



## Consultation Document on Listing Eligibility

### *Pseudomys auritus* (Long-eared Mouse)

You are invited to provide your views and supporting reasons related to the eligibility of *Pseudomys auritus* (Long-eared Mouse) 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:  
[species.consultation@environment.gov.au](mailto:species.consultation@environment.gov.au)

or by mail to:

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

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

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## General background information about listing threatened species

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at:

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

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 threatened 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 against a set of criteria. These criteria are available on the Department's website at:

<http://www.environment.gov.au/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2018.pdf>.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. 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 and what conservation actions might be appropriate. 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>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at:

<http://www.environment.gov.au/biodiversity/threatened/recovery.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.

# *Pseudomys auritus*

## Long-eared Mouse

### Taxonomy

Conventionally accepted as *Pseudomys auritus* Thomas, 1910.

### Species/Sub-species Information

#### Description

*Pseudomys auritus* (Long-eared Mouse) is known from dried skin specimens and subfossil material. From the available dried skin samples, the Long-eared Mouse was large compared to other *Pseudomys* species, with a head and body length of 145–172 mm and a tail length of 112–121 mm. An estimated weight range has not been recorded. The fur was dark fawn-grey above and light grey interspersed with yellowish-brown below. The outer guard hairs were tipped with black (Medlin 2008). The Long-eared Mouse was similar in appearance to *P. australis* (Plains Mouse), which it was originally synonymised with until it was recognised as a separate species (Woinarski et al. 2014b). The Long-eared Mouse was distinguished from the Plains Mouse through its slightly longer ears (25–28 mm), a darker belly, and a longer and a broader head (Medlin 2008).

#### Distribution

The Long-eared Mouse was distributed along the south coast of Australia from Kangaroo Island and the Coorong, south-east South Australia (SA), across to the basalt plains, south-west Victoria, encompassing both semi-arid and temperate habitats (Medlin 2008; Carnegie 2016). Across the distribution range, the vegetation composition varies from open heath, dense mallee, and open scrub in SA, changing to open woodland and forest with a dense heath and fern understorey in Victoria (Medlin 2008; Adams et al. 2016).

#### Extinction date

The Long-eared Mouse has a presumed extinction decade of the 1850s (Woinarski et al. 2014a), with collection dates for the species from 1841–1845 (Medlin 2008; Woinarski et al. 2014a).

#### Relevant Biology/Ecology

Almost nothing is known about the biology of the Long-eared Mouse. However, given the species was morphologically similar to the Plains Mouse and that both historically occupied habitat along the south coast of Australia, the biology can be surmised to have been broadly similar.

The Plains Mouse is a social rodent and lives in colonies. It exhibits boom/bust population cycles, with usually small populations dramatically increasing in size after good rains (Moseby 2012). The Plains Mouse is nocturnal and lives in burrows located at the base of bushes or within cracks. Nest chambers built from dried grass and other vegetation are dug into cracks or within warrens up to two metres in area, dug into friable soils around the bases of low shrubs. Burrows in breeding populations usually contain one male and one or more females, whilst burrows in non-breeding areas contain up to 20 individuals of both sexes (Watts and Aslin 1981). The Plains Mouse forages over areas of up to 1.6 ha (Brandle and Moseby 1999), feeding mostly on seeds with some green plant material and a few insects also taken (Watts and Aslin 1981).

#### Likely Causes of Decline and Extinction

Likely causes of decline and extinction are surmised from threats known to have occurred in the mid-19th century and an assumption that the threats that affect many conilurine rodents (particularly the larger *Pseudomys* species) would also impact on the Long-eared Mouse.

Table 1: Probable causes of decline towards extinction for the Long-eared Mouse in approximate order of impact, based on available evidence.

Threat factor	Threat status and severity*	Evidence base
Introduced predators		
Predation by feral cats ( <i>Felis catus</i> )	<ul style="list-style-type: none"> <li>– Status: Historical</li> <li>– Confidence: Suspected</li> <li>– Consequence: Severe</li> <li>– Extent: Across the entire range</li> </ul>	<p>Feral cats are thought to have been present throughout the distribution range of the Long-eared Mouse prior to the mid-1800s (Abbott 2008).</p> <p>Predation by feral cats has been implicated in the extinction and ongoing decline of many terrestrial, non-volant, mammal species (Dickman 1993; Smith &amp; Quin 1996; Woinarski et al. 2014c; Hardman et al. 2016; Davies et al. 2017; Radford et al. 2018; Woolley et al. 2019), with vertebrate prey up to four kg taken (DoE 2015). Woinarski et al. (2014c) considered predation by feral cats to be the most critical factor in the decline and extirpation of Australia's mammal fauna.</p> <p>Fire and stock grazing can amplify the impacts of predation on small mammals by reducing ground cover, particularly following high-intensity burns (Smith &amp; Quinn 1996; Leahy et al. 2015). The number of predators attracted to the burnt area (Hradsky et al. 2017), individual predator activity (Leahy et al. 2015), and hunting success (McGregor et al. 2015) have all been observed to increase where habitat has been modified through frequent burning. Therefore, threats from predation would have increased as European settlement spread throughout the accepted distribution range.</p>
Predation by European red fox ( <i>Vulpes vulpes</i> )	<ul style="list-style-type: none"> <li>– Status: Historical</li> <li>– Confidence: Suspected</li> <li>– Consequence: Severe</li> <li>– Extent: Across the entire range</li> </ul>	<p>The European red fox was released near Melbourne in the 1860s (Coman 1973) and arrived in SA shortly after 1870, with the open plain and lightly wooded habitat an ideal environment promoting their abundance (Johnson 2006).</p> <p>The presumed extinction date of the Long-eared Mouse pre-dates the arrival of the red fox in the Victoria and SA. However, if remnant populations were still extant at that time, the introduction of foxes would have likely impacted their survival. Predation by the red fox has been implicated in the extinction and decline of many terrestrial, non-volant mammal species in Australia (Richards 2004; DEWHA 2008; Woinarski et al. 2014c; Radford et al. 2018) and was identified by Smith &amp; Quin (1996) as having a significant impact on small isolated populations of</p>

		<p>threatened species, being able to eliminate them even at low densities.</p> <p>As identified above, fire can amplify the impacts of predation on small and medium-sized mammals (Leahy et al. 2015; McGregor et al. 2015; Hradsky et al. 2017).</p>
Habitat loss and fragmentation		
Habitat degradation and resource depletion by livestock	<ul style="list-style-type: none"> <li>– Status: Historical</li> <li>– Confidence: Suspected</li> <li>– Consequence: Severe</li> <li>– Extent: Across the entire range</li> </ul>	<p>Stock grazing began in the 19th century, predominantly in the semi-arid and temperate south-east region of Australia (Johnson 2006), with overstocking hastened the demise of native species (Tunbridge 1993; Robinson et al. 2000; Johnson 2006).</p> <p>In SA, temperate forests were mostly cleared during the 19th and early 20th centuries (Szabo et al. 2011 cited in Bradshaw 2012) and in Victoria about 66 per cent of native vegetation has been cleared, mostly prior to the 1890s (Bradshaw 2012). In particular, the likely preferred habitat of the Long-eared Mouse (periodically inundated areas adjacent to swamps) has mostly been cleared (Medlin cited in Woinarski et al. 2014a).</p> <p>Grazing by stock removes shrub cover (Dennis 2001; McDowell et al. 2015) and the green stems, leaves and seeds that likely comprised the bulk of the Long-eared Mouse's diet and may have degraded or destroyed potential refuges during times of drought (Richards 2004; Tunbridge 1993; Morton et al. 1995).</p> <p>Trampling by stock compacts and powders topsoil, renders soil too loose for digging (Dickman 1993). It is unknown whether the Long-eared Mouse was a sub-surface burrower and possibly severely impacted by trampling. However, the Plains Mouse is known to shelter in shallow burrows (Woinarski et al. 2014b) and it is possible the Long-eared Mouse shared this behavioural trait.</p>
Habitat degradation and resource depletion by introduced European rabbits ( <i>Oryctolagus cuniculus</i> )	<ul style="list-style-type: none"> <li>– Status: Historical</li> <li>– Confidence: Suspected</li> <li>– Consequence: Severe</li> <li>– Extent: Across the entire range</li> </ul>	<p>European rabbits were released in 1859, and by the 1880s they were recorded throughout the known historical distribution range of the Long-eared Mouse (Fenner 2010).</p> <p>The presumed extinction date of the Long-eared Mouse pre-dates the arrival of the rabbit. However, if remnant populations were still extant, the presence of the rabbit would have impacted their survival (Woinarski et al. 2014a).</p> <p>Rabbits compete with native fauna for food and degrade the habitat by intensively grazing on</p>

		<p>native vegetation and ringbarking trees (Richards 2004). In large numbers, rabbits turn areas of productive, well-vegetated country into a virtual desert, greatly impacting sympatric mammals (Johnson 2006). Where rabbits are found in abundance, conilurine rodents experience significantly greater reductions in population than in areas which have fewer rabbits (Smith &amp; Quin 1996).</p> <p>Rabbits, with high standing biomass and high rate of increase, provide abundant prey for predators as native species decline. Therefore, rabbit presence supports elevated predator populations and predation pressures on native mammalian species. Native species are also easier to catch, being without the behavioural or morphological defences to avoid detection or capture (Richards 2004; Pedler et al. 2016; Radford et al. 2018).</p>
<b>Fire</b>		
Change in fire regime	<ul style="list-style-type: none"> <li>– Status: Historical</li> <li>– Confidence: Suspected</li> <li>– Consequence: Unknown</li> <li>– Extent: Across the entire range</li> </ul>	<p>The degree to which a change in fire regime impacted the Long-eared Mouse is unknown. Johnson (2006) believed that a change in fire regime made little direct contribution to mammal extinctions, with declines related to increased predator activity after fire and not the fire itself (Leahy et al. 2015; McGregor et al. 2015; Hradsky et al. 2017).</p> <p>Smith &amp; Quin (1996) identified that some small, fire sensitive, <i>Pseudomys</i> species (<i>P. novaehollandiae</i> (New Holland Mouse), <i>P. gracilicaudatus</i> (Eastern Chestnut Mouse) and <i>P. apodemoides</i> (Silky Mouse)) remain reasonably widespread despite a change in fire regime.</p>

Status: “historical/ current/ future” – identify the temporal nature of the threat

Confidence: “suspected/ inferred/ known” – identify the extent to which we have confidence about that threat

Consequence: “severe/ moderate/ low/ unknown” – identify the severity of that threat

Trend: “decreasing/ static / increasing / unknown” – identify the extent to which it will continue to operate on the species

Extent: “across the entire range/across part of its range / unknown.” – identify its spatial context

## **Assessment of available information in relation to the EPBC Act Criteria and Regulations**

The Long-eared Mouse is known from dried skin specimens (collected 1841–1845) and subfossil material recovered from south-east SA to south-west Victoria. So little information is available on the Long-eared Mouse that the extinction date cannot be readily estimated. However, Woinarski et al. (2014a) gives a probable extinction decade of the 1850s.

The Long-eared Mouse is listed as Extinct under the Victorian *Advisory List of Threatened Vertebrate Fauna in Victoria 2013* and not listed under the SA *South Australia National Parks and Wildlife Act 1972*. The Long-eared Mouse is listed Extinct under the IUCN Red List (Burbidge & Woinarski 2016) and in the Action Plan for Australian Mammals (Woinarski et al. 2014a).

The conilurine rodents of Australia, of which just over half are *Pseudomys* species, have undergone a more severe rate of extinction than that of the total mammalian fauna (Smith & Quin 1996). Biological surveys for rodents have been conducted throughout the accepted historical distribution range of the Long-eared Mouse without recording the species. Robinson et al. (2000) assessed the status of native rodents in SA using locality records from museums, literature records and Indigenous knowledge. Of the original 27 native rodent species identified, 11 were state extinct. The subfossil remains of the Long-eared Mouse are recorded as an undescribed *Pseudomys* species, under the Plains Mouse, but noted as a type specimen for the Long-eared Mouse. Also, biological surveys on Kangaroo Island (1989-1990) and the south-east coast (1982-1983) did not detect any evidence of the species' persistence. Harris (2016) compiled all known mammalian species in Victoria over a 182 year time span (1834-2016) from previous compilations (1996 and 2013) and published and unpublished records since that time. The Long-eared Mouse was recorded as one of eight extinct species.

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 to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

### **Collective list of questions – your views**

#### **Information to aid listing assessment**

1. Do you have further information on past or potential searches or research activities for the species?
2. Can you provide information on specimen records, including collection location and date?
3. Can you provide additional information on the range or location of populations, or a historic range (national extent)?
4. Do you have any additional information in regard to the ecology or biology of the species?
5. Do you further information on the historic threats that faced the species?
6. Are you aware of other knowledge (e.g. indigenous ecological knowledge) that may help better understand the species?
7. Are you aware of any cultural importance or use that the species had?

#### **Any other information**

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

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