



Consultation Document on Listing Eligibility and Conservation Actions

***Mastacomys fuscus mordicus* (broad-toothed rat (mainland))**

You are invited to provide your views, and reasons supporting them, related to:

- 1) the eligibility of *Mastacomys fuscus mordicus* (broad-toothed rat (mainland)) for inclusion on the EPBC Act threatened species list in the Vulnerable category; and
- 2) the necessary conservation actions for the above subspecies.

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

or by mail to:

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

Responses are required to be submitted by 25 November 2015.

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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/biodiversity/threatened/pubs/guidelines-species.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>.

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.

Mastacomys fuscus mordicus

Broad-toothed rat (mainland)

Note: The information contained in this conservation advice was primarily sourced from 'The Action Plan for Australian Mammals 2012' (Woinarski et al., 2014). Any substantive additions obtained during the consultation on the draft will be cited within the advice. Readers may note that conservation advices resulting from the Action Plan for Australian Mammals show minor differences in formatting relative to other conservation advices. These are reflective of the desire to achieve efficiency over preparation of a large number of advices by adopting the approach of the Action Plan for Australian Mammals in presentation of information and do not reflect any difference in the evidence used to develop the recommendation.

Taxonomy

Conventionally accepted as *Mastacomys fuscus mordicus* (Thomas, 1922).

Two subspecies are recognised. The other subspecies is *M. f. fuscus* (broad-toothed rat (Tasmania)).

Species/subspecies Information

Description

The broad-toothed rat has a broad face, short tail and stocky body. It has fine, dense fur which is brown tinged with rufous above, merging to a paler grey underneath. It may have a green tinge due to the presence of algae. The ears are small and round with tufts of hair inside. The feet are brown above and below. The tail is lightly haired, dark above and becoming slightly lighter underneath. It has characteristically large molars in a rounded head, with well developed cheeks and large jaw muscles. It has a head and body length of 14–17 cm and a tail length of 10–13 cm (Happold, 2008; Australian Museum, 2014).

Distribution

The broad-toothed rat (mainland) now has a highly fragmented distribution, with scattered records across the Great Dividing Range from near Warburton (Victoria) to the Brindabella Range (Australian Capital Territory), and around Barrington Tops, with at least one poorly-known subpopulation in coastal areas of far East Gippsland and south-eastern New South Wales (Seebeck & Menkhorst, 2000; Green & Osborne 2003; C. Dickman pers. comm., cited in Woinarski et al., 2014).

It was formerly far more widespread. Its distribution has declined significantly since European settlement (Seebeck, 1971; Menkhorst, 1995; Hocking & Driessen, 2000; Bilney et al., 2010), and its area of occupancy is probably continuing to decline, particularly in the mainland component of its range (Seebeck & Menkhorst, 2000; Green & Osborne, 2003; Green et al., 2008; Menkhorst et al., 2008; Happold, 2008). For example, Menkhorst et al. (2008) reported that it had not been recorded in the Otway Ranges 'for the last 30 years'; the last records from the Victorian Western District Plains and far East Gippsland are before 1900, from west Gippsland before 1950, and from Wilson's Promontory before 1980. In Victoria, a high proportion of its range was burnt by major bushfires in 2003, 2006 and 2009, and the current status of affected subpopulations is unknown (Flora and Fauna Guarantee – Scientific Advisory Committee (Victoria), 2012).

Relevant Biology/Ecology

Many aspects of the ecology and life history of the broad-toothed rat are relatively well known, due to a series of intensive studies (e.g. Happold, 1989b, 1998; Carron et al., 1990; Bubela et al., 1991; Bubela & Happold, 1993), although these studies are not necessarily representative of

the environmental range occupied by this species. The broad-toothed rat is a terrestrial and mostly nocturnal rodent. It is herbivorous, with grasses forming the major component of its diet (Carron et al., 1990). In summer it nests in burrows in the soil. In alpine areas in winter, it dens communally during the day in nests of shredded grass situated in dense undergrowth or under logs beneath the snow (Bubela & Happold, 1993). In alpine and sub-alpine areas, it is active in the vegetation layer under snow cover (Happold, 1998).

The species occupies a range of habitats across its range, but typically is highly selective in any region. Preferred habitats include alpine and subalpine heathlands, grassland adjacent to boulder outcrops, swamps, sedgeland, coastal grassy or shrubby dunes, and sometimes forests with grassy understories (Wallis et al., 1982; Seebeck et al., 2003; Green & Osborne, 2003). Habitat suitability is largely determined by availability of cover and grasses (Green & Osborne, 2003; Menkhorst et al., 2008). In mainland alpine areas its preferred habitats are those with rocks and shrubs (including *Phebalium* and *Prostanthera* species: D. Happold pers. comm., cited in Woinarski et al., 2014). In Tasmania, the species is restricted to button-grass moorland or adjacent ecotones (Hocking & Driessen, 2000), or wet sedgeland and heathland (Green, 2007), and in alpine areas above the impact of grazing wallabies in isolated grassland on rocky mountains (Green, 2011). Because of a requirement for dense ground cover, fire reduces the suitability of this habitat, and 'regrowth takes some years to mature to a stage suitable for re-colonisation' (Green, 2007).

In part, the preferred habitat is naturally discontinuous, prompting a fragmented distribution for this species. However, many areas of apparently suitable habitat are unoccupied (Green & Osborne, 2003) and the species may have limited ability to disperse across unfavourable habitat, although where discrete habitat patches are relatively close together, there may be sufficient dispersal to treat these fragmented occurrences as a meta-population (O'Brien et al., 2008).

Home range size and social dispersion vary seasonally, from about 0.1 to 0.3 ha. Breeding is seasonal, with females giving birth to one or two litters (of one to four young) per season between October and March (Happold, 1998; Green, 2007). Sexual maturity is reached in 6-12 months (Happold, 2008, 2011); longevity is probably 2-3 years (Happold, 2011) so generation length is assumed to be 1-2 years (Woinarski et al., 2014).

Threats

Threats to the broad-toothed rat (mainland) are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Predation by red foxes	severe	large	many studies demonstrating predation by foxes; and Green (2002) demonstrated that this predation is highly selective
Inappropriate fire regimes	severe	large	major fires over the last decade have reduced habitat extent and suitability (Menkhorst et al., 2008; Happold, 2008; Flora and Fauna Guarantee – Scientific Advisory Committee (Victoria), 2012); correlative studies demonstrate requirements for unburnt (>15 years post-fire) vegetation (Hocking & Driessen, 2000; Green, 2007)

Predation by feral cats	moderate	entire	some studies demonstrating predation (Menkhorst <i>et al.</i> 2008)
Global climate change	severe	large (magnifying in the near-medium future)	direct impacts due to reduced habitat suitability, but also through increases in predators and competitors (Green <i>et al.</i> , 2008); direct evidence of detrimental impacts of early snow thaws in Snowy Mountains subpopulations (K. Green pers. comm., cited in Woinarski <i>et al.</i> , 2014)
Habitat change and resource depletion due to livestock and feral herbivores	moderate	moderate	Menkhorst <i>et al.</i> (2008) notes habitat degradation due to feral horses, rabbits, deer, hares and pigs; and some recent impact-control experiments demonstrate decline of the broad-toothed rat in areas with horse impact (K. Green pers. comm., cited in Woinarski <i>et al.</i> , 2014)
Habitat loss and fragmentation	severe	localised	some habitat destruction associated with ski resort development (Menkhorst <i>et al.</i> , 2008)
Competition with other native rodents	minor	moderate	some correlative evidence (Green & Osborne, 2003)
Habitat change (and resource depletion) due to weeds	minor	minor	weed invasion noted at some sites (Menkhorst <i>et al.</i> , 2008)
Habitat change due to logging	minor	minor	likely threat, but impacts unknown (Flora and Fauna Guarantee – Scientific Advisory Committee (Victoria), 2012)

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

Criterion 1. Population size reduction (reduction in total numbers)

Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%

A1	Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.	(a)	direct observation [except A3]
A2	Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.	(b)	an index of abundance appropriate to the taxon
A3	Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]	(c)	a decline in area of occupancy, extent of occurrence and/or quality of habitat
A4	An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.	(d)	actual or potential levels of exploitation
		(e)	the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

based on any of the following

Evidence:

Recent decline of the broad-toothed rat (mainland) has been demonstrated at some sites and inferred at most other known locations. This rate may approach or exceed 30% over the last or next 10 year period, but the rate of decline is not well established across its range. Menkhorst et al. (2008) noted a >50% decline in the largest known and best-studied subpopulation (in the Mt Kosciuszko area) over the period 1999-2008; and K. Green (pers. comm., cited in Woinarski et al., 2014) noted that, in the summer of 1999-2000, the population in the Snowy Mountains fell to about 34% of average values over the previous 13 years (associated with the earliest snow thaw on record), and has not increased above that point subsequently (in part due to subsequent extensive fire, and another early snow thaw in 2006). The Flora and Fauna Guarantee – Scientific Advisory Committee (Victoria) (2012) reported that much of its range in Victoria was burnt by extensive wildfires in 2003, 2006 and 2009, with presumed detrimental impacts.

Categorisation of the conservation status of the broad-toothed rat (mainland) is hampered by limited knowledge of the total population size, population trends, and area of occupancy. However, there is continuing decline in habitat suitability and extent, area of occupancy, number of subpopulations and population size, and Woinarski et al. (2014) infer the overall rate of this population size decline to be >30% over 10 years. Threats are ongoing.

The data presented above appear to demonstrate that the species is **eligible for listing as Vulnerable** under criteria A2b,c,e; A3b,c,e; A4b,c,e. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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.

Criterion 2. Geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or			

Evidence:

Woinarski et al. (2014) estimate the extent of occurrence to be 31 300 km², and the area of occupancy likely to be > 2000km². Both are considered to be declining. The subspecies occurs at >10 locations but the population distribution is highly fragmented (Woinarski et al., 2014).

The data presented above appear to be insufficient to demonstrate if the subspecies is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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.

Criterion 3. Small population size and decline				
		Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals		< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generations (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b)	Extreme fluctuations in the number of mature individuals			

Evidence:

There are no robust estimates of the population size, nor that of most subpopulations, of the broad-toothed rat (mainlan). In suitable habitat it may attain relatively high densities: the density of one subpopulation in Kosciusko National Park was 12.1 individuals/ha (range 8-19/ha) during a 12 year period (Happold, 1989, 1998). However, most sources consider it to be scarce and patchily distributed: Seebeck and Menkhorst (2000) noted that it was 'generally rare and localised, but may be locally common in appropriate habitat'; Happold (2008) considered it 'sparse to common'; and Menkhorst *et al.* (2008) considered it 'not a common species'. However, Woinarski et al. (2014) consider that the population size is 'probably substantially > 10 000 mature individuals.'

The data presented above appear to be insufficient to demonstrate if the subspecies is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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.

Criterion 4. Very small population			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
Number of mature individuals	< 50	< 250	< 1,000

Evidence:

Woinarski et al. (2014) consider that the population size is 'probably substantially > 10 000 mature individuals.'

The data presented above appear to be insufficient to demonstrate if the subspecies is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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.

Criterion 5. Quantitative Analysis			
	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

Evidence:

No population viability analysis has been undertaken.

There are insufficient data to demonstrate if the subspecies is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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.

Conservation Actions

Recovery Plan

A decision about whether there should be a national recovery plan for this subspecies has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

Primary Conservation Objectives

1. Manage threats to secure or increase overall population size.
2. Maintain viable subpopulations at all known localities.

Conservation and Management Actions

Much of the current range of the broad-toothed rat is within conservation reserves, in some of which there is intensive and extensive management of some threats to this species. This species has also been the subject of a series of intensive research studies, and some monitoring.

Recommended management actions for the broad-toothed rat (mainland) are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Active mitigation of threats	implement control mechanisms for non-native predators, that minimise adverse impacts upon this species	high
	undertake landscape-scale fire management, to decrease incidence of extensive and intense fire	medium-high
	constrain grazing by livestock and feral herbivores to within acceptable limits in and around important subpopulations	medium-high
	control or eradicate woody weeds in and around important subpopulations	low-medium
Captive breeding	maintain a captive breeding colony	low-medium
Quarantining isolated populations	n/a	
Translocation	reintroduce to parts of former range, once threat management is effective	low-medium
Monitoring	implement integrated monitoring program linked to assessment of management effectiveness	medium-high
	monitor abundance of feral predators at key subpopulations, in response to management actions	medium-high
	monitor incidence of fire, and vegetation response, at key subpopulations	medium-high
Community engagement	seek conservation covenants on private land holding important subpopulations	low-medium

Information and research priorities

Information and research priorities are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Survey to better define distribution	assess population size (or relative abundance) of all subpopulations, and then prioritise subpopulations for management focus	high
	undertake a targeted survey of all suitable habitat within range	low-medium
Assess relative impacts of threats	assess impacts of feral predators (under different densities and seasonal conditions)	medium-high
	assess impacts of livestock and feral herbivores, and develop thresholds of safe grazing pressure	medium-high
	assess impacts of fire, and identify a preferred fire regime	medium
	assess the impacts of competition with other native rodents	medium (in Barrington Tops area: K. Green pers. comm.)
Establish or enhance monitoring program	design an integrated monitoring programs across subpopulations	medium-high

Assess relative effectiveness of threat mitigation options	assess efficacy of a range of management regimes for non-native predators	medium-high
	assess efficacy of a range of management regimes for weeds	medium
	identify options for management control of other native rodents, if deemed necessary	medium
Resolve taxonomic uncertainties	n/a	
Assess habitat requirements	n/a	
Assess diet, life history	n/a	
Undertake research to develop new or enhance existing management mechanisms	develop broad-scale, targeted feral cat control technology	medium

References cited in the advice

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Consultation questions

1. Do you agree with the current taxonomic position of the Australian Faunal Directory for this taxon (as identified in the draft conservation advice)
2. Can you provide any additional references, information or estimates on longevity, age of maturity, average life span and generation length?
3. Has the survey effort for this taxon been adequate to determine its national distribution and adult population size?

4. Do you accept the estimate provided in the nomination for the current population size of the taxon?
5. For any population with which you are familiar, do you agree with the population estimate provided? If not, are you able to provide a plausible estimate based on your own knowledge? If so, please provide in the form:
 - Lower bound (estimated minimum):
 - Upper bound (estimated maximum):
 - Best Estimate:
 - Estimated level of Confidence: %
6. Can you provide any additional data, not contained in the current nomination, on declines in population numbers over the past or next 10 years or 3 generations, whichever is the longer?
7. Is the distribution as described in the nomination valid? Can you provide an estimate of the current geographic distribution (extent of occurrence or area of occupancy in km²) of this taxon?
8. Has this geographic distribution declined and if so by how much and over what period of time?
9. Do you agree that the taxon is eligible for inclusion on the threatened species list, in the category listed in the nomination?
10. Do you agree that the threats listed are correct and that their effects on the taxon are significant?
11. To what degree are the identified threats likely to impact on the taxon in the future?
12. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect this taxon at any stage of its life cycle?
13. In seeking to facilitate the recovery of this taxon, can you provide management advice for the following:
 - What individuals or organisations are currently, or need to be, involved in planning to abate threats and any other relevant planning issues?
 - What threats are impacting on different populations, how variable are the threats and what is the relative importance of the different populations?
 - What recovery actions are currently in place, and can you suggest other actions that would help recover the taxon? Please provide evidence and background information.
14. Can you provide additional data or information relevant to this assessment?