



Consultation Document on Listing Eligibility and Conservation Actions

Phascogale tapoatafa subsp. (brush-tailed phascogale (Kimberley))

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

- 1) the eligibility of *Phascogale tapoatafa subsp.* (brush-tailed phascogale (Kimberley)) for inclusion on the EPBC Act threatened species list in the Endangered 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.

Phascogale tapoatafa spp.

Brush-tailed phascogale (Kimberley)

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 *Phascogale tapoatafa* subsp. (Rhind, 2008). Two other subspecies are recognised: *P. t. tapoatafa* (brush-tailed phascogale (eastern)) and *P. t. spp* (south-western Australia).

Subspecies Information

Description

The brush-tailed phascogale is uniformly grizzled grey above, and cream to white below. Its ears are large and bare. It has a conspicuous black 'bottle-brush' on the distal two-thirds of the tail, on which the hairs grow to 55 millimetres long (Soderquist & Rhind, 2008).

Distribution

The brush-tailed phascogale (Kimberley) originally occurred in coastal and near coastal areas from Kalumburu to Broome. Its current status in the Kimberley is unclear as there have been very few recent records despite numerous surveys: it has been recorded at only three localities (Yampi Peninsula, Mitchell Plateau, Mt Hart) in the past 25 years. It has not been located on Kimberley islands (Gibson and McKenzie 2012). The small number of records is despite very considerable and increasing mammal survey in the Kimberley (although these have not targeted this subspecies). It is well known that brush-tailed phascogales do not readily enter the trap types used in most mammal surveys, so targeted surveys using more specialised techniques such as nest boxes and camera traps are required.

Relevant Biology/Ecology

There is very little information on the ecology of the brush-tailed phascogale (Kimberley). It is the most arboreal of the dasyurid marsupials, seldom feeding on the ground. An agile hunter, it can leap up to 2 m between tree branches or trunks. It is nocturnal and shelters in tree hollows during the day.

The subspecies mainly occurs in savanna woodland. Home ranges in females can typically be 20-40 ha, while male home ranges may be >100 ha. However, home ranges can be much smaller in high quality forest (van der Ree et al., 2001). Its diet predominantly consists of invertebrates found on or under bark, but nectar is also taken and appears to be a particularly prized but rare and patchy food source (Scarff et al., 1998).

Rhind (1996) found that, in forests of south-western Australia, brush-tailed phascogales used hollows in mature and dead Jarrah *Eucalyptus marginata* and Marri *Corymbia calophylla*. Rhind (1996) found that logging practices of the time removed most habitat trees. Competition for nest hollows from other species that nest or shelter in hollows, including the introduced honey bee (*Apis mellifera*), may be limiting (van der Ree et al., 2006).

Rhind (2002) reported that, in south west Australia, habitat quality was correlated with body size and the largest phascogales were found in swamp/gully systems, suggesting food is a normally limiting resource for this species in this environment. Additionally, a significant decrease in growth rate occurred during a drought year, and growth of young seemed restricted during dependency. Maternal mortality appeared high during late lactation as orphaned, unweaned young were encountered in nest boxes. Subsequently, adult males were 25% less in mass than usual; females 15% less. Population decline followed with capture rates one-third of that typically found for the time of year. Recovery was not apparent until two years after drought. In this food-limited environment phascogale populations appear particularly vulnerable to annual fluctuations in rainfall.

In southern Australia, the breeding season extends over three weeks between mid-May and early July (Soderquist, 1993). In the wild, all males die after their first breeding season (Rhind, 1992; Cuttle, 1982; Soderquist & Ealey, 1994; Rhind, 2002; Menkhorst et al., 2008). However, in captivity they may survive for up to three years, but are not sexually active after the first year. Reproductive success varies, with significant female deaths while lactating in some areas (Soderquist, 1993a, b). Both sexes breed at one year of age and generation length is assumed to be 1 year (Woinarski et al., 2014).

Threats

Threats to the brush-tailed phascogale (Kimberley) are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Inappropriate fire regimes	severe	entire	home range of eastern subspecies much smaller in high quality habitat compared with degraded areas (van der Ree et al., 2001); extensive and high intensity fires have been common in the Kimberley and reduce hollow and food availability; predation by indigenous predators may be significant if population fragmented and at low density
Predation by feral cats	moderate-severe	entire	Feral cats shown to be a major cause of failure in two of three releases of brush-tailed phascogales in Gippsland (Soderquist, 1995)
Small, low density subpopulations	moderate-severe	entire	sparse densities, fluctuating reproductive success and annual male die off means an isolated subpopulation that fails to reproduce in one year will fail (Soderquist & Rhind, 2008)
Poisoning by cane toads (<i>Rhinella marina</i>)	unknown (possibly severe)	minor currently, but entire by c. 2020	no direct evidence for this subspecies, but some circumstantial evidence for impacts on similar northern phascogale <i>P. pirata</i> in the Northern Territory

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.	<i>based on any of the following</i>	(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	

Evidence:

There are very few records of the brush-tailed phascogale (Kimberley). There are no estimates of abundance and insufficient information to assess whether there has been a population size reduction (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 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 subpopulations; (iv) number of mature individuals			

Evidence:

Woinarski et al. (2014) estimate the extent of occurrence to be 1100 km². The area of occupancy is unknown. The subspecies has been recorded at 3 locations.

There is an inferred continuing decline in the area, extent and/or quality of habitat, and number of individuals. The brush-tailed phascogale (Kimberley) has suffered a historical decline in

range, and threats are ongoing. Elsewhere the closely-related *P. pirata* is known to be vulnerable to predation by cats (e.g. a reasonably high proportion of records of *P. pirata* from the Northern Territory are of specimens brought in by cats) and as the brush-tailed phascogale (Kimberley) is not known from islands all subpopulations are prone to cat predation. As it occurs mainly in savanna woodland rather than in rocky areas, it is greatly affected by frequent, intense fires (Woinarski et al., 2014).

The data presented above appear to demonstrate that the subspecies is **eligible for listing as Endangered** under criterion B1a,b(iii,v). 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 3 years or 1 generation (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
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

The brush-tailed phascogale (Kimberley) has suffered a historical decline in range and its population size is likely to be small. Woinarski et al. (2014) infer the number of mature individuals to be < 10 000; however, this estimate is not reliable or robust. There is an inferred continuing decline in population. The number of subpopulations is unknown

There are no estimates of abundance. Brush-tailed phascogales do not readily enter the trap types commonly used for zoological surveys, and lack of records in the Kimberley may be due to detection issues (Start et al., 2007), declines or both. Dahl (1926) collected this subspecies at Broome in 1896, but there are no records from the south-western Kimberley since. Despite thousands of trap nights targeting mammals in the north-western Kimberley over the past 30 years, there have been very few records (Bradley et al., 1987; Start et al., 2007; Radford et al., 2011; I. Radford *pers. comm.*, cited in Woinarski et al., 2014). One phascogale was recorded during intensive survey in 1981 and 1982 by Bradley et al. (1987). In trapping surveys in the Kimberley region from 1994 to 2011 (91 695 trap nights) there were six records of phascogales at three sites on Yampi Peninsula (I. Radford *pers. comm.*, cited in Woinarski et al., 2014). In the Mitchell Falls area there have been three sightings (with one confirmed by photo) of phascogales from 2007 to 2012, suggesting they are present but probably not abundant in the region. There has been a recent sight record from Mt Hart (S. Craswell *pers. comm.*, cited in Woinarski et al., 2014).

The data presented above appear to be insufficient to demonstrate if the subspecies is eligible for listing under this criterion. The estimate of population size is not considered to be reliable or robust. 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:

There is no robust estimate of population size (see Criterion 3).

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 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. Develop and implement better survey technology
2. Maintain viability of all subpopulations and increase abundance and geographic range.

Conservation and Management Actions

There is no taxon-specific management for this subspecies. Recommended management actions are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Active mitigation of threats	implement fire management that is favourable to this species	high
	where possible, seek to control feral cats at broad-scale, and/or intensively at and around significant subpopulations	high
Captive breeding	establish an 'insurance' captive colony	medium
Quarantining isolated populations	n/a	
Translocation	consider translocation to a Kimberley island	medium
Monitoring	implement monitoring of selected subpopulations throughout range	high
Community engagement	involve Aboriginal communities in survey, monitoring and management	medium

Information and research priorities

Information and research priorities for the brush-tailed phascogale (Kimberley) are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Survey to better define distribution	develop and trial more efficient survey technology	high
	conduct targeted survey using a variety of detection techniques to define distribution and estimate population size	high
Assess impacts of threats on species	assess population-level impact of feral cats	high
	assess responses to a range of fire regimes, and identify optimal regime	high
	assess responses to cane toads	medium-high
Establish or enhance monitoring program	develop cost-effective monitoring protocols	high
Assess effectiveness of threat mitigation options	assess responses to better fire management	high
Resolve taxonomic uncertainties	finalise and publish morphological and genetic analyses and revise taxonomy	high
Assess habitat requirements	delineate habitat requirements including the extent to which tree hollow occurrence and quality is a limiting factor on phascogale subpopulations	high
Assess diet, life history	document diet and life history	high

Undertake research to develop new or enhance existing management mechanisms	develop broad-scale, targeted feral cat eradication technology	high
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References cited in the advice

- Bradley, A. J., Kemper, C. M., Kitchener, D. J., Humphreys, W. F., and How, R. A. (1987). Small mammals of the Mitchell Plateau region, Kimberley, Western-Australia. *Australian Wildlife Research* 14, 397-413.
- Cuttle, P. (1982). Life history strategy of the dasyurid marsupial *Phascogale tapoatafa*. In 'Carnivorous marsupials.' (Ed. M. Archer.) pp. 13-22. (Royal Zoological Society of New South Wales: Mosman.)
- Dahl, K. (1926). 'In savage Australia. An account of a hunting and collecting expedition to Arnhem Land and Dampier Land.' (Philip Allan and Co: London.)
- Gibson, L. A., and McKenzie, N. L. (2012). Occurrence of non-volant mammals on islands along the Kimberley coast of Western Australia. In 'Biodiversity values on selected Kimberley islands, Australia'. (Eds L. A. Gibson, S. Yates and P. Doughty.) *Western Australian Museum Records Supplement* No. 81, pp 15-39.
- Menkhorst, P., Rhind, S., and Ellis, M. (2008). *Phascogale tapoatafa*. In 'IUCN red list of threatened species.' Version 2011.2. <www.iucnredlist.org>. Accessed 10 June 2012.
- Radford, I. J., Shedley, E., Carnes, K. and Fairman, R. (2011). Kimberley science and conservation strategy. Landscape conservation initiative: monitoring and evaluation 2011. Department of Environment and Conservation, Kununurra.
- Rhind, S. G. (1992). Reproductive demographics among brush-tailed phascogales (*Phascogale tapoatafa*) in south-western Australia. *Wildlife Research* 29, 247-257.
- Rhind, S. (1996). Habitat tree requirements and the effects of removal during logging on the marsupial brush-tailed phascogale (*Phascogale tapoatafa*) in Western Australia. *Western Australian Naturalist* 21, 1-22.
- Rhind, S. G. (2002). Reproductive demographics among brush-tailed phascogales (*Phascogale tapoatafa*) in south-western Australia. *Wildlife Research* 29, 247-257.
- Scarff, F. R., Rhind, S. G., and Bradley, J. S. (1998). Diet and foraging behaviour of brush-tailed phascogales (*Phascogale tapoatafa*) in the jarrah forest of south-western Australia. *Wildlife Research* 25, 511-526
- Soderquist, T., and Rhind, S. (2008). Brush-tailed Phascogale *Phascogale tapoatafa*. In 'The mammals of Australia.' Third Edition. (Eds S. Van Dyck and R. Strahan.) pp. 105-107. Reed New Holland: Sydney.
- Soderquist, T. R. (1995). The importance of hypothesis testing in reintroduction biology: examples from the reintroduction of the carnivorous marsupial *Phascogale tapoatafa*. In 'Reintroduction biology of Australian and New Zealand fauna.' (Ed. M. Serena.) pp. 159-164. (Surrey Beatty and Sons: Sydney.)
- Soderquist, T. R. (1993a). Maternal strategies of *Phascogale tapoatafa* (Marsupialia, Dasyuridae). 1. Breeding seasonality and maternal investment. *Australian Journal of Zoology* 41, 549 – 566.

- Soderquist, T. R. (1993b). Maternal strategies of *Phascogale tapoatafa* (Marsupialia, Dasyuridae). 2. Juvenile thermoregulation and maternal attendance. *Australian Journal of Zoology* 41, 567 – 576.
- Soderquist, T. R., and Ealey, L. (1994). Social interactions and mating strategies of a solitary carnivorous marsupial, *Phascogale tapoatafa*, in the wild. *Wildlife Research* 21, 527 - 541
- Start, A. N., Burbidge, A. A., McKenzie, N. L., and Palmer, C. (2007). The status of mammals in the north Kimberley, Western Australia. *Australian Mammalogy* 29, 1-16.
- van der Ree, R., Soderquist, T. R., and Bennett, A. F. (2001). Home-range use by the brush-tailed phascogale (*Phascogale tapoatafa*) (Marsupialia) in high-quality, spatially limited habitat. *Wildlife Research* 28, 517-525.
- van der Ree, R., Bennett, A. F., and Soderquist, T. R. (2006). Nest-tree selection by the threatened brush-tailed phascogale (*Phascogale tapoatafa*) (Marsupialia: Dasyuridae) in a highly fragmented agricultural landscape. *Wildlife Research* 33, 113–119.
- Woinarski, J. C. Z., Burbidge, A. A., & Harrison, P. L. (2014). *The Action Plan for Australian Mammals 2012*. Collingwood, Australia: CSIRO Publishing.

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?