Threatened Species Assessment

Petrogale penicillata
Brush-tailed Rock-wallaby

Taxonomy

Petrogale penicillata (J. Gray, 1827)

No subspecies are recognised. However, three evolutionarily significant units with substantial genetic distinctiveness (Menkhorst and Hynes 2011) have been defined: southern (encompassing Victorian populations), central (central New South Wales) and northern (north-eastern New South Wales and south-eastern Queensland) (Browning et al. 2001; Paplinska et al. 2011). The southern ESU is recognised in the national recovery plan (Menkhorst and Hynes 2011) and draft action statement (Hill in prep) and corresponds with the Victorian population (and extralimitally ACT).

Current conservation status

Listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1991).

Categorised as Critically endangered in the 2013 Advisory list of threatened vertebrate fauna in Victoria (DSE 2013).

Proposed conservation status

Critically Endangered in Victoria

Criterion D

The population size in the future is based on the assumption that the conservation efforts will continue, and there will be successful translocations and establishment of new populations. However to date, the reintroduction success has been low.

Species Information

Description and Life History

The Brush-tailed Rock-wallaby is brown above, tending to be rufous on the rump and grey on the shoulders. The chest and belly are paler and in some individuals there is a white blaze on the chest. There is a white to buff cheek stripe and a black dorsal stripe from the forehead to the back of the head. The exterior of the ears is black, and inside the ears is buff. There is a black auxiliary patch often extending as a dark stripe to the margin of the hind-legs. There is a pale grey side-stripe sometimes present. The feet and paws are dark brown to black. The tail darkens distally with a prominent brush. The pelage is long and thick, particularly about the rump, flanks and base of the tail. Individuals from the north of the taxon's range tend to be lighter and have a less prominent tail brush (Eldridge and Close 1998). Males grow to 529-586 mm and females to 510-570 mm in head and body length. The tail length of the male is 510-700 mm and 500-630 mm for females. Males reach a weight of 5.5-10.9 kg and females a weight of 4.9-8.2 kg (Eldridge and Close 1998).

The Brush-tailed Rock-wallaby lives in colonies, usually comprising fewer than 30 individuals (Piggott et al. 2006; Hazlitt et al. 2006a), with many colonies now comprising just a few individuals (Menkhorst and Hynes 2011). At night, Brush-tailed Rock-wallabies move from their daytime shelter sites to a foraging area, typically using a habitual route. Home range size varies from 6-30 hectares (Short 1980), although more recent radio-tracking data demonstrate that movements of c. 500 m distance per night are relatively common, suggesting home range sizes

may be larger than previously published values (T. Soderquist pers. comm.). Foraging areas may include forests, woodlands and pastures. The Brush-tailed Rock-wallaby has a mixed diet: grass is the main item, but flowers, forbs, leaves, fruit, bark and fungi are also eaten (Short 1989; Menkhorst and Hynes 2011).

The Brush-tailed Rock-wallaby can breed throughout the year, although births peak from February to May (Eldridge and Close 2008), and at least in some colonies breeding may be highly synchronised (Wynd et al. 2006). Sexual maturity is reached at about 1.5-2 years (longer for males: Lee and Ward 1989). Longevity may reach at least 14 years (Jones et al. 2009); although the maximum recorded in the wild in studies of Victorian subpopulations is 8 years (L. Clausen pers. comm.).

Generation Length

The generation length of the Brush-tailed Rock-wallaby is estimated to be 7 to 8 years. Animals reach sexual maturity at about 1.5-2 years. Longevity may be at least 14 years (Jones et al. 2009); although the maximum recorded in the wild in studies of Victorian subpopulations is 8 years. The figure provided in the Mammal Action Plan (Woinarski et al. 2015) is also 7-8 years.

Distribution

The Brush-tailed Rock-wallaby is now patchily distributed along the Great Dividing Range (GDR) from Yarraman (north of Toowoomba, Queensland) to the upper Snowy River in eastern Victoria. Within this broad distribution, three Evolutionarily Significant Units (ESUs; as defined by Moritz 1994) that are substantially genetically distinct from one another have been identified: a Southern ESU (S-ESU) that is currently restricted to East Gippsland and a reintroduced population in the Grampians in western Victoria; a Central ESU (C-ESU) in central NSW; and a Northern ESU (NESU) in northern NSW and south-eastern Queensland (Browning et al. 2001).

There is currently a substantial gap of about 320 km between the most easterly S-ESU population (Snowy River National Park) and the southern edge of the C-ESU range (Kangaroo Valley), although many populations have been lost from this region since European colonisation.

The Brush-tailed Rock-wallaby was also introduced to New Zealand and Hawaii, where feral populations have become established (Lazel et al. 1984; Warburton and Sadlier 1995; Eldridge et al. 2001)

Habitat

Brush-tailed Rock-wallaby habitat includes refuge habitat, feeding habitat, and routes in between. Refuge habitat includes rock faces or outcrops with large tumbled boulders, ledges and caves (often with vegetation cover) that provide shelter and some protection from predators. Preferred rocky habitat consists of three major types (Short 1982): loose piles of large boulders containing a maze of subterranean holes and passageways; cliffs with many mid-level ledges and with some caves and/or ledges covered by overhangs; and isolated rock stacks, usually sheer-sided and often girdled with fallen boulders. Rock refuges are usually on a steep slope (e.g. cliff lines, river banks, gorges, outcrops from hillsides, plateau edges). The extent of occupied refuge habitat may not be large, with some colonies persisting in refuge habitat that is less than 50 m long and 20 m high, although some large colonies occupy refuge habitat that is continuous for many hundreds of metres along cliff lines (Short 1982; Bayne 1994; Murray 2002; Waldegrave-Knight 2002; P. Jarman pers. obs. 2007). Most refuge sites have areas that receive sunlight for much of the day. Preferred refuge sites in East Gippsland had more than one entrance, several ledges, a northerly or easterly aspect, and occurred within a large area of rocky slope where the general slope was greater than 45° (Waldegrave-Knight 2002).

Foraging habitat includes forest and woodland with a grassy understorey, and animals will forage in artificial clearings and pastures. Precise vegetation community type may not be critical in habitat selection as Brush-tailed Rock-wallabies eat a wide variety of plant material, although mainly grasses.

Prior to European settlement, the taxon may have also occurred in non-rocky forests and woodlands, especially those on steep slopes and with cover in the form of dense vegetation and large fallen logs or trees (Jarman and Bayne 1997). The apparent restriction of Brush-tailed Rock-wallabies to rocky habitats may be relatively recent, and is probably a consequence of threatening processes operating on the taxon. Habitat critical to survival of the taxon includes rocky refuge habitat, foraging habitat and commuting routes between the two. This has not yet been precisely mapped for the taxon.

Threats

The principal threats to the Brush-tailed Rock-wallaby are not well understood. While some declines happened decades ago, the decline is continuing in some areas, as evidenced by the ongoing loss of individual colonies. Remaining populations are generally highly fragmented and isolated from one another. The disjunct nature of its distribution makes populations particularly susceptible to local extinction from stochastic events such as fire, drought and disease. Also, the loss of genetic variation in a population reduces the ability of the population to respond to environmental change and increases the risk of extinction, through increased inbreeding and genetic drift may cause loss of fitness. However, the direct causes of any colony's extinction have never been established. There are several historic and current threats that have undoubtedly contributed to the decline of the Brush-tailed Rock-wallaby.

Habitat degradation and loss continues due to rural residential and tourist developments. The impacts of bushfires and managed fires on the animals and their habitat are not known. Predation by introduced predators, (i.e. Red Fox and possibly feral Cat), poses significant threats to the taxon.

IUCN Criteria

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

	Critically Endangered	Endangered	Vulnerable
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.

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.

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*]

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.

based on any of the following:

(a) direct observation [*except A3*]

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Evidence:

Ineligible under Criterion A

The past population reduction does not meet the threshold for eligibility under criterion A2, and the future population reduction does not meet the threshold for eligibility under criterion A3.

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
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:

Eligible under Criterion B as Endangered

The Extent of Occurrence (EoO) is estimated to be 1,514 km², based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA). The Grampians area has not been included in the EoO because

The Grampians population was translocated in 2008 and has low likelihood of persistence due to lack of successfully breeding (there has not been a second generation), so it does not meet the IUCN thresholds for translocated populations. Therefore this group was not considered for purpose of this assessment.

The Area of Occupancy (AoO) is estimated to be 40 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

The taxon is considered to occur in one location as all key identified threats apply across its range and can rapidly affect all individuals of the taxon present. It has a continuing decline in (iii) above. There has been a substantial management effort to intensively manage the threats at the colonies and such management has increased or stabilised population sizes. However, habitat degradation and loss continue due to development and altered fires regimes.

Criterion C. Small Population size and decline				
		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND 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:

Ineligible under Criterion C

It is estimated that there are 35 to 45 mature individuals, but other thresholds under this criterion have not been met.

Criterion D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	< 50	< 250	< 1,000
D2 Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time.	-	-	D2. Typically: AoO < 20 km2 or number of locations ≤ 5

Evidence:

Eligible under Criterion D as Critically Endangered

The taxon is estimated to have 35 to 45 mature individuals. The number of mature individuals is based on monitoring at the two regional populations of Brush-tailed Rock-wallabies in Victoria.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

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