

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the Environment Protection and Biodiversity Conservation Act 1999

The Minister approved this conservation advice and included this species in the Vulnerable category, effective from 3/12/15

Conservation Advice

Antechinus bellus

fawn antechinus

Taxonomy

Conventionally accepted as *Antechinus bellus* (Thomas, 1904) (Baker and Van Dyck, 2013).

Summary of assessment

Conservation status

Vulnerable: Criterion 1 A2 (b).

Antechinus bellus has been found to be eligible for listing under the following listing categories:
Criterion 1: A2 (b): Vulnerable.

The highest category for which *Antechinus bellus* is eligible to be listed is 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 information provided by the NT Government as part of the process to systematically review species that are inconsistently listed under the EPBC Act and relevant NT legislation.

Public Consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 33 business days from 2 October to 18 November 2014. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Description

Antechinus bellus (fawn antechinus) is a small (30–60 g) dasyurid with pale to medium grey fur above, occasionally with a fawn or brownish tinge. It has a white chin, pale eye-ring and the upper parts of the hands and feet are also white (Baker and Van Dyck, 2013; Menkhorst and Knight, 2009). The tail is uniformly brown, slightly darker above and is shorter than the head-body length (Cole and Woinarski, 2002). Females do not have true pouch (Calaby and Taylor, 1981).

Distribution

The fawn antechinus is only found in the forests and woodlands in the lowlands of the monsoonal tropics of the Northern Territory. Recent surveys have failed to record it across central and eastern Arnhem Land (Gambold et al., 1995; Brennan et al., 2003; Woinarski et al., 2008), where it was previously recorded in the 1930s and 1940s (Johnson, 1964; Dixon and Huxley, 1985). The species is found in Garig Gunak Barlu National Park, Kakadu National Park and Litchfield National Park.

Relevant Biology/Ecology

A terrestrial and partly arboreal insectivore that is generally active at dusk and dawn (Cole and Woinarski, 2002). Diet mainly consists of invertebrates and small vertebrates such as geckoes (Watson and Calaby, 2008). The fawn antechinus shelters in tree hollows and fallen logs (Cole and Woinarski, 2002). It occurs mostly in open forests and woodlands dominated by Darwin woollybutt *Eucalyptus miniata* and/or Darwin stringybark *E. tetradonta*, particularly where these forests have a relatively dense shrubby understorey (Friend, 1985; Friend and Taylor, 1985). Much of the habitat is burnt during the dry season and the fawn antechinus shows a preference for areas exposed to cooler and less frequent fires (Woinarski et al., 2004). The species declines in areas with frequent intense fires (Corbett et al., 2003) but is not necessarily common in areas where fire has been excluded for long periods (>20 years) (Woinarski et al., 2004a).

Breeding occurs from mid June to late August after which a synchronous male die-off occurs. However, some females survive to breed over a second and occasionally third breeding season (Calaby and Taylor, 1981; Friend, 1985). Young are born from late September to October and litter size can be as high as ten (Friend, 1985). Young remain attached to the nipples for 4-5 weeks and are suckled in the nest until weaned in early January (Friend, 1985). During the breeding season males may have the fur on the chest stained yellow to brown from a chest gland (Taylor and Horner, 1970; Watson and Calaby, 2008). The generation length is considered to be one year, given the annual die-off of males, and that the majority of breeding females are in their first year (Woinarski et al., 2014).

Threats

The current threats to the fawn antechinus are predation by feral cats *Felis catus*, inappropriate fire regimes, and habitat loss and fragmentation. Potential threats include exotic invasive grasses, cane toads *Bufo marinus* and disease from introduced species such as black rats *Rattus rattus* and feral cats.

Current Threats

Introduced Fauna

Feral Cats:

There is strong evidence implicating feral cats in the decline of small mammals (including the fawn antechinus) in northern Australia (Woinarski et al., 2011; Fisher et al., 2014; Frank et al., 2014). O'Neill (2002) suggested that feral cat numbers may have increased recently, at least in the Kapalga (Kakadu National Park) area, as a consequence of decline in the dingo population, citing Corbett (1995) 'heartworm virtually eliminated dingoes at Kapalga in the 1980s' (Woinarski et al., 2010). Feral cats are known to be vectors of some diseases that are known to affect some native wildlife (Hollings et al., 2013). In particular, toxoplasmosis is a significant protozoa carried by feral cats that can be transmitted to native wildlife, particularly mammals (Adams, 2003). Recent research demonstrates that cat predation is more marked in areas that were recently burnt by intense fires (McGregor et al., 2014; Leahy, 2013).

Inappropriate Fire Regimes

A number of factors have contributed to a change in fire patterns across northern Australia. These include the loss of purposeful, traditional fire management, vegetation change caused by grazing by introduced herbivores, and an increase in the introduction of highly flammable exotic pasture grasses such as gamba grass (*Andropogon gayanus*). Within the distributional extent of the fawn antechinus, fires have become more frequent, extensive and intense. This has led to changes in vegetation structure and composition over extensive areas, most notably the depletion of a diverse woody understorey which may provide habitat for foraging for the fawn antechinus as well as reducing habitat trees with hollows for nesting (Woinarski et al., 2011a).

Habitat Loss and Fragmentation

The species is found in open forests and woodlands dominated by Darwin woollybutt and/or Darwin stringybark trees. This forest type is now the main target for broadscale vegetation clearance in northern Australia (Land and Water Australia, 2008). Tropical open forests and savanna woodlands dominated by Darwin woollybutt and/or Darwin stringybark trees extend over 450,000 km² or about 6% of Australia's land area (Land and Water Australia, 2008). Since 2002, clearing has been approved within 21 vegetation types in the Northern Territory and approximately 45 per cent of the area approved has been in Darwin woollybutt and/or Darwin stringybark habitat (DLRM unpublished data, 2014). The habitat with the next highest figure is less than 20 per cent of the area approved (DLRM unpublished data, 2014).

Potential Threats

The potential threats to the fawn antechinus include exotic invasive grasses, cane toads and disease from black rats.

Exotic invasive grasses

Invasive grasses such as gamba grass will affect this species' ability to forage effectively on the ground, and may result in fires of greater intensity and frequency (Woinarski et al., 2014).

Cane toads

Cane toads were first detected in Kakadu National Park in 2000/01 and spread throughout the park over the following 2–3 years. While the cane toad is having a direct impact on species such as *Dasyurus hallucatus* (northern quoll) they may also be impacting on the fawn antechinus. Woinarski et al., (2010) suggests that the fawn antechinus may also have suffered declines directly as a result of cane toad poisoning.

Black rats

While there is no information available indicating that black rats pose a direct threat to the species, there has been an observed increase in the abundance of black rats in the Northern Territory (Woinarski et al., 2011a). Black rats are known to be vectors of some diseases that have caused mammal extinctions in other areas (Wyatt et al., 2008).

Threats acting on the fawn antechinus should be viewed in terms of the broader decline of mammals in the Northern Territory. The combination of the above listed threats are likely having a synergistic impact on the species. Woinarski et al. (2011a) have suggested that mammals in the Northern Territory may have entered an extinction vortex whereby they have declined gradually but extensively and may have now passed a threshold where a combination of threatening processes of increasing intensity renders their decline more precipitous and their persistence unlikely.

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%
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.		
	<i>based on any of the following:</i> <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:

Eligible under Criterion 1 A2 (b) for listing as Vulnerable

Woinarski et al. (2014) estimates that there are currently approximately 20,000 mature individuals of the species.

Recent surveys have failed to record the species across central and eastern Arnhem land where it was previously found in the 1930s and 1940s (Johnson, 1964; Dixon and Huxley, 1985). There are also data indicating a decline in the species' abundance at Kakadu and Garig Gunak Barlu National Parks (Woinarski et al., 2010). Trapping surveys at 136 quadrats of 0.25 hectares in Kakadu, typically at five yearly intervals, have revealed a ten-fold drop in the population index of the fawn antechinus. Trap success rates declined from a mean of 0.39 in 2001–2004 to a mean of 0.04 in 2007–2009 (Woinarski et al., 2010). Another survey in Kakadu National Park showed a 76 per cent decline in captures at one site over a seven-year period from 2002 to 2009 (Woinarski et al., 2014). Firth (2010) reported a 93 per cent decline in captures of the species at each of the two sites in Garig Gunak Barlu National Park between 2002 and 2008: from 15 to 1 capture at one site; and from 44 to 3 captures at another site.

These widespread declines are thought to be due to a combination of the threats described in the threats section above, but in particular the increased frequency and intensity of fires throughout the species' habitat and the impact on the species of predation by feral cats.

The population size of the fawn antechinus is believed to have declined by more than 30 per cent over the past 10 years (Woinarski et al., 2014). This conclusion is based on the surveys conducted across the species' range since 2001. Some declines have been greater than 50 per cent and others greater than 80 per cent, but Woinarski et al. (2014) believe that overall it is unlikely that the species has undergone a decline of greater than 50 per cent. Therefore, the Committee considers that the fawn antechinus has undergone a substantial decline over the past 10 years.

The Committee considers that the species has undergone a substantial reduction in numbers over the past 10 years and the reduction has not ceased, the cause has not ceased and is not understood. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it eligible for listing as vulnerable.

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; (number of mature individuals)			

Evidence:

Not eligible

Based on a minimum convex polygon enclosing all extant records, the species' extent of occurrence is estimated to be 53,746 km². Based on 2 x 2 km grid cells, the scale recommended for assessing geographic distribution by the IUCN (2014), the area of occupancy is approximately 488 km² (Woinarski et al., 2014). However, the area of occupancy is considered to be an underestimate due to limited surveying across the species' occupied range, and it is consequently considered to be limited (<2,000 km²) (Woinarski et al., 2014).

The geographic distribution of the species is not considered to be precarious for the survival of the species because it is not considered to be severely fragmented or known to exist at a limited location, as its known distribution is within Garig Gunak Barlu National Park, Kakadu National Park and Litchfield National Park.

The species' abundance changes seasonally, exhibiting the typical life history strategy for *Antechinus* spp., which is characterised by a highly synchronised mating period after which all males die (Friend, 1985). While it has been noted that in some locations the species' abundance may change between years (Friend, 1985), and that the Garig Gunak Barlu National Park population trends were inconsistent and suggested substantial fluctuations (Woinarski et al., 2014), there is a lack of evidence to suggest that there are extreme fluctuations in distribution, number of locations or subpopulations, or number of mature individuals of the species.

Following assessment of the data the Committee has determined that the geographic distribution is limited. However, the geographic distribution of the species is not considered to be precarious for the survival of the species because it is not considered to be severely fragmented or known to exist at a limited location. In addition, there is no evidence that the species undergoes extreme fluctuations apart from the seasonal abundance changes typical of the species' life history strategy. Therefore, the species has not been demonstrated to have met the required elements of this criterion and is therefore ineligible for listing under this criterion.

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			

Evidence:

Not eligible

Woinarski et al. (2014) estimate that there are approximately 20,000 mature individuals of the species. Therefore, the number of mature individuals of the species is neither very low, low or limited. Consequently, the species is ineligible for listing under this criterion.

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

Evidence:

Not eligible

Woinarski et al. (2014) estimate that there are approximately 20,000 mature individuals of the species. Therefore, the number of mature individuals of the species is neither very low, low or limited. Consequently, the species is ineligible for listing under 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 for this species. Consequently, there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Conservation Actions

Recovery Plan

A recovery plan for the species is not recommended as the approved conservation advice for the species provides sufficient direction to implement priority actions and mitigate against key threats.

Primary Conservation Objectives

1. Increase the total population size of the species
2. Investigate options for linking, enhancing or establishing additional populations
3. Maintain and enhance habitat quality of the extant and former populations
4. Stabilise populations across the species range, through amelioration of existing threats
5. Effectively administer the recovery effort

Conservation and Management actions

1. Implement an appropriate fire management regime to protect the species' key habitat.
2. Implement cost-effective control measures to reduce the abundance of feral cats.
3. Increase community engagement by involving Indigenous rangers in the survey, monitoring and management of the species.
4. Prevent clearing of the species' habitat through legislative or policy changes in the Northern Territory to protect Darwin woollybutt and Darwin stringybark forests.
5. Manage sites to identify, control and reduce the spread of exotic invasive grasses.
6. Manage sites to identify and cull introduced pests such as cane toads and black rats using humane methods.

Monitoring priorities

1. Continue the current monitoring program and expand the program to cover additional sites where the species is found.
2. Undertake survey work in suitable habitat and potential habitat to locate any additional populations and to more accurately assess the species' total population size.
3. Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

Information and research priorities

1. More precisely assess the relative impact of threats on the species. For example, examine the degree to which feral cats are causing the species' decline; examine how and to what extent a range of fire regimes impact on the species and its habitat and; ascertain the susceptibility of the species to poisoning by cane toads.
2. Conduct research into more effective or novel threat mitigation strategies. For example, develop landscape scale control strategies for feral cats.
3. Examine the effectiveness of the threat mitigation strategies. For example, can feral cat control strategies help to recover the species?

4. Gain further information on the species' biology and ecology such as life history, diet and habitat requirements.

Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Vulnerable category:
Antechinus bellus
- (ii) The Committee recommends that there should not be a recovery plan for this species.

Threatened Species Scientific Committee

03/03/15

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