

**Advice to the Minister for the Environment, Heritage and the Arts
from the Threatened Species Scientific Committee (the Committee)
on Amendment to the list of Threatened Species
under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

1. Name

Pseudomys novaehollandiae

The species is commonly known as the New Holland Mouse. It is in the Muridae family.

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information provided by a public nomination to list the New Holland Mouse. The nominator suggested listing in the vulnerable category of the list.

This is the Committee's first consideration of the species under the EPBC Act.

3. Summary of Conclusion

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 2 to make it **eligible** for listing as **vulnerable**.

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 3 to make it **eligible** for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **vulnerable**.

4. Taxonomy

The species is conventionally accepted as *Pseudomys novaehollandiae* Waterhouse (1843) (New Holland Mouse) (Lee 1995).

5. Description

The New Holland Mouse is a small, burrowing native rodent. The species is similar in size and appearance to the introduced house mouse (*Mus musculus*), although it can be distinguished by its slightly larger ears and eyes, the absence of a notch on the upper incisors and the absence of a distinctive 'mousy' odour. The species is grey-brown in colour and its dusky-brown tail is darker on the dorsal side. The species has a head-body length of approximately 65–90 mm, a tail length of approximately 80–105 mm and a hind foot length of approximately 20–22 mm (Menkhorst and Knight, 2001). Specimens of the New Holland Mouse from Tasmania are heavier than specimens from NSW and Victoria, although head-body length and skull measurements are similar between the Tasmanian and mainland forms of the species (Hocking, 1980; Lazenby, 1999).

6. National Context

Genetic evidence indicates that the New Holland Mouse once formed a single continuous population on mainland Australia and the distribution of recent subfossils further suggest that the species has undergone a large range contraction since European settlement (Breed and Ford, 2007).

The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. At a landscape scale, the species appears to be clumped in its distribution, most likely due to its specific habitat requirements (Posamentier and Recher, 1974; Braithwaite and Gullan, 1978; Fox and Fox, 1978; Fox and Mckay, 1981). The total number of mature individuals is unknown, however, it is estimated that there are fewer than 10,000 individuals (Menkhorst et al., 2008).

A high percentage of previously known New Holland Mouse populations were not surveyed between 1999 and 2009, therefore the species' present distribution may be smaller or larger than the most current estimates. However, surveys undertaken since 2006 have found that a number of populations have become extinct, making it likely that the species' distribution is actually smaller than those estimates. Including sites in which the species has not been confirmed as present between 1999 and 2009, the extent of occurrence of the New Holland Mouse is estimated to be around 108,000 km² and the area of occupancy is estimated to be around 680 km². However, including only sites from which the species has been confirmed as present between 1999 and 2009, the current extent of occurrence is estimated to be around 90,000 km² and the species' area of occupancy is estimated to be around 420 km².

The New Holland Mouse is currently listed as Endangered under the *Tasmanian Threatened Species Protection Act 1995*, and listed as Endangered under the *Victorian Flora and Fauna Guarantee Act 1988*. The species is listed as Secure under the *NSW Threatened Species Conservation Act 1995* and listed as Least Concern under the *Queensland Nature Conservation Act 1992*.

7. Relevant Biology/Ecology

Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes (Keith and Calaby, 1968; Posamentier and Recher, 1974; Fox and Fox, 1978; Hocking, 1980; Fox and Mckay, 1981; Norton, 1987; Pye, 1991; Wilson, 1991; Lazenby et al., 2008). The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha (Lazenby, 1999; Lazenby et al., 2008).

The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals (Kemper, 1980; Lazenby et al., 2008). The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal (Cockburn, 1980; Wilson and Bradtke, 1999). It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species, including the red fox (*Vulpes vulpes*), cat (*Felis catus*) and dog (*Canis familiaris*) (Lazenby, 1999).

The species' generation length is less than two years. Females live up to two years and reach sexual maturity at 13 weeks of age. There are insufficient data on longevity for males, but males are believed to reach sexual maturity at 20 weeks (Kemper, 1980). Litter size ranges from 1–6 young, with first-year females producing one litter per season and second-year females producing three or four (Seebeck et al., 1996). Breeding typically occurs between August and January, but can extend into autumn (Kemper, 1976, 1980; Pye, 1991). The timing of breeding is related to abundance and quality of food (Kemper, 1976, 1980), which in turn is related to rainfall patterns (Fox et al., 1993) and fire succession (Seebeck et al., 1996).

The New Holland Mouse peaks in abundance during early to mid stages of vegetation succession typically induced by fire (Posamentier and Recher, 1974; Braithwaite and Gullan, 1978; Fox and Fox, 1978; Fox and Mckay, 1981). The species is known to peak in abundance three to four years after fire, or eight to nine years following sand mining (Fox and Mckay, 1981; Fox, 1982; Wilson, 1991). It is likely that the New Holland Mouse shelters in burrows during fires. This may be an attribute that allows the species to peak in abundance in a relatively short time following fires compared with other species (Friend, 1993).

8. Description of Threats

Loss and modification of habitat due to factors such as land development, weed invasion, overgrazing by stock, or dieback caused by *Phytophthora cinnamomi* have been identified as threats to the New Holland Mouse (Seebeck et al., 1996). Whilst a high proportion of known populations of the New Holland Mouse occur within reserves, knowledge and skills to manage habitat for the species both within and outside these reserves is lacking. An impediment to effective habitat management for the New Holland Mouse is a lack of ecological knowledge of the appropriate fire regimes for specific areas. Inappropriate fire regimes may result in a lack of habitat patches of suitable successional age, size and distribution required by the species (Seebeck and Menkhorst, 2000).

Predation by introduced predators, including the red fox, cat and dog is a threat to the New Holland Mouse (Seebeck et al., 1996; Smith and Quin, 1996; Ford, 2003). The potential establishment of a red fox population in Tasmania is a significant potential threat to the Tasmanian populations. Competition from introduced rodents, such as the house mouse, is a potential threat to the New Holland Mouse (Fox and Gullick, 1989; Seebeck et al., 1996).

Climate change has been identified as a potential threat to the New Holland Mouse through the potential alteration and further fragmentation of the species' habitat. Brereton et al. (2005) modelled the impact of a number of potential climate change scenarios on the distribution of a range of small mammals, including the New Holland Mouse, and concluded that future climate change could result in a decline of up to 50% in the distribution of the species.

Overall, the threats listed above are likely to be synergistic. For example, a disturbance event such as a fire within the species habitat may result in increased predation of the species by introduced predators.

9. Public Consultation

The nomination was made available for public exhibition and comment for 30 business days. No comments were received.

10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the species is **eligible** for listing as **vulnerable** under the EPBC Act. The assessment against the criteria is as follows:

Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers

At a regional scale there are several areas from which the New Holland Mouse has disappeared in post European times (Ford, 2003). There have been 11 metapopulations of the New Holland Mouse recorded since European settlement, however the number of metapopulations has since declined to between six and eight in 2009 (metapopulations are defined as groups of subpopulations that likely exchange migrants between them, but that are separated from other metapopulations by distinct geographic barriers) (NSW Atlas of Wildlife, VIC Atlas of Wildlife, TAS Natural Values Atlas). Between 1999 and 2009, there has been a confirmed decline in the national extent of occurrence of the New Holland Mouse of between 1% (including sites where the species has not been confirmed as present between 1999 and 2009) and 17% (including only sites where the species has been confirmed as present between 1999 and 2009). The species' national area of occupancy is estimated to have declined between 2.5% (including sites where the species has not been confirmed as present between 1999 and 2009) and 4% (including only sites from which the species has been confirmed as present between 1999 and 2009). The Tasmanian and Victorian populations have undergone a higher rate of decline than the national rate of decline, with an estimated decline in area of occupancy of between 21% (including sites from which the species has not been confirmed as present between 1999 and 2009) and 45% (including only sites from which the New Holland Mouse has been confirmed as present between 1999 and 2009).

Although the majority of known populations of the New Holland Mouse occur in reserves, the species has been observed to have declined, and populations have disappeared, from within reserves. This indicates there is a lack of knowledge of the appropriate actions to effectively manage New Holland Mouse habitat, including the use of appropriate fire regimes, and this lack of knowledge could result in further losses from known populations.

In addition, predation by introduced predators, and habitat modification caused by land development, weed invasion and dieback caused by *Phytophthora cinnamomi*, are likely to have contributed to past declines in the species (Seebeck et al., 1996), and may cause further declines in the future.

Although the Committee judges that the species has undergone a reduction in range and is likely to undergo further reductions in range, it is unlikely that this decline was very severe, severe or substantial between 1999 and 2009. There is a lack of quantitative data to determine the severity of future declines. Therefore, the species has not been demonstrated to have met each of the required elements of Criterion 1, and is **not eligible** for listing in any category under this criterion.

Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited

The New Holland Mouse has a highly fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. The estimated extent of occurrence of the New Holland Mouse, including sites in which the species has not been confirmed as present between 1999 and 2009, is estimated to be around 108,000 km² and the species' area of occupancy is estimated to be around 680 km². However, including only sites from which the species has been confirmed as present between 1999 and 2009, the extent of occurrence is estimated to be around 90,000 km², and the species' area of occupancy is estimated to be around 420 km². Based on these estimates, the Committee considers the species' area of occupancy to be limited.

Populations of the New Holland Mouse are currently small and fragmented. As discussed under Criterion 1, between 1999 and 2009, there has been a confirmed decline in the national extent of occurrence of the species. This decline is likely to be due to loss of habitat as a result of land development, inappropriate fire regimes, dieback caused by *Phytophthora cinnamomi* and weed invasion, as well as predation by introduced predators (Seebeck et al., 1996).

Given the degree of threat operating on the species, the Committee considers the species' geographic distribution to be precarious for its survival. The Committee considers a continuing decline in the species' extent or occurrence, area of occupancy, and extent and quality of habitat is likely. The lack of knowledge of appropriate actions to effectively manage New Holland Mouse habitat, including the use of appropriate fire regimes, could result in further losses from known populations.

As the Committee considers that the species' limited geographic distribution is precarious for its survival, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **vulnerable**.

Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either

- (a) evidence suggests that the number will continue to decline at a particular rate; or**
- (b) the number is likely to continue to decline and its geographic distribution is precarious for its survival**

Across the species' entire range, the total number of mature individuals is unknown. However, the species' total population is estimated to be fewer than 10,000 individuals (Menkhorst et al., 2008). Given the highly fragmented distribution of the species, and the potential threats operating on the species, the Committee considers that the total number of mature individuals is limited.

As discussed under Criterion 1, the species' range has declined and fragmented markedly since European settlement (Ford, 2003) and continues to decline, though there are no quantitative data to demonstrate a particular rate of future decline. As discussed under Criterion 2 the species' geographic distribution is precarious due to its fragmentation and range of ongoing threats.

The Committee considers that the estimated total number of mature individuals of the species is limited, the total number of individuals is likely to decline and the species' geographic distribution is precarious for the survival of the species. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **vulnerable**.

Criterion 4: The estimated total number of mature individuals is extremely low, very low or low

Surveys for the New Holland Mouse have generally been localised and site specific, rather than the broad-scale regional surveys necessary for an accurate assessment of the New Holland Mouse's total population size.

Whilst the total number of mature individuals is unknown, the species' total population is estimated to be fewer than 10,000 individuals (Menkhorst et al., 2008).

The Committee considers that there are insufficient quantitative data to determine whether the estimated total number of mature individuals of the species is extremely low, very low or low. Therefore, as the species has not been demonstrated to have met any required element of Criterion 4, it is **not eligible** for listing in any category under this criterion.

Criterion 5: Probability of extinction in the wild that is at least

- (a) **50% in the immediate future; or**
- (b) **20% in the near future; or**
- (c) **10% in the medium-term future**

There are insufficient data available to estimate a probability of extinction of the species in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 5, it is **not eligible** for listing in any category under this criterion.

11. CONCLUSION

Conservation Status

Pseudomys novaehollandiae (New Holland Mouse) was nominated for inclusion in the list of threatened species referred to in section 178 of the EPBC Act. The nominator suggested listing in the vulnerable category of the list.

The Committee considers that the species has a limited geographic distribution, which is precarious for the survival of the species due to threats including habitat loss and predation by introduced predators. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **vulnerable**.

The Committee considers that the estimated total number of mature individuals of the species is limited, the number is likely to decline and the species' geographic distribution is precarious for the survival of the species. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **vulnerable**.

Recovery Plan

There should be a recovery plan for this species as the species would benefit from a nation-wide coordinated survey and monitoring program. As the species has a disjunct distribution across four States, there is a need for national coordination of threat abatement actions and for the sharing of research outcomes across jurisdictions.

12. 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 **vulnerable** category:

Pseudomys novaehollandiae

- (ii) The Committee recommends that there should be a recovery plan for this species.

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Chair

Threatened Species Scientific Committee

13. References cited in the advice

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