although this was not statistically significant (Lumsden et al. 1999). This study also indicated there had been a range contraction from east to west. This pattern was again identified following 2002 surveys which found their distribution had shrunk even further and that the overall decline between 1994 and 2002 was 58% (Corbett et al. 2003). A study undertaken between 2004 and 2006 concluded that there had been a 25% reduction in pipistrelle abundance between 1998 and 2004, a further 25% reduction between 2004 and 2005 and 30% in 2006 (James & Retallick 2007). In 2006 regular monitoring commenced at four sites where pipistrelles were known to be present and this continued until 2009. Figure 1 illustrates the decline described above (Lumsden and Schulz 2009).

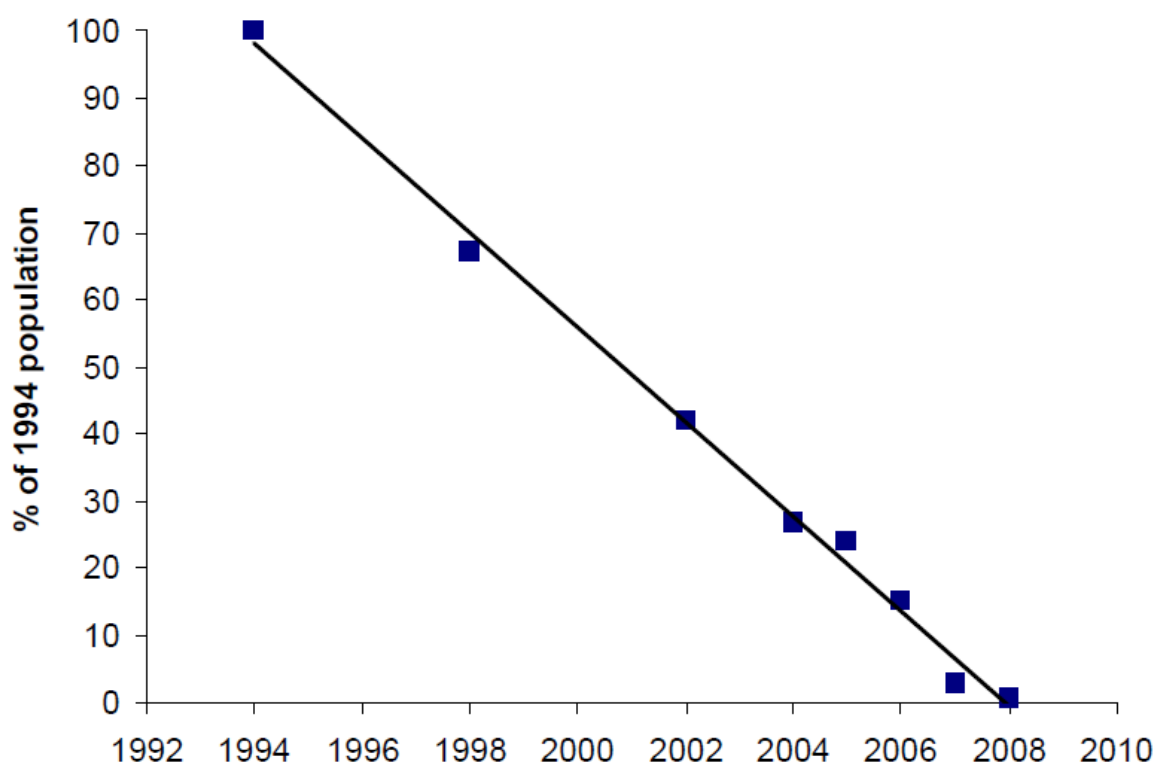


Figure 1 The trend of decline in the Christmas Island Pipistrelle from 1994 to 2008 (taken from Lumsden & Schulz 2009)

Intensive monitoring from 2004 onwards confirmed that pipistrelle numbers were in a rapid decline. In 2006 the conservation status of the species under the *Environment Protection and Biodiversity Conservation Act 1999* was changed from Endangered to Critically Endangered

(TSSC 2006). As part of their advice to the Minister on this matter, the Committee recommended more radical management interventions were needed, including captive breeding. In January 2009 the Minister for the Environment sought advice from the Committee on the feasibility of a captive breeding program, and in July 2009 permission was granted and resources were made available to attempt to capture animals for such a program.

In August 2009, intensive sampling was undertaken with a view to capturing pipistrelles for captive breeding. One individual was detected every night for several weeks up until 26 August 2009, following which it was no longer detected (Lumsden 2009). Following this there have been no further sightings or recordings of the Christmas Island Pipistrelle by researchers or Parks Australia staff (Lumsden et al. 2017).

A small number of undocumented targeted surveys have been conducted since 26 August 2009 but have failed to detect the Christmas Island Pipistrelle, (Parks Australia 2019, pers comm, 16 May 2019). In addition, Dr Lindy Lumsden and Professor John Woinarski conclude that, despite the lack of systematic surveys since August 2009 the robust pre-extinction monitoring and survey work undertaken across the island and the fact the species was readily detected at all times of the year provides sufficient evidence of extinction (J. Woinarski 2019. pers. comm 19 June 2019, L. Lumsden 2019. pers. comm 22 June 2019).

The Committee considers that the species has undergone a very severe reduction in population size from being common in 1984 to extinct in 2009. Surveys for the species have been undertaken in all known habitat, and there is no reasonable doubt that the last individual in Australia has died. Therefore, the species has met the relevant requirements to make it eligible for listing as **Extinct**.

The data presented above appear to demonstrate that the species is **eligible for listing as Extinct**. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered as tentative at this stage, as it may be changed as a result of responses to this consultation process.

Collective list of questions – your views

1. Do you have further information on past, present or potential surveying or research activities for the species? Please include details on survey techniques and effort, where possible.

Any other information

2. Do you have comments on any other matters relevant to the assessment of this species?

References cited in the advice

Algar, D & Johnston, M. (2010) *Proposed Management plan for cats and black rats of Christmas Island*, Western Australian Department of Environment and Conservation.

Andrews, C. W. (1900). A monograph of Christmas Island: physical features and geology (with descriptions of the fauna and flora). Longmans/British Museum, London.

Beeton B., Burbridge A., Grigg G., Harrison P., How R., Humphreys B., McKenzie N., Woinarski J. (2010). Final Report of the Christmas Island Expert Working Group to the Minister for Environment Protection, Heritage and the Arts

Churchill, S.K. (1998). *Australian Bats*. Sydney: Reed New Holland.

Corbett, L., F. Crome & G. Richards (2003). Fauna survey of Mine Lease Applications and National Park reference areas, Christmas Island, August 2002. Appendix G. In: Phosphate Resources Limited. Christmas Island Phosphates Draft Environmental Impact Statement for the *Pipistrellus murrayi* (Christmas Island Pipistrelle) draft consultation document

Proposed Christmas Island Phosphate Mines (9 Sites) (EPBC 2001/487). Christmas Island: Phosphate Resources Limited.

Director of National Parks (2008). Christmas Island Biodiversity Monitoring Program-December 2003-April 2007. Report to the Department of Finance and Deregulation. Page(s) 11-29. Canberra: Director of National Parks.

Helgen, K.M., Armstrong, K.N., Guzinski, J., How, R.A. and Donnellan, S.C. (2009). Taxonomic status of the Christmas Island Pipistrelle, *Pipistrellus murrayi* Andrews, 1900, as assessed by morphometric and molecular phylogenetic investigations of Indo-Australian *Pipistrellus*. Report to the Commonwealth Department of Environment, Water, Heritage and the Arts.

James, D.J. (2004). Christmas Island Biodiversity Monitoring Programme: Third quarterly report for the period April to June 2004. Parks Australia North, Christmas Island. Unpublished report to Department of Finance and Administration.

James, D.J. (2005). Christmas Island Pipistrelle *Pipistrellus murrayi*: An interim assessment of conservation status and threats. A report to Parks Australia North, Christmas Island.

James, D.J. and Retallick, K. (2007) Research into the conservation status and threats of the Christmas Island Pipistrelle *Pipistrellus murrayi*, 2004-2006. Parks Australia North, Christmas Island Monitoring Programme: Report to Department of Finance and Deregulation and Department of the Environment, Water and the Arts, Canberra.

Lumsden, L (2009). The Christmas Island Pipistrelle (*Pipistrellus murrayi*) at risk of extinction within six months. Australasian Bat Society Website. Available from: http://batcall.csu.edu.au/abs/ChristmasIsland/PipistrellusmurrayiJan_09.htm.

Lumsden, L., Sillins, J., and Schulz, M. (1999). Population dynamics and ecology of the Christmas Island Pipistrelle *Pipistrellus murrayi* on Christmas Island. Report for Parks Australia North – Christmas Island. Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria.

Lumsden, L., Racey, P.A. & Hutson, A.M. (2017). *Pipistrellus murrayi*. The IUCN Red List of Threatened Species 2017: e.T136769A518894. <http://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T136769A518894.en>. Downloaded on 19 June 2019.

Lumsden, L. F. and Cherry, K. (1997). Report on a preliminary investigation of the Christmas Island Pipistrelle, *Pipistrellus murrayi* in June-July 1994. Arthur Rylah Institute for Environmental Research, Parks Australia North, Christmas Island.

Lumsden L., and Schulz, M. 2009. Captive breeding and future in-situ management of the Christmas Island Pipistrelle *Pipistrellus murrayi*. A report to the Director of National Parks. Arthur Rylah Institute, Department of Sustainability and Environment, Heidelberg, Victoria.

Lumsden, L. & C. Tidemann (1999). Christmas Island Pipistrelle. Duncan, A, Baker, G.B. & Montgomery, N, eds. The Action Plan for Australian Bats. Page(s) 28-29. Canberra: Environment Australia.

Rumpff, H. (1992). *Distribution, population structure, and ecological behaviour of the introduced South-East Asian Wolf Snake Lycodon aulicus capuncinus on Christmas Island, Indian Ocean*. ANPWS. Canberra: ANPWS.

Schulz, M. & Lumsden, L.F. (2004) National Recovery Plan for the Christmas Island Pipistrelle *Pipistrellus murrayi*. Commonwealth of Australia, Canberra. Available on the Internet at: <http://www.environment.gov.au/resource/national-recovery-plan-christmas-island-pipistrelle-pipistrellus-murrayi>

Smith, L.A. (1988). *Lycodon aulicus capucinus* a colubrid snake introduced to Christmas Island, Indian Ocean. *Records of the Western Australian Museum*. 14:251-252.

Tidemann, C. (1985). A Study of the Status, Habitat Requirements and Management of the Two Species of Bat on Christmas Island (Indian Ocean). Canberra, Australia

Threatened Species Scientific Committee (2006). *Commonwealth Listing Advice on Pipistrellus murrayi*. Available from:
<http://www.environment.gov.au/biodiversity/threatened/species/pipistrellus-murrayi.html>. In effect under the EPBC Act from 13-Sep-2006.

Tidemann, C. (1985). *A study of the status, habitat requirements and management of the two species of bats on Christmas Island (Indian Ocean)*. Report to Australian National Parks and Wildlife Service, Canberra.

Woinarski J. (2018). A Bat's End – The Christmas Island pipistrelle and Extinction in Australia. CSIRO Publishing, Clayton, Victoria.

Woinarski, John C. Z.; Burbidge, Andrew A.; Harrison, Peter L. (2015) A review of the conservation status of Australian mammals. *Therya*, vol. 6, no. 1, 2015, pp. 155-166
Asociación Mexicana de Mastozoología Baja California Sur, México

Other sources cited in the advice

Lumsden, L. (2019) Personal communication by email 22 June 2019. Bat ecologist – Arthur Rylah Institute for Environmental Research, Melbourne, Victoria.

Parks Australia (2019) Personal communication by email 16 May 2019. Staff from Christmas Island Office.

Woinarski, J. (2019) Personal communication by email 19 June 2019. Australian Threatened Species Ecologist - Charles Darwin University, Darwin.