Department of Sustainability and Environment

Action Statement

Flora and Fauna Guarantee Act 1988 No. 187

Heath Mouse

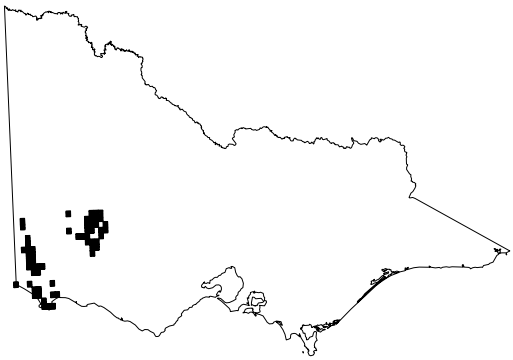
Pseudomys shortridgei

Description and distribution

The Heath Mouse *Pseudomys shortridgei* is one of the larger members of the genus *Pseudomys* (Watts & Aslin 1981). In Victoria, the species is about 120-125 mm in body length and weighs about 70 g. The tail is shorter than the body, being approximately 100 mm in length and has a distinct bicoloured pattern of dark above and white below. (Meulman 1997). The coat has long black guard hairs and brown underfur, giving it a brindled appearance. The belly is grey/white and the ears are dark and covered with soft fine hairs. Adults appear rounder, wider and more compact than juveniles, which have a sleek appearance. It is a quiet, gentle species that shows little agitation at being trapped. When handled, it rarely attempts to bite and makes little vocalisation (Meulman 1997).

The Heath Mouse was first described by Thomas in 1907, from a specimen collected in 1906 by George Shortridge in south-western Western Australia. It was considered to be extinct for thirty years, the last specimen having been collected in 1931 (Baynes *et al.* 1987). However, in 1961 it was discovered in The Grampians, Victoria (Happold 1976, Seebeck 1976), and subsequently found to be present in suitable habitat in much of The Grampians and the southern half of the Wannon Region, south of Dergholm and west of Mt Clay (Happold 1976, Menkhorst 1995, Menkhorst and Beardsell 1982). It is present in the Lower Glenelg National Park. In 1987 it was rediscovered in Western Australia (Baynes *et al.* 1987) and, in 2000 a specimen collected from Kangaroo Island, South Australia in 1967 was identified as *P. shortridgei* (Kemper *et al.* 2000); no further specimens have been encountered and it may be extinct on Kangaroo Island (M. Bachmann *pers. comm.*). In 2002 it was discovered on mainland South

Heath Mouse *Pseudomys shortridgei*
(Photo: DSE/McCann)



Distribution in Victoria (DSE 2004)

Victoria
The Place To Be

Australia, in the Lower Glenelg River Conservation Park, adjacent to the Lower Glenelg National Park in Victoria (Bachmann 2002). There are some ecological differences between the Western Australian and Victorian populations, notably their tolerance of different fire regimes (Quinlan 2001), and a taxonomic comparison of these two populations is warranted (Lee 1995). However, studies by Breed (1997 and *pers. comm.*) of the morphology of the spermatozoa of Victorian and Western Australian specimens demonstrated that there were few, if any, differences. Cooper *et al.* (2003) have investigated DNA from Western Australian and eastern Australian animals and found that there was little divergence. They consider that the eastern and western populations represent the same species.

The Heath Mouse is reported to be poorly represented in Victorian sub-fossil deposits (Wakefield 1963a,b,c, 1964a,b). However, Cockburn (1979a) believed that this was simply a matter of mis-identification and that the species identified by Wakefield as the Eastern Chestnut Mouse *Pseudomys (Thetomys) gracilicaudatus*, was actually the Heath Mouse. Therefore, Cockburn (1979a) concluded that the Heath Mouse was previously quite widespread. A re-examination of Wakefield's collection at the Museum of Victoria would be necessary to clarify the situation and to determine accurately the former distribution of the species. Populations located in The Grampians National Park and those in the south-west are now separated by extensive tracts of cleared pastoral land (Menkhorst 1995, see distribution map). Similarly, in the south-west, the populations south of the Princes Highway are segregated from those to the north by cleared land.

Habitat

The Heath Mouse inhabits dry heath and open woodland and forest with a heathy understorey, such as are developed on nutrient-poor sandy soils. In the southern Wannon Region, it preferred Silver Banksia heath to eucalypt forest or paperbark scrub (Menkhorst and Beardsell 1982). In the Grampians the species has been found in nine different plant communities; in the Victoria Valley it preferred areas of relatively immature, floristically rich low heath (Cockburn 1979a, Meulman 1997). Cockburn (1979a) found that the species was most abundant in the most floristically rich vegetation types, although this may not be the case in all locations at which the species occurs (Meulman 1997). Microhabitat preferences, diet and population processes reflect the species' adaptation to an environment dominated by frequent fires. Population numbers and hence density decline as the heath matures (Cockburn 1979b). Sites that are capable of supplying year-round food are sought after. Such sites can produce grasses, sedges and underground fungi during the autumn and winter months, and plant species that flower and set seed in late winter and early spring.

Life history and ecology

Described as a generalist herbivore (Braithwaite *et al.* 1978), the Heath Mouse's diet consists of seeds, leaf, flowers, grasses, stem, roots and fungi (Watts & Braithwaite 1978, Meulman 1997). Meulman (1997) found evidence that the species is a hindgut fermenter and is thus able to make use of a principally herbivorous diet, in addition to which it can utilise the nutrients available in fungi. Plant material other than fungi made up 60% of the diet, with seeds the most important dietary item in early summer, falling to a minimum in May. Fungus was important in winter – 33% of annual diet. Grasses and other monocotyledons are eaten in autumn and winter, and soil-stored seeds provide a dietary boost during winter (Meulman 1997). Births occur in late spring and summer, with one or two litters of three young (although females have four nipples) being produced in optimal habitat. Nesting sites are believed to be constructed in shallow burrows or on the ground amongst thick vegetation, such as the skirts of the Grass Tree *Xanthorrhoea australis* (Happold 1976). Young are precocious and growth is rapid, juveniles reaching adult size in 3-4 months (Cockburn 1979a, Meulman 1997). The life-history strategy appears to be a temporally dynamic response to a complex set of environmental cues associated with plant succession. In regenerating heathland, adults are small, juvenile survival is high, adult survival is low, breeding can occur in the season of birth, growth is very rapid and two litters may be born in a season. The reproductive strategy is considered to be annual. In mature heath, animals are larger, juvenile survival lower, adult survival higher, breeding does not take place in the season of birth and there is usually only one litter per season. This strategy is described as perennial (Cockburn 1979a).

Heath Mice are semi-nocturnal, being active in the late afternoon and early evening, and again in the early morning, returning to the nest at sunrise. The home range is large in relation to the body size. Trap-revealed home range was about 0.75ha and was similar for males and females, juveniles and adults. Radio-tracking indicated that the range was considerably larger, perhaps as much as 5.5ha. The size of the home range is probably related to food productivity.

Conservation status

National conservation status

Pseudomys shortridgei has been listed as vulnerable under the Commonwealth **Environment Protection and Biodiversity Conservation Act 1999**.

Victorian conservation status

Pseudomys shortridgei has been listed as threatened under the **Flora and Fauna Guarantee Act 1988**.

Pseudomys shortridgei is currently considered as 'Near Threatened' in Victoria, according to the 'Advisory List of Threatened Vertebrate Fauna in Victoria – 2003' (DSE 2003).

Decline and threats

All four extant *Pseudomys* species (*apodemoides*, *fumeus, novaehollandiae* and *shortridgei*) that occur in Victoria show a fragmented distribution. Cockburn (1979a) believed that these species, together with *Mastacomys fuscus,* had suffered substantial range reductions and that the pre-European rodent fauna may have been much more complex and extensive than today. This is evidenced by records of three species of *Pseudomys,* two species of *Leporillus* and one species of *Conilurus* that are now extinct in the state (Seebeck and Menkhorst 2000).

Because the species is considered rare, concern about the future of the Heath Mouse relates to its restricted distribution and specialised habitat requirements. The species is primarily threatened by the loss or degradation of habitat. This occurs as a result of clearing, inappropriate burning regimes, invasion of woody weeds such as *Acacia longifolia* and subtle changes to critical habitat as a result of changed drainage patterns, road-works and dieback in heathland flora caused by *Phytophthora cinnamomi*. It is not known to what extent predation by introduced predators is a threat, but it is presumed to play a role.

In its final recommendations, the Scientific Advisory Committee (SAC 1993) determined that the Heath Mouse is:

- Significantly prone to future threats which are likely to result in extinction; and
- Very rare in terms of abundance and distribution.

Existing conservation measures

- Conservation of existing populations of Heath Mouse is a management aim in Management Plans for the Lower Glenelg National Park and The Grampians National Park.
- Surveys of the Kentbruck Heath have been conducted in the Lower Glenelg National Park (Menkhorst and Beardsell 1982). These identified habitat suitable for the species that has been protected from wildfire and subjected to ecological burns when possible. Fire management regimes in the Lower Glenelg National Park and Narrawong Flora Reserve have been modified to enhance habitat for the Heath Mouse.
- Heath Mice were trapped in the Kentbruck Heath after fire in 1986. Yearly sessions occurred from 1987 - 1990 until dieback disease caused by Cinnamon Fungus (*Phytophthora cinnamomi*) was detected in the surrounding area. The program ceased and the track was closed. Recent trapping by Deakin University revealed no Heath Mice in areas that were 17 years post-fire.
- Studies on the distribution and population dynamics of species were conducted by Cockburn (1975, 1979a,b) and Meulman (1993,1997).
- Heath Mouse was bred in captivity at the Arthur Rylah Institute in early 1973, but not under controlled conditions (J. Seebeck *pers. comm.*). A captive-breeding program was conducted at the Royal Melbourne Zoo between 1993 and 1996, with Heath Mouse bred under controlled conditions, using founder animals from the Narrawong Flora Reserve (Woods 1994). Stock remaining at the termination of this breeding program was released to the wild at Narrawong in November 1996.
- Recent research has been undertaken in Lower Glenelg National Park by Ellen Mitchell, Deakin University. Heath Mice were trapped in the North Nelson area along Big Heath Track in small pockets of vegetation that has not been burnt since 1979. These areas are floristically diverse. Heath Mouse densities were high, up to 20 animals/ha. The post-fire succession of the vegetation appears to have stabilised in these areas.

Conservation objectives

Long-term objective

The long-term goal (10+ years) for conservation of the Heath Mouse is to ensure that it is maintained throughout its present range at densities appropriate to the carrying capacity of the available habitat.

Objectives of this Action Statement

The short-term aim is to secure existing populations from further decline and to protect them from threatening processes by:

- improving knowledge of specific habitat requirements and present distribution of the species;
- ensuring all sites on both public and private land containing Heath Mouse are protected from further clearing, where practical;
- introducing appropriate burning prescriptions at all heathland areas in the public domain within the range of the species which have the potential to provide the floristic richness required by this species;
- controlling woody weed and Cinnamon Fungus invasion at all sites;
- minimising changes to drainage patterns around heathlands containing Heath Mouse. In particular, careful consideration must be given to any planned road-works;
- investigating the impact of predation on distribution and abundance of the species and, if necessary implementing regular and continuing predator control at each site.

Intended management actions

The intended management actions listed below are further elaborated in DSE's Priority Actions Information System. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities.

Survey

1. Identify additional areas of suitable habitat using remote sensing and GIS techniques. Inspect and assess such areas for their potential as Heath Mouse habitat and survey to determine the presence of the species.

   Responsibility: Parks Victoria, DSE South West Region

Planning

2. Conduct a review of the fire control programs of DSE's South West and North West Regions, and Parks Victoria's Western Zone to ensure that the conservation of the habitat for the Heath Mouse is prominent in both fire protection plans and in incident control plans developed for bushfires.

   Responsibility: Parks Victoria, DSE South West Region

3. Establish an inventory of the fire history of heathlands in DSE's South West and North West Regions, and Parks Victoria's West Region to document the current distribution of age classes. Identify areas of old-growth heath and establish fire exclusion zones to protect them.

   Responsibility: Parks Victoria, DSE South West Region

4. Prepare an ecological burning plan for all heathlands in the Department's South West and North West Regions, and Parks Victoria's West Region to provide a planning framework for the implementation of fire regimes which provide a basis for the conservation of the Heath Mouse and other threatened species and which promotes ecological values of the heathland communities in general. This framework will be consistent with the Interim Guidelines and Procedures for Ecological Burning on Public Land in Victoria (NRE 1999) and should address issues such as fire intensity, patch size, frequency and environmental care.

   Responsibility: Parks Victoria, DSE South West Region

Management and monitoring

5. Implement the ecological burning plan specified in Action 4. Burning prescriptions should be reviewed regularly in light of results obtained from research and monitoring actions (see below).

   Responsibility: Parks Victoria, DSE South West Region

6. Develop and implement a population and habitat monitoring protocol for the Heath Mouse that informs the adaptive management of its habitat.

   Responsibility: DSE Biodiversity & Natural Resources Division, Parks Victoria

7. Protect habitat at key sites through control of roading and drainage works, woody weeds and the spread of *Phytophthora cinnamomi*.

   Responsibility: Parks Victoria, DSE South West Region

Research

8. Conduct research into habitat and resource requirements of the species so that habitat critical to Heath Mouse survival can be defined and identified. Include investigation of diet and availability of dietary resources, movement and dispersal characteristics and population parameters that aid assessment of site carrying capacity. Carry out Population Viability Analysis for the species, using data from at least two sites.

   Responsibility: DSE Biodiversity & Natural Resources Division

9. Conduct research into the impact of predation by introduced carnivores upon the species.

   Responsibility: DSE Biodiversity & Natural Resources Division

10. Document and maintain information related to captive husbandry of the species, to ensure that captive breeding remains a viable option for the future.

    Responsibility: Zoos Victoria

Extension

11. Run a workshop for all relevant land managers, detailing the objectives and priorities of the conservation program for Heath mouse and illustrating the need for an integrated strategy.

    Responsibility: Parks Victoria, DSE South West Region

12. Produce an electronic brochure for the general public about the conservation biology of the Heath mouse and detailing the integrated management strategy.

    Responsibility: DSE Biodiversity & Natural Resources Division

References

Bachmann, M. (2002). Small mammals back on the map in South Australia…. but only just! Monitoring the small mammal community in Lower Glenelg River Conservation Park. Abstracts, Australian Mammal Society Scientific Meeting, Warrnambool, July 2002.

Baynes, A., Chapman, A. and Lynam, A.J. (1987). The rediscovery, after 56 years, of the Heath Rat, *Pseudomys shortridgei* (Thomas, 1907) (Rodentia: Muridae) in Western Australia. *Records of the Western Australian Museum* **13(2)**: 319-22.

Braithwaite, R.W., Cockburn, A. and Lee, A.K. (1978). Resource partitioning by small mammals in lowland heath communities in South-eastern Australia. *Australian Journal of Ecology* **3**: 423-45.

Breed, W. G. (1997). Evolution of the Spermatozoon in Australian Rodents. *Australian Journal of Zoology* **45**, 459-78.

Cockburn, A. (1975). The ecology of the genus *Pseudomys* in Victorian heath communities. BSc (Hons) Thesis, Monash University.

Cockburn, A. (1979a). The ecology of *Pseudomys* species in South-Eastern Australia. PhD Thesis, Monash University.

Cockburn, A. (1979b). Conservation of the Heath Rat, *Pseudomys shortridgei*, in the Grampians area. *Victoria's Resources* **21** (2), 9-11.

Cooper, N.K., Bertozzi, T., Baynes, A. and Teale, R.J. (2003). The relationship between eastern and western populations of the Heath Rat, *Pseudomys shortridgei* (Rodentia: Muridae). *Records of the Western Australian Museum* **21**: 367-70.

DSE (2003). *Advisory List of Threatened Fauna in Victoria -2003*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2004) *Atlas of Victorian Wildlife* (electronic fauna database). Department of Sustainability and Environment, East Melbourne, Victoria.

Happold, M. (1976). Social behaviour of the Conilurine rodents (Muridae) of Australia. *Zeitschrift für Tierpsychology* **40**: 113-82.

Kemper, C.M. (2000). *Pseudomys shortridgei*: a new species for South Australia. Abstracts, Australian Mammal Society Scientific Meeting, Alice Springs, July 2000, p. 74.

Lee, A.K. (1995). *The Action Plan for Australian Rodents*. Australian Nature Conservation Agency, Endangered Species Program Project Number **130**, Canberra.

Menkhorst, P.W. (ed.) (1995). *Mammals of Victoria. Distribution, ecology and conservation*. Oxford University Press, Melbourne.

Menkhorst, P.W. and Beardsell, C.M. (1982). Mammals of southwestern Victoria from the Little Desert to the coast. *Proceedings of the Royal Society of Victoria* **94**, 221-47.

Meulman, E. (1993). Aspects of the ecology of the Heath Mouse *Pseudomys shortridgei*. BSc (Hons) Thesis, Charles Sturt University, Wagga, NSW

Meulman, E.P. (1997). The ecology of the Heath Mouse, *Pseudomys shortridgei* in the Grampians National Park, Victoria. PhD Thesis, Charles Sturt University, Wagga, NSW.

NRE (1999). *Interim Guidelines and Procedures for Ecological Burning on Public Land in Victoria*. Department of Natural Resources and Environment, East Melbourne, Victoria.

SAC (1993) Final Recommendation on a nomination for listing: Heath Rat *Pseudomys shortridgei* (Nomination no. **260**). Scientific Advisory Committee, Flora and Fauna Guarantee. Department of Conservation and Natural Resources: Melbourne.

Seebeck, J.H. (1976). Mammals in the Pomonal area, the Grampians. *The Victorian Naturalist* **93**, 138-47.

Seebeck, J. and Menkhorst, P. (2000). Status and conservation of the rodents of Victoria. *Wildlife Research* **27**: 357-69.

Wakefield, N.A. (1963a). Sub-fossils from Mount Hamilton, Victoria. *The Victorian Naturalist* **79**: 323-30.

Wakefield, N.A. (1963b). Mammal sub-fossils from near Portland, Victoria. *The Victorian Naturalist* **80**: 39-45.

Wakefield, N.A. (1963c). Mammal remains from the Grampians, Victoria. *The Victorian Naturalist* **80**: 130-33.

Wakefield, N.A. (1964a). Recent mammalian sub-fossils of the basalt plains of Victoria. *Proceedings of the Royal Society of Victoria* **77**: 419-25.

Wakefield, N.A. (1964b). Mammal sub-fossils from basalt caves in South-Western Victoria. *The Victorian Naturalist* **80**: 274-78.

Watts, C.H.S. and Aslin, H.J. (1981). *The Rodents of Australia*. Angus & Robertson, Melbourne.

Watts, C.H.S. and Braithwaite, R.W. (1978). The diet of *Rattus lutreolus* and five other rodents in Southern Victoria. *Australian Wildlife Research* **5**: 47-57.

Compiled by:

A.J. Watson, Department of Sustainability and Environment, South West Region.

E.P. Meulman, Glenelg-Hopkins Catchment Management Authority.

J.H. Seebeck, Department of Sustainability and Environment, Biodiversity & Natural Resources Division: Melbourne..

Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: http://www.dse.vic.gov.au

This Action Statement has been prepared under section 19 of the Flora and Fauna Guarantee Act 1988 under delegation from Professor Lyndsay Neilson, Secretary, Department of Sustainability and Environment, September 2003.

Published by the Department of Sustainability and Environment, Victoria. 8 Nicholson Street, East Melbourne, Victoria 3002 Australia

ISSN 1448-9902