

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Minister approved this conservation advice and transferred this species from the Endangered to Vulnerable category, effective from 07/12/2016

Conservation Advice

Sminthopsis douglasi

Julia Creek dunnart

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 have been 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 reflect the desire to efficiently prepare a large number of advices by adopting the presentation approach of the Action Plan for Australian Mammals, and do not reflect any difference in the evidence used to develop the recommendation.

Taxonomy

Conventionally accepted as *Sminthopsis douglasi* (Archer 1979).

This species was first recognised and described relatively recently (1979). No subspecies are recognised.

Summary of assessment

Conservation status

Vulnerable: Criterion 2 B2 (b)(iii)(v),(c)(iv)

Sminthopsis douglasi was listed as Endangered under the predecessor to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the *Endangered Species Protection Act 1992* (ESP Act), and transferred to the EPBC Act in July 2000. For a species to be considered as Endangered under the ESP Act, the Minister must have been satisfied that the species was likely to become extinct, was in immediate danger of extinction, or might already be extinct but is not presumed extinct.

Following a formal review of the listing status of *Sminthopsis douglasi*, the Threatened Species Scientific Committee (the Committee) has determined that there is sufficient evidence to support a change of status of the species under the EPBC Act from Endangered to Vulnerable.

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>.

Reason for conservation assessment by the Threatened Species Scientific Committee

This advice follows assessment of new information provided to the Committee to reassess the listing status of *Sminthopsis douglasi*.

Public Consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 32 business days between 29 February 2016 and 15 April 2016. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Species Information

Description

The Julia Creek dunnart is the largest species of *Sminthopsis* found in Australia, with a head and body length of 110–135 mm and a weight of 40–70 g. The tail is long, being just slightly shorter than the head and body length, and tapers slightly towards the tip. Its fur is a grey-speckled brown above and buff-white below, and rufous on its cheeks and at the base of the ears. Like the stripe-faced dunnart (*Sminthopsis macroura*) it has a prominent facial stripe which runs from the nose to the top of the head, and when in good condition, a tail that is fattened at the base. However, it can be distinguished by the dark hairs found on the tip of the tail, upper-outer edge of the ears, and in a ring around the eyes (Woolley 2008).

Distribution

The Julia Creek dunnart is endemic to north-western Queensland, where it occurs in the Mitchell Grass Downs and Desert Uplands bioregions. Its known range has increased substantially with more recent surveys (Kutt 2003), and it is now known from at least 25 locations (Qld DERM 2009; Woolley 2009) across an extent of occurrence of about 60 000 km² (Qld DERM 2009). Subsequent new records include Kynuna Station (in 2009) and Mt Margaret Mine area near Cloncurry in 2012 (an extension to the west of the known range) (Woolley pers. comm., cited in Woinarski et al., 2014). Its potential distribution was modelled by Smith et al. (2006).

Prior to 1990, the species was only known from four museum specimens lodged between 1911 and 1972 (Lundie-Jenkins & Payne 2000), all from the vicinity of Julia Creek and Richmond in north-west Queensland (Archer 1979; Woolley 2008). In 1990, a new survey program began that revealed a number of new specimens from owl pellets (i.e. the indigestible remains of an owl's prey that are disgorged as pellets) and cat (*Felis catus*) kills. In 1991 and 1992, the first live specimens were caught (including one rescued from a cat) (Qld DEHP 2013).

Relevant Biology/Ecology

The Julia Creek dunnart is a nocturnal, terrestrial marsupial. It is closely associated with tussock grasslands on cracking clay soils, with habitat quality associated particularly with increasing densities of cracks and holes, and with the extent and density of grass cover. During the day it shelters within cracks in the soil (during dry periods), or under vegetation (after rain periods, when soil cracks close) (Qld DERM 2009). It is mainly insectivorous (consuming particularly crickets, spiders and cockroaches), but also feeds on some reptiles (Qld DERM 2009). Home range size has been reported to vary from 0.25 to 7 ha (Mifsud 1999), with males generally more mobile with larger home ranges than females (Woolley 2008). A very high proportion of its relatively small range occurs in lands managed for intensive grazing by sheep and cattle, and this pressure- likely reduces habitat suitability.

Females can raise two litters per year of up to eight young within one season, with reproduction peaking in spring-summer (Mifsud 1999; Woolley 2008). Sexual maturity is reached in 17-31 weeks (with males maturing later than females), and longevity is 2-3 years (Woolley 2008; Qld DERM 2009), so generation length is assumed to be 1-2 years. *Sminthopsis* species are considered 'boom or bust' species, being subject to periodical fluctuations in population associated with seasonal changes (Qld DERM 2013); Julia Creek dunnart populations appear to fluctuate even in areas protected by a predator proof fence (O'Hara pers. comm., 2016).

Threats

Threats to the Julia Creek dunnart are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Distributional extent over which threat may operate	Evidence base
Predation by feral cats (<i>Felis catus</i>)	Severe	Entire	'Cats have been shown to prey heavily' on this species and Mifsud & Woolley (2012) reported 18 Julia Creek dunnarts in stomach contents of 199 sampled feral cats in the range area for this species (Lundie-Jenkins & Paine 2000; Kutt 2003; Burnett & Winter 2008; Mifsud & Woolley 2012). Julia Creek dunnart populations have been shown to increase following control of feral cats (Mifsud 1999).
Predation by foxes (<i>Vulpes vulpes</i>)	Moderate	Entire	Recognised as a threat (Burnett & Winter 2008), and some direct evidence of predation (Kutt 2003), but none reported in stomach contents of 57 foxes sampled by Mifsud & Woolley (2012) on properties near the town of Julia Creek.
Habitat degradation and resource depletion due to livestock and feral herbivores	Moderate	Large	Much of the Julia Creek dunnart habitat is intensively grazed by sheep (<i>Ovis aries</i>) and cattle (<i>Bos taurus</i>). There is some evidence of habitat degradation by vertebrate herbivores, but evidence is varied and correlative (Lundie-Jenkins & Paine 2000; Smith et al., 2007).
Habitat change due to weed invasion	Moderate	Moderate	There has been wholesale change in habitat structure and suitability associated with the spread of prickly acacia (<i>Acacia nilotica</i>) and other woody weeds (Lundie-Jenkins & Paine 2000).
Interactive effects of fire and predators	Moderate	Moderate	There is some experimental evidence suggesting increased predation pressure on Julia Creek dunnarts following fire (Qld DERM 2009). Dunnarts can survive direct effects of fire if there is suitable habitat depend on the timing and severity of the burn (Qld DEHP 2013).

How judged by the Committee 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%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>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.</p> <p>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]</p> <p>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.</p>	<p>based on any of the following:</p> <ul style="list-style-type: none"> (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:

Insufficient data to determine eligibility

There is limited knowledge of the population size and population trends of this species. Some monitoring of Julia Creek dunnarts has been conducted at several sites (Toorak Research Station, Bladensburg National Park, Proa/Yorkshire Downs and Moorrinya National Park), however the 'consistency and frequency of this monitoring has varied considerably due to changes in staffing and funding available' (Qld DERM 2009). Given the typically low rates of detection, the statistical power of such irregular monitoring is also likely to be low. This problem may be magnified by the likely fluctuations in abundance in association with inter-annual rainfall variability, such that the detection of longer-term trends in population size may require intensive sampling over many years.

Burnett and Winter (2008) considered that its population size was declining, but that 'little is known about its population trend. It is unlikely to be declining at the rate required to qualify for listing in a threatened category, but it might be nearly there'. Ongoing decline (or maintenance of populations at levels lower than carrying capacity) is likely due to the range-wide operation of many threats (notably introduced predators and reduced habitat quality due to livestock), some of which have increased in recent years. Feral cats erupted in plague proportions throughout Queensland in 2010, and a long-haired rat (*Rattus villosissimus*) plague in western Queensland in 2011 further increased cat numbers and likely competed with wildlife for food (O'Hara & Rush 2015). The effects of both these plagues on Julia Creek dunnart populations, coupled with the prolonged drought in the state in recent years, are unknown (O'Hara & Rush 2015). Woinarski et al. (2014) suspect that the population size is declining at a rate of less than 30 percent over a 10 year period. However, there are no data by which to assess the rate of decline.

The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Criterion 2. Geographic distribution as indicators 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:

Eligible under Criterion 2 B2 (b)(iii)(v),(c)(iv) for listing as Vulnerable

The Julia Creek Dunnart was thought to have a very restricted distribution, however more recent records have considerably extended the known range. The extent of occurrence is estimated at 79 152 km², and the area of occupancy estimated at 228 km². These figures are based on the mapping of 75 point records from 1996 to 2016, obtained from state governments, museums and CSIRO. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2014 (DotE 2015). Woinarski et al. (2014), which estimated the AOO at 164 km², considered this to be a significant underestimate due to limited sampling across the occupied range, but that the AOO was likely to be 'not appreciably >2000 km².'

The species occurs at more than 10 locations (Qld DERM 2009; Woolley 2009) and is not severely fragmented. Woinarski et al. (2014) consider that there is evidence of some, but not extreme, fluctuations in population numbers. However, given the prolonged drought and feral cat plagues that have occurred in Queensland since 2010 (O'Hara & Rush 2015), and the boom/bust nature of the species, it is likely that there have been extreme fluctuations in the number of mature individuals (meeting Criterion (c)(iv)). A continuing decline in habitat quality and number of individuals is inferred (meeting Criterion (b)(iii)(v)), due to threats from feral cats, prickly acacia and ongoing drought conditions.

The Committee considers that, based on the information available, the AOO is likely to be somewhere between 228 km² and 2000 km² with an inferred continuing decline and extreme fluctuations in numbers. The listing status therefore falls in the range of Vulnerable to Endangered. Given that new knowledge has extended the EOO, it is more likely that the species meets the eligibility criteria for Vulnerable.

Criterion 3. 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 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			

Evidence:

Insufficient data to determine eligibility

There are no robust estimates of population size, nor that of most subpopulations. Most sources consider it scarce and patchily distributed, but this assessment may be substantially influenced by low detectability (Kutt 2003). Burnett and Winter (2008) and Woolley (2008) considered that the Julia Creek Dunnart was rare. Mifsud (1999) and Mifsud and Woolley (2012) reported capture of 100 individuals from 65 500 trap-nights (success rate of 0.15%) across four study sites spread across the species' range, over 3 years (1995–97). Woinarski et al. (2014) suspect that the number of mature individuals is 'not substantially >10 000,' and that the largest subpopulation 'probably contains >1000 individuals'.

The Committee considers that, based on the information available, it is unlikely that the population contains less than 2500 mature individuals, and the species would probably not meet the eligibility criteria for Endangered under this criterion. There is insufficient information to determine the eligibility of the species for listing as Vulnerable under this criterion.

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

Evidence:

Not eligible

The population size of the species is unknown. Woinarski et al. (2014) suspect that the number of mature individuals is 'not substantially >10 000,' and that the largest subpopulation 'probably contains >1000 individuals'.

The Committee considers that, based on the information available, it is highly unlikely that the population contains less than 1000 mature individuals. Therefore, the species does not meet this required element of this criterion.

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:

Insufficient data to determine eligibility

Population viability analysis has not been undertaken.

Conservation Actions

Recovery Plan

A recovery plan for the Julia Creek dunnart (Qld DERM 2009) was developed by the State of Queensland and adopted as a national recovery plan under the EPBC Act in 2009. The plan is scheduled to expire in 2020 and has not yet been reviewed. The Committee recommends that the current recovery plan be retained, and the decision whether to continue to have a recovery plan be considered prior to the plan expiring.

The recovery plan includes a review of the level of implementation and success of a previous recovery plan (Lundie-Jenkins & Payne 2000), with notable outcomes relating to some research activities (assessment of threats and biology), habitat modelling, some limited monitoring, management of some threats, habitat protection, and community involvement (Lundie-Jenkins 2012). Key actions in the recovery plan include:

- conduct surveys to clarify the extent of the species distribution;
- continue and expand population monitoring programs;
- encourage landholders to protect and manage key sites;
- integrate Julia Creek dunnart habitat into local government Stock Route Network Management Plans;
- continue and expand implementation of pest animal and plant control programs;
- investigate interactions between predators, water sources and grazing management;

- investigate interactions with sympatric species of small mammals; and
- conduct media campaigns and continue to produce/distribute educational material.

There has been partial implementation and success of this plan, including improved knowledge of the species and increased protection of some populations and habitat (Lundie-Jenkins 2012).

Primary Conservation Actions

1. Continue and enhance ongoing control measures for feral cats.
2. Maintain the extent and density of grasscover in habitat areas by preventing habitat degradation from livestock, feral herbivores and woody weeds.
3. Undertake surveys to better define distribution and population size.

Predation by feral cats is likely to have a significant impact on the species, particularly during the breeding season. Further habitat degradation from intensive grazing and invasion of woody weeds in the species distribution is also likely to have a significant impact on the species.

Habitat critical to survival are Mitchell grass (*Astrebla* spp.) tussock grasslands on deep cracking clay soils which occur in areas with dominant summer rainfall (Qld DERM 2009). Particular areas of importance include Bladensburg National Park, Moorrinya National Park, Toorak Research Station and Proa/Yorkshire Downs (Qld DERM 2009).

Conservation and Management Actions

The Julia Creek dunnart is present in two conservation reserves, Bladensburg National Park and Moorrinya National Park (Qld DERM 2009), where it is protected from some threats. The species has also been recorded in Julia Creek Aerodrome, and a predator-proof fence was erected there (encompassing an area of 250 ha) in 2008 for its conservation (Qld DERM 2009). Twenty captive-bred dunnarts were released at this site in 2007 (Lundie-Jenkins 2008), and a further 22 released at this site in 2008 (Qld DEHP 2013). There is ongoing management of some woody weeds, and community involvement in some management (Lundie-Jenkins 2012).

Recommended conservation and management actions are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Active mitigation of threats	Implement control mechanisms for introduced predators (especially feral cats), that minimise adverse impacts upon this species.	High
	Constrain grazing by livestock and feral herbivores to within acceptable limits in and around important subpopulations.	Medium-high
	Undertake landscape-scale fire management, to increase heterogeneity and decrease incidence of frequent extensive and intense fire; Qld DERM (2009) recommends some areas should be burnt every 4-8 years at Moorrinya National Park.	Medium
	Control or eradicate woody weeds in and around important subpopulations.	Medium
Captive breeding	Maintain a captive breeding colony.	Low-medium
Quarantining isolated populations	N/a	
Translocation	N/a	
Community engagement	Seek conservation covenants on private land holding important subpopulations.	Medium-high

Survey and monitoring priorities

Theme	Specific actions	Priority
Survey to better define distribution	Refine sampling methodologies to more reliably, cost-effectively and consistently detect the species (note that recent studies have examined occurrence in owl pellets and cat and fox stomachs as an effective means of indicating distributional patterns: Woolley 2009; Mifsud & Woolley 2012).	High
	Assess the population size (or relative abundance) of all subpopulations, and then prioritise subpopulations (or meta-populations) for management focus.	Medium-high
	Undertake a targeted survey of all suitable habitat within the species' range	Low-medium
Establish or enhance monitoring program	Design an integrated monitoring program across subpopulations.	Medium-high
	Implement an integrated monitoring program linked to assessment of management effectiveness.	Medium-high
	Monitor the abundance of introduced predators at key subpopulations, in response to management actions.	Medium-high
	Monitor the incidence of fire, and vegetation response, at key subpopulations.	Low-medium

Information and research priorities

Theme	Specific actions	Priority
Assess relative impacts of threats	Assess the impacts of introduced predators (under different densities and seasonal conditions).	Medium-high
	Determine the sensitivity of populations to a range of densities of livestock and feral herbivores, and develop thresholds for safe stocking density and/or grazing pressure.	Medium-high
	Assess the impacts of fire, and identify a preferred fire regime.	Medium
Assess relative effectiveness of threat mitigation options	Assess the efficacy of a range of management regimes for introduced predators.	Medium-high
	Assess the efficacy of a range of management regimes for woody weeds.	Low-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 methods.	Medium
	Develop methods to improve detectability (e.g. improved baits in live box traps, camera traps).	High

Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **transferring** from the Endangered category to the Vulnerable category:

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- (ii) The Committee recommends that there should be a recovery plan for the species and that the current recovery plan be retained and updated as appropriate.

Threatened Species Scientific Committee

06/09/2016

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