FLORA & FAUNA GUARANTEE

FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE

FINAL RECOMMENDATION ON A NOMINATION FOR LISTING

Sminthopsis crassicaudata Fat-tailed Dunnart

DOCID107-417469679-742

Date of receipt of nomination: 5 July 2021

Date of preliminary recommendation: 20 June 2022

Date of final recommendation decision: 6 December 2022

Validity: The nomination is for a valid item.

Prescribed Information: The prescribed information was provided.

Name of the Nominator is adequately provided.

Name of the Item is adequately provided.

The nominated taxon is accepted by the Scientific Advisory Committee (SAC) as a valid taxon because it has been formally described and is accepted as a valid taxon by Museums Victoria.

Thomas (1902) described a difference in distribution between proposed Fat-tailed Dunnart subspecies. He described *Sminthopsis crassicaudata crassicaudata* as the subspecies that predominantly occupies grasslands, and *Sminthopsis crassicaudata centralis* as the subspecies that predominantly occupies desert areas. The two populations are geographically separated by the Murray River along the border of Victoria and south-eastern South Australia. Cooper et al. (2000) later identified these populations as genetically distinguished and separated by Evolutionarily Significant Units, however these are not yet formally accepted subspecies.

The taxon being assessed under this nomination is the parent taxon *Sminthopsis crassicaudata*, rather than one of the purported subspecies.

Current conservation status

The nominated taxon is not currently listed as threatened in Victoria, in another state or federally.

Eligibility for listing as a taxon under the Flora and Fauna Guarantee Act 1988

The SAC has assessed the eligibility of this nomination based on its extinction risk within Victoria in accordance with Section 16C(4)(c) of the *Flora and Fauna Guarantee Act 1988* (FFG Act) and the criteria for determining eligibility for listing prescribed in the *Flora and Fauna Guarantee Regulations 2020* (FFG Regulations). In its application of the relevant eligibility criteria, the SAC has, as required by the nationally adopted Common Assessment Method, had regard to the *IUCN Red List Categories and Criteria (Version 3.1)* and the *Guidelines for Using the IUCN Red List Categories and Criteria (version15, 2022).*

Species information

Description, Life History, Generation Length

The Fat-tailed Dunnart is a nocturnal, carnivorous marsupial. It stores fat in its tail as a form of energy storage and weighs approximately 15g. Their main diet consists of arthropods (spiders, crickets, beetles, earthworms, insect larvae/pupae) as well as small vertebrates (including skinks and mice) (Morton 1978c,d). In common with other Dasyurid marsupials, Fat-tailed Dunnarts have a short gestation (c. 14 days), long pouch-development (c. 65–70 days) and a short life overall. Males typically

die after mating in their first (and only) year of life, and females can enter torpor (hibernation) during winter and when food is in short supply (Geiser & Baudinet 1987).

In the wild, expected longevity is approximately 2 years for females and 1 year for males, though maximum longevity in captivity can be 5 years. Females reach sexual maturation at 4 months, whereas males reach maturity at 7 months. Litter size can be up to 10 pouch young as females have 10 nipples, though average litters are around 5–7 individuals. Females will occasionally live to reproduce through two breeding seasons (two years), while male Fat-tailed Dunnarts rarely contribute to more than one breeding season (Morton 1978b).

Generation length estimates vary, so for this assessment a generation length of 6–18 months was used (Department of Environment, Land, Water & Planning 2022 unpublished).

Distribution

Fat-tailed Dunnarts are the most widely distributed of the 19 dunnart species occurring in Australia and can be found in all mainland states.

Habitat

Fat-tailed Dunnarts are found in a variety of open habitats including open woodland, low shrublands, and a variety of grassland ecosystems, though they are most common in arid and semi-arid regions of Australia (Morton 1978a,b,c; Menkhorst & Knight 2010).

In Victoria, Fat-tailed Dunnarts are heavily reliant on grassy ecosystems (Morton 1978a,b,c; Lunt et al. 1998; Antos & Williams 2015). This species is the only small ground-dwelling marsupial known to persist in Victorian grassland habitats (Lunt et al. 1998) and it relies primarily on habitat consisting of tussock grasses and inter-tussock forbs, with small open spaces. This structure is characteristic of Australian lowland native grasslands. Fat-tailed Dunnarts make nests of grass under fallen logs, rocks or in cracks in seasonally dry wetlands and in the ground (particularly those formed by the clay soils of the Victorian Volcanic Plains Bioregion) (Morton 1978a,b,c; Hadden 2002; Homan 2012).

While dunnarts can thrive in ecosystems used for agricultural purposes, they can do so only if they have access to appropriate shelter. This is usually in the form of fallen timber or rocks. However, on some farm properties they can be found underneath discarded fence posts and sheets of corrugated iron, so can be quite opportunistic when searching for shelter (Lindenmayer 2011; Lindenmayer et al. 2003; Menkhorst 1995).

Threats

Habitat loss

Since European settlement, the grasslands of south-eastern Australia have suffered extensive landscape modification through cropping and livestock production and are now one of the most threatened and fragmented terrestrial ecosystems in the country. Accordingly, 26 of the 30 Australian mammals to have become extinct after European settlement were entirely or somewhat reliant on grassland ecosystems (Lunt et al. 1998; Gott et al. 2015). Fat-tailed Dunnarts are broadly accepted to be a species with a stable population but concerns for the species have been expressed due to their significant habitat loss (Antos & Williams 2015; Menkhorst 1995; Lunt et al. 1998; Scicluna et al. 2021) and changing land use in their habitat (Farrington et al. 2020).

Estimates of pre-European and present extent indicate that natural temperate grasslands of the Victorian volcanic plain have undergone a very severe decline of at least 98% and mosaic grassland/grassy woodland vegetation is considered to have declined by over 99% (Threatened Species Scientific Committee 2008). Good condition patches across the Victorian volcanic plain are likely to constitute less than one percent of the original extent (Commonwealth of Australia 2011). Secondary, modified grasslands containing *Themeda* and/or *Rytidosperma* and *Austrostipa* cover a greater area but the value of these modified grasslands for Fat-tailed Dunnart habitat is not well known. The vast majority of lowland native grasslands occur on private land (Williams & Morgan 2015). Farmers in Victoria are under increased pressure to switch from livestock to cropping agricultural practices as they try to accommodate the reality of a changing climate (Department of Agriculture, Water and the Environment 2021). Although Fat-tailed Dunnarts can persist in fragmented, agricultural landscapes, this is dependent on the availability of suitable shelter sites and habitat for foraging. Agricultural land use for cropping (as opposed to rearing livestock) involves practices inclusive of but not limited to rock removal, rock-crushing and burying, removal of plantations and shelter-belts, grading, tillage, drainage modification, fertilising, irrigation, biocide use (herbicide, insecticide, molluscicide, rodenticide), addition of soil ameliorants, and unnatural burning regimes (Casanova & Casanova 2016). These

activities, in addition to the removal of grassland flora species and replacement with monoculture crops, results in gross ecosystem structural change.

Loss of habitat structure

Of particular concern to Fat-tailed Dunnarts is removal of rocks and the loss of intertussock spaces, leading to declines in habitat appropriate for persistence (Homan 2012; Menkhorst 1995; Michael et al. 2003; Scicluna et al. 2021; Zimmer & Turner 2009). This is additional to the absence of fire and/or grazing (if appropriate fire regimes are unable to be implemented) in both agricultural and grassland landscapes. A lack of fire can result in accumulation of biomass and change in grassland structure (Williams & Morgan 2015; Morgan 2015), causing remaining areas of grasslands to become inappropriate habitat for dunnarts. Fat-tailed Dunnarts (like many grassland faunal species) need intertussock spaces for movement, nesting, foraging and detection of potential predators, and are found most often where vegetation is sparse (Homan 2012; Morton 1978a; Hadden 2002; Parker 2009). Many grasslands and agricultural land are now occupied by flora (exotic pasture grasses and legumes) which differ in structure to native Victorian grasses, filling intertussock spaces and transforming grassland ecosystem structure and function (Williams & Morgan 2015).

Predation

Invasive predators, particularly foxes and cats, are well known to have broad-scale negative effects on Australian mammals, and both of these are listed as Potential Threatening Processes under the FFG Act in Victoria. Twenty-five of the 30 Australian mammals extinct since European settlement (to 2018) are documented to have succumbed to predation pressure from these species (Radford et al. 2018). Foxes and cats can and do predate on Fat-tailed Dunnarts directly, but they also predate on the same prey species in competition with native carnivores and insectivores. The effects of predation pressure from foxes and cats on Fat-tailed Dunnart populations is currently unknown but is likely to be significant.

There is growing concern that the introduced Brown Rat (*Rattus norvegicus*) and Black Rat (*Rattus rattus*) not only outcompete Fat-tailed Dunnarts for resources such as invertebrate prey and shelter sites, but also directly prey on dunnarts. Scicluna et al. (unpublished data) documented high mortality due to Black Rats following a reintroduction of Fat-tailed Dunnarts to the La Trobe Wildlife Sanctuary. Similarly, the larger and often more aggressively inclined Brown Rats will also prey on animals like dunnarts. While there isn't currently direct evidence of predation of Fat-tailed Dunnarts, Brown Rats will readily predate introduced House Mouse (*Mus musculus*) populations and other small mammals. Black Rats are more social and often found in higher numbers (thus causing a potentially larger issue), but Brown Rats are larger and more aggressive in their hunting of other species, meaning both species could be an issue. Increases in introduced rodent populations in particular (due to a change to the wetter La Nina weather pattern) can be a threat to the Fat-tailed Dunnart (Parrott pers. comm 2022). Brown Rats have become the dominant rat at very high densities within Tiverton; a 1000 ha predator-proof grassland near Mortlake, Victoria. Fat-tailed Dunnarts have become harder to detect over the past two years and although there is no direct evidence that this is due to the increase in Brown Rat density following the removal of larger predators; it is very plausible the two are related (Hill pers. comm 2022).

Decision by the Scientific Advisory Committee

The eligibility of the nominated taxon (including the extinction risk and the category of threat that applies to the taxon) to be specified in the Threatened List must be determined in accordance with the eligibility criteria prescribed for the purposes of Division 2 of Part 3 of the FFG Act.

The relevant eligibility criteria are prescribed in Schedule 1 of the FFG Regulations, which provides that a taxon is at risk of extinction in a particular category of threat if a primary criterion is met and is therefore eligible to be specified in the Threatened List.

As required under the Intergovernmental Memorandum of Understanding - Agreement on a Common Assessment Method for Listing of Threatened Species (to which Victoria is a signatory), eligibility has also been assessed in accordance with the *IUCN Red List Categories and Criteria (Version 3.1)* and the *Guidelines for Using the IUCN Red List Categories and Criteria (version15, 2022).*

For details of the IUCN criteria see Appendix 1.

Criterion A – Population Size Reduction

Eligible as Vulnerable under IUCN Criteria A2ce (FFG Primary Criterion 5.1 - Subcriterion 5.1.1)

Evidence:
The past and current Fat-tailed Dunnart population size is unknown due to a lack of intensive surveying. The species is cryptic, small, and predominantly solitary which adds to the difficulty of surveying. The population reduction over the past 10 years is inferred to be 30 to 40% based on criteria A2c (a decline in area of occupancy, extent of occurrence and habitat quality) and A2e (effects of introduced taxa).

Atlas of Living Australia Fat-tailed Dunnart records from 1970 through to 2020 show a very steep decline in observations. The same trend can be observed for Fat-tailed Dunnarts across the rest of Australia (Atlas of Living Australia 2021). While the orders of magnitude are different, the low observation levels since 2020 have continued. A comparison of Victorian data (Atlas of Living Australia 2021) from 2000-2009 and 2010-2019 (228 to 81 observations), represents more than 60% decrease. This implies an inferred decline of at least 30% over the last 10 years, thus meeting the A2 threshold for Vulnerable.

The last targeted species surveys for Fat-tailed Dunnarts were conducted by Stephen Morton in 1972-1976. His Victorian field sites were four sites at the Western Treatment Plant (WTP) in Werribee, and over 700 Fat-tailed Dunnart captures were recorded during this time. In 2019, Scicluna et al. (2021) endeavoured to recreate this study and establish an updated population estimate during similar climate conditions (i.e., not drought). They found that two of the four WTP sites have since been leased for agriculture and stripped of rocks, and cropped, and one of the sites was cleared for the construction of grain silos rendering them unsuitable as dunnart habitat. This left only one of Morton's primary survey sites unmodified and suitable as dunnart habitat; the site now known as McIntosh's Paddock. Thus, suitable habitat has been reduced by 75% in the last c. 45 years at that location. Scicluna et al. (2021) used a similar survey protocol to Morton (1978a) over the course of 12 months, adding extra artificial habitat in the form of terracotta roof tiles to increase chances of locating the species. After one year of surveying what was once known to be one of Victoria's largest Fat-tailed Dunnart populations, Scicluna et al. (2021) found no dunnart individuals, scats or nests at this site. Fat-tailed Dunnarts have not been found at WTP since 2010 (Schmidt 2012). This case illustrates the potential effect of changed land use on dunnart populations. Statistics for the land use in dunnart-specific habitat are difficult to access, however, there has been a southern spread and increase in cropping in Victoria in the last two decades (an increase of 2.5 million hectares (11%) of the state in 1992–93 compared to 1972-73, and there has been a recorded increase in cropping area Australia-wide from 2.36% in 1996-97 to 2.71% in 2010-11 (an additional 26,800 km²) (Department of Agriculture, Water and the Environment 2022)). Given that much of the increase in cropping land has been as a result of conversion of grazing and temporary wetland area, suitable habitat for Fat-tailed Dunnarts has declined.

Criterion B – Geographic Range (Extent of Occurrence and Area of Occupancy)

Eligible as Vulnerable under IUCN Criterion B2ab(ii,iii,v) (FFG Primary Criterion 5.1 - Subcriterion 5.1.2 (a), (b) (ii, iii, v))

Evidence:
The Area of Occupancy across the taxon's range is estimated to be 1,427 km², thus meeting the B2 threshold for Vulnerable. The population is severely fragmented, is estimated to have 6 threat-based locations and an inferred continuing decline based on criterion B2b (ii – area of occupancy), (iii – area, extent and/or quality of habitat) and (v – number of mature individuals). The threat-based locations are based on land tenure (reserved public land, alienated public land such as roadsides and private land) and separated into north and south of the Great Dividing Range. These locations are ecologically distinct and are likely to suffer from a suite of threats that are particular to that land use type. The locations north and south of the divide can suffer similar threats but at different intensities and timing.

Most populations of dunnarts reside on private agricultural properties, or in roadside grasslands. While these populations are not all currently isolated, fragmentation is highly likely to increase as pockets of suitable habitat become more scarce. Although Fat-tailed Dunnarts can cross through farm fences, this species is unlikely to survive crossing roads to move between habitat fragments, as they are likely to be preyed upon by either native (birds of prey) or exotic (fox or cat) predators. Additionally, small mammals are known to be deterred from crossing roads which can then serve as physical barriers for genetic dispersal and population drift (Mansergh & Scotts 1989; Trombulak & Frissell 2000). Reliance on agricultural landscapes and fragmented linear roadside reserves to provide long-term habitat for Fat-tailed Dunnarts is not ideal. Victoria's Land Cover Time Series data show that across the majority of the Fat-tailed Dunnart's range, between 1985 and 2019, there have been increases in the number of hectares under dryland cropping of between 21 – 488% (depending on the

Catchment Management Authority (CMA) region). This is coupled with decreases in hectares of native grasses and herbs of between 7 – 51% across the same CMAs and during the same time period (Department of Environment, Land, Water & Planning 2022). As discussed above, the trend of increasing cropping (and accompanying practices of rock removal, grading etc.) is expected to continue.

Criterion C – Small Population Size and Decline

Evidence: Insufficient data to determine eligibility.
There is currently insufficient evidence to determine the number of mature individuals.

Criterion D – Very Small or Restricted Population

Evidence: Insufficient data to determine eligibility.
There is currently insufficient evidence to determine the number of mature individuals.

Criterion E – Quantitative Analysis

Evidence: Insufficient data to determine eligibility.
Population viability analysis has not been undertaken. Therefore, there is insufficient evidence to determine the eligibility of the species for listing in any category under this criterion.

Documentation
The published information provided to and sourced by the SAC has been assessed. To the best of their knowledge, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well supported.

Advertisement for public comment
In accordance with the requirements of Section 16D of the FFG Act, the preliminary recommendation was advertised for a period of at least 30 days.
The preliminary recommendation was advertised in:

- Victorian Government Gazette on 7 July 2022
- DELWP website
- DELWP social media

Public submissions closed on 8 August 2022.

Additional Information considered by the Scientific Advisory Committee
Following publication of the preliminary recommendation, the SAC received five submissions, all of which supported the recommendation. In formulating its final recommendation on this item, the SAC considered the submissions and was not aware of any compelling evidence to warrant a change to the preliminary recommendation that the nominated taxon is eligible for listing.

Final Recommendation of the Scientific Advisory Committee
As outlined above, the nominated taxon satisfies at least one criterion of the set of criteria prepared and maintained under Division 2 of Part 3 of the FFG Act and stated in Schedule 1 of the FFG Regulations.

The SAC concludes that on the evidence available, the nominated taxon is eligible for listing as Vulnerable in Victoria because Primary Criterion 5.1 – Subcriteria 5.1.1 and 5.1.2 (a), (b) (ii, iii, v) of the FFG Regulations have been satisfied (IUCN criteria A2ce, B2ab (ii, iii, v)).

Vulnerable, in relation to a taxon of flora or fauna, means that the taxon is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future.

The Scientific Advisory Committee therefore makes a final recommendation that the nominated taxon be supported for listing as Vulnerable in Victoria under the *Flora and Fauna Guarantee Act 1988*.

Endorsement by the Convenor of the Scientific Advisory Committee **Date**

Dr. Michelle T. Casanova **10 January 2023**
Convenor

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In person communications

Parrott, Marissa. – Reproductive Biologist, Wildlife Conservation & Science, Zoos Victoria.

Hill, Richard. – Natural Environment Project Officer, Department of Environment, Land, Water and Planning.

Appendix 1: IUCN Red List Categories and Criteria

SUMMARY OF THE FIVE CRITERIA (A-E) USED TO EVALUATE IF A TAXON BELONGS IN AN IUCN RED LIST THREATENED CATEGORY (CRITICALLY ENDANGERED, ENDANGERED OR VULNERABLE).[1]

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 where the causes of the reduction are clearly reversible AND understood AND have ceased.

A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction projected, inferred 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 (AOO), extent of occurrence (EOO) and/or habitat quality
(d) actual or potential levels of exploitation
(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)

	Critically Endangered	Endangered	Vulnerable
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			

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 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			

D. Very small or restricted population

	Critically Endangered	Endangered	Vulnerable
D. Number of mature individuals	< 50	< 250	**D1.** < 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 taxon to CR or EX in a very short time.	-	-	**D2.** typically: AOO < 20 km² or number of locations ≤ 5

E. Quantitative Analysis

	Critically Endangered	Endangered	Vulnerable
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

1 Use of this summary sheet requires full understanding of the *IUCN Red List Categories and Criteria* and *Guidelines for Using the IUCN Red List Categories and Criteria*. Please refer to both documents for explanations of terms and concepts used here.