

***Isoodon obesulus obesulus* Southern Brown Bandicoot (eastern)**

Assessment of conservation status in NSW

4 July 2016 Ben Hope

Introduction

The Threatened Species Scientific Committee established under the *Environment Protection and Biodiversity Conservation Act 1999* released a conservation advice approved by the Minister on 5 May 2016 (TSSC 2016); the outcome of which was to maintain the status of this species as Endangered. In the Threatened Species Scientific Committee (TSSC) review the geographic distribution of this sub-species was redefined on the basis of more recent genetic analysis, this redefinition does not have practical impacts on the status of the New South Wales (NSW) population.

This document assesses the status of the Southern Brown Bandicoot *Isoodon obesulus obesulus* in NSW under the NSW *Threatened Species Conservation Regulation 2010* and the IUCN red list criteria. Relevant excerpts from TSSC (2016) are reproduced in this document along with any additional NSW specific information although this document is intended to be read in conjunction with TSSC (2016) and Woinarski *et al.* (2014) to view information in the original context.

The taxonomy, species description, distribution, ecology and threats are adequately described in the conservation advice published by the Threatened Species Scientific Committee (TSSC 2016) which is available here:

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/68050-conservation-advice-05052016.pdf> (verified 16 August 2016)

Assessment against IUCN (2012) Red list and NSW *Threatened Species Conservation Regulation 2010*

Summary

Consistent with the overall findings of the TSSC (2016) the Southern Brown Bandicoot (eastern) *Isoodon obesulus obesulus* was assessed as ENDANGERED in NSW using both the *Threatened Species Conservation Regulation 2010* (Table 1) and IUCN (2012) Red list (Table 2) criteria.

Table 1 NSW Threatened Species Conservation Regulation 2010 summary of results

TSC Regulation 2010 Clause	NSW
6	Endangered
7	Endangered
8	Vulnerable
9	Not eligible
10	Not eligible

Table 2 IUCN assessment for NSW and comparison with the Federal assessment (TSSC 2016)

IUCN (2012) Clause	NSW	Global (TSSC 2016)
A	Endangered	Endangered
B	Endangered	Vulnerable
C	Vulnerable	Not eligible
D	Not eligible	Not eligible
E	Data deficient	Data deficient

Criteria 6— Threatened Species Conservation Regulation 2010 -reduction in population size of species

The species has undergone, is observed, estimated, inferred or reasonably suspected to have undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:

- (a) for *critically endangered species*—a very large reduction in population size, or
- (b) for *endangered species*—a large reduction in population size, or
- (c) for *vulnerable species*—a moderate reduction in population size,

based on either of the key indicators:

- (a) an index of abundance appropriate to the taxon, or
- (b) geographic distribution, habitat quality or diversity, or genetic diversity of the species.

IUCN Criteria A. 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

Outcome

Global (TSSC 2016) IUCN Criteria A: Endangered under Criteria 1 A2 (a)(c)(e)

NSW TSC Regulation 2010 Criteria 6: Endangered

NSW IUCN Criteria A: Endangered

NSW summary

In NSW there are two extant populations of this species (TSSC 2016). The first is in Northern Sydney which includes Gargial and Ku-ring-gai Chase National Parks and adjoining areas. The second is in the Eden Region which includes Ben Boyd National Park, Nadgee Nature Reserves and a large area of State Forest managed for timber/ woodpulp production or conservation. The northern Sydney population is disjunct and forms the northern limit of this species, while the Eden population is within forest contiguous with Victorian populations of this species. Recently a translocation from the Eden region into Jervis Bay (ACT) was performed (DoE 2016; PowerFM 2016), however it is too early to assess if this release will result in a viable population.

The northern Sydney population has declined (see TSSC 2016 excerpt below), and studies have demonstrated very low genetic diversity in this population (Zenger *et al.* 2005; Dowle 2012). In the Eden region, bandicoots (this includes southern brown bandicoots and long-nosed bandicoots) have declined by 44-47% in conservation reserves between 1999-2008 (TSSC 2016). Within State Forests in the same region (Eden), recent changes from seasonal predator control to permanent predator control programs have seen increases in both southern brown bandicoots and long-nosed potoroos (FCNSW 2014; P Kambouris and R Bilney unpublished data). Longer –term monitoring is required to ascertain if permanent predator control will have ongoing positive impacts (see Dexter and Murray 2009; Dexter *et al.* 2011).

Historically this species was much more widely distributed in coastal NSW, with many isolated populations becoming extinct (Lunney and Leary 1988; Mills 1999; Paull *et al.* 2013). As there are only two remaining populations within NSW, extinction of either of these populations would represent a 50% reduction in the number of populations and a significant decrease in extent of occurrence (and to a lesser extent area of occupancy). If the Northern Sydney population becomes extinct, EOO would decrease from 17,600 km² to 2,434 km², an 86% decline (AOO would decline by 26%). Given recent declines in the Northern Sydney

population, intense threats from urbanisation (e.g. fire management, fragmentation, loss of habitat, domestic predators) and low genetic diversity the long term viability of this population is uncertain. The TSSC (2016) concluded that a 50% decline has possibly occurred over the last 10 years across the range of this species. Further declines are predicted within NSW, in particular in Northern Sydney. Endangered is therefore an appropriate status under this clause.

Excerpt from Threatened Species Scientific Conservation Advice (TSSC 2016)

“In NSW the southern brown bandicoot’s (eastern) geographic distribution has possibly declined in the past 10 years (NSW OEH 2015). In northern Sydney, where monitoring using mark recapture methods has been ongoing since 2000, populations were relatively stable until 2008; however, more recently there have been population declines with local (potentially temporary) extinctions following fire events (NSW OEH 2015). This area has also been subject to fox baiting since 2000, but this has been insufficient to prevent further decline (NSW OEH 2015). Bandicoots in the north of their range in NSW appear to be under more pressure than those of southern NSW, due to more intensive habitat fragmentation exacerbating other threats (NSW OEH 2015). In southern NSW trapping efforts have been limited in scale and few individuals have ever been captured. Trapping in Ben Boyd National Park and Nadgee Nature Reserve from 2000 to 2004 yielded only three captures, despite 300 trap nights per reserve per year (NSW OEH 2015). Activity monitoring using sand traps recorded declines in bandicoots (species unable to be determined) in the same reserves from 1999 to 2008. The overall decline was 44 percent in Ben Boyd National Park and 47 percent in Nadgee, and occurred despite a substantial decline in fox activity due to 1080 baiting in Ben Boyd National Park (Claridge *et al.*, 2010).”

Available quantitative data are summarised in the table below.

Population	State	Decline
Ben Boyd National Park	NSW	44% (1999 to 2008)
Nadgee Nature Reserve	NSW	47% (1999 to 2008)

Following assessment of the information, the Committee considers that the southern brown bandicoot (eastern) is continuing to decline across its range. Existing habitat fragmentation exacerbates threats continuing to operate over much of its range, particularly predation by foxes and feral cats, too frequent and extensive burning, and further habitat clearing and fragmentation. All of the available quantitative estimates for recent population trends exceed or approach a 50 percent reduction in numbers over a recent 10 year period (see table above). For many populations that lack quantitative estimates, there is qualitative evidence of recent population decline. This information, combined with current understanding of ongoing threats listed above (as well as extensive wildfires in the Grampians over the past 10 years resulting in large impacts on habitat), suggests that the southern brown bandicoot (eastern) has likely undergone a severe reduction in numbers of at least 50 percent over the past 10 years, and the causes have not ceased and are not well understood. Therefore, the southern brown bandicoot (eastern) has met the relevant elements of Criteria 1 to make it eligible for listing as Endangered.”

Criteria 7— *Threatened Species Conservation Regulation 2010* -restricted geographic distribution of species and certain other conditions

The geographic distribution of the species is estimated or inferred to be:

- (a) for critically endangered species— very highly restricted, or
- (b) for endangered species— very highly restricted, or
- (c) for vulnerable species—moderately restricted,

and either:

(d) a projected or continuing decline is observed, estimated or inferred in either of the key indicators:

- (a) an index of abundance appropriate to the taxon, or
- (b) geographic distribution, habitat quality or diversity, or genetic diversity of the species, or

(e) at least 2 of the following 3 conditions apply:

- (i) the population or habitat is observed or inferred to be severely fragmented,
- (ii) all or nearly all mature individuals are observed or inferred to occur within a small number of populations or locations,
- (iii) extreme fluctuations are observed or inferred to occur in either of the key indicators:

- (a) an index of abundance appropriate to the taxon, or
- (b) geographic distribution, habitat quality or diversity, or genetic diversity of the species.

IUCN Criteria B. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy**Outcome**

Global (TSSC 2016) IUCN Criteria B: Vulnerable under Criteria 2 B1, B2 (a),(b)(i-v)
NSW *TSC Regulation 2010* Criteria 7: Endangered
NSW IUCN Criteria B: Endangered

Due to the different spatial scale of assessment the overall results of the TSSC (2016) review are not directly applicable to NSW. TSSC (2016) report that the NSW area of occupancy (AOO) is 448 km² (using records after 1980) and 276 km² (using records after 1995) with a 38% decline in AOO between the two periods. Validated records from Bionet (NSW only) from 2000 to present indicate the state-wide (NSW) extent of occurrence (EOO) is 17,600 km² and the state-wide area of occupancy (AOO) is 492 km² (OEH 2015). AOO in all cases satisfies the criteria for Endangered (< 500 km²) and the EOO satisfies the criteria for Vulnerable. The species is heavily fragmented, has a declining geographic distribution, has only 2 extant populations in NSW (one of which is in decline, has limited genetic diversity and habitat quality is in continuing decline) and bandicoot populations are known to fluctuate (OEH 2015; Dexter *et al.* 2011). This species is therefore Endangered in NSW using both IUCN and NSW *TSC Regulation 2010*.

Excerpt from Threatened Species Scientific Conservation Advice

“The extent of occurrence for the southern brown bandicoot (eastern) is estimated at 13 718 km² , and the area of occupancy estimated at 1900 km² . These figures are based on the mapping of point records from 1995 to 2015, 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). When point records from 1980 to 2015 are mapped the EOO is 18 925 km² and the AOO 2896 km² , which equates to a decline in the AOO by approximately 34% between 1980 and 1995 (see table below). The data suggest that the EOO has also declined between 1980 and 1995. However, figures showing the extent of change in the EOO have a larger degree of uncertainty and are therefore not presented here (DotE 2015).

	AOO (km ²) using records post- 1980	AOO (km ²) using records post-1995	Change in AOO between 1980 and 1995
New South Wales	448	276	-38%
Victoria	1312	848	-35%
South Australia	1136	776	-32%
Total	2896	1900	-34%

The above data support anecdotal evidence which suggests that the AOO in Victoria is declining due to encroaching development and habitat loss (Frankston City Council 2015). Surveys in south-western Victoria have also shown large areas of apparently suitable habitat to be unoccupied (Brown & Main 2010). The bandicoot’s distribution is highly fragmented (Paull 2003; Zenger et al., 2005; Le Duff & Stratman 2009), and there have been observed continuing declines in population numbers, area of occupancy and number of subpopulations (see Criterion 1). In South Australia, the bandicoot has a severely fragmented distribution and there has been an observed continuing decline in the extent of occurrence, area of occupancy, area and quality of habitat, and number of locations (SA DEWNR 2015). This declining trend is most evident in the Mt Lofty Ranges, where the bandicoot’s geographic distribution has declined over the past 5-10 years (see Criterion 1). The Committee considers that the bandicoot’s extent of occurrence and area of occupancy are limited, and the geographic distribution is precarious for its survival because it is severely fragmented and a decline in extent of occurrence, area of occupancy, habitat, number of individuals and number of locations may be inferred or projected. Therefore, the southern brown bandicoot (eastern) has met the relevant elements of Criterion 2 to make it eligible for listing as Vulnerable.”

Criteria 8— *Threatened Species Conservation Regulation 2010*- low numbers of mature individuals of species, and certain other conditions

The estimated total number of mature individuals of the species is:

- (a) for critically endangered species— very low, or
- (b) for endangered species— low, or
- (c) for vulnerable species—moderately low, (that is, not as low as for paragraph (b)), and either:
 - (d) a projected or continuing decline is observed, estimated or inferred in either of the key indicators:
 - (i) an index of abundance appropriate to the taxon, or
 - (ii) geographic distribution, habitat quality or diversity, or genetic diversity of the species, or
 - (e) at least 2 of the following 3 conditions apply:
 - (i) the population or habitat is observed or inferred to be severely fragmented,
 - (ii) all or nearly all mature individuals are observed or inferred to occur within a small number of populations or locations,
 - (iii) extreme fluctuations are observed or inferred to occur in either of the key indicators:
 - (a) an index of abundance appropriate to the taxon, or
 - (b) geographic distribution, habitat quality or diversity, or genetic diversity of the species.

IUCN Criteria C. Population size and decline

Outcome

Global (TSSC 2016) IUCN Criteria C: Not eligible

NSW IUCN Criteria C: Vulnerable

NSW *TSC Regulation 2010* Criteria 8: Vulnerable

No robust population exist for NSW, based on available habitat, records and inferred densities the NSW population is likely to be between 2500 and 10,000 adults and declining. This classifies this species as Vulnerable in NSW using both the IUCN and *TSC Regulation 2010* criteria.

Excerpt from Threatened Species Scientific Conservation Advice (TSSC 2016)

“Survey and monitoring effort have not been adequate to enable a robust estimate of population size for the southern brown bandicoot (eastern). Few rigorous monitoring programs are in place, and many records are old with individuals no longer occurring at many sites where they were previously recorded (Coates pers. comm., 2015a; SA DEWNR 2015; Murray pers. comm., 2015; Legg pers. comm., 2015). Although population estimates exist for some sites, few of these are reliable and contemporary, and many sites have very low trapping rates or other indicators of density (Coates pers comm., 2015a). In the south-east of NSW, for example, home range sizes are unknown and the relationship between detection and population density is poorly understood (NSW OEH 2015). Many monitoring programs focus on trends in detection levels only, rather than using techniques that could provide population estimates (NSW OEH 2015). In northern Sydney, NSW, the population is estimated to be between 54 and 900 individuals, based on available habitat, occupancy rates and home range size. However, these estimates are based on studies in which trapping rates were higher than is currently the case, and thus may be overestimates (NSW OEH 2015). In southern NSW, there is no information

about home range sizes in the region that could be used to extrapolate across potential habitat and estimate potential population size, and few individuals have ever been captured. However, the spatial extent of recent records is approximately twice that of the northern NSW population, so it is speculated that the adult population size exceeds that predicated for the northern NSW population, but by how much is unknown (NSW OEH 2015).

“Following assessment of the data, the Committee considers that the total number of mature individuals is likely to be greater than 10 000. Therefore, the southern brown bandicoot (eastern) has not met this required element of this criterion.”

Criteria 9— *Threatened Species Conservation Regulation 2010* -low numbers of mature individuals of species

The total number of mature individuals of the species is observed, estimated or inferred to be:

- (a) for critically endangered species— extremely low, or
- (b) for endangered species— very low, or
- (c) for vulnerable species—low

Criteria 10— *Threatened Species Conservation Regulation 2010*- very highly restricted geographic distribution of species

For *vulnerable species*, the geographic distribution of the species is observed, estimated or inferred to be very highly restricted such that it is prone to the effects of human activities or stochastic events within a very short time period.

IUCN Criteria D. Number of mature individuals (note this criteria relates to clause 9 and 10 of the *TSC Regulation 2010*)

The NSW population is likely to be between 2500 and 10,000 adults and does not meet the criteria for listing under Clause 9 (*TSC Regulation 2010*) or Criteria D (IUCN). The AOO (see above) greatly exceeds the threshold for listing under Clause 10 (*TSC Regulation 2010*) or Criteria D (IUCN).

Outcome

Global (TSSC 2016) IUCN Criteria D: Not eligible

NSW IUCN Criteria D: Not eligible

NSW *TSC Regulation 2010* Criteria 9: Not eligible

NSW *TSC Regulation 2010* Criteria 10: Not eligible

Excerpt from Threatened Species Scientific Conservation Advice (TSSC 2016)

“There is no robust estimate of population size for the southern brown bandicoot (eastern). However, based on the available data (see Criterion 3), the total number of mature individuals is highly likely to be greater than 1000. Following assessment of the data the Committee considers that the total number of mature individuals is not extremely low, very low or low. Therefore, the southern brown bandicoot (eastern) has not met this required element of this criterion.”

IUCN Criteria E. Quantitative Analysis (No equivalent TSC Regulation 2010 clause)

Outcome

Global (TSSC 2016) IUCN Criteria E: Insufficient data to determine eligibility

Excerpt from Threatened Species Scientific Conservation Advice (TSSC 2016)

“A population viability analysis undertaken for the greater Melbourne region, which included populations around Cardinia, Casey, Frankston, and the northern Mornington Peninsula, indicated that 84 percent of populations in the region would go extinct in 100 years without active management (Lechner 2006). However, a population viability analysis for the total population has not been undertaken. The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.”

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