



## **Consultation Document on Listing Eligibility and Conservation Actions**

### ***Bettongia gaimardi* (eastern bettong)**

You are invited to provide your views, and reasons supporting them, related to:

- 1) the eligibility of *Bettongia gaimardi* (eastern bettong) for inclusion on the EPBC Act threatened species list in the Vulnerable category; and
- 2) the necessary conservation actions for the above species.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing either by email to:  
[species.consultation@environment.gov.au](mailto:species.consultation@environment.gov.au)

or by mail to:

The Director  
Marine and Freshwater Species Conservation Section  
Wildlife, Heritage and Marine Division  
Department of the Environment  
PO Box 787  
Canberra ACT 2601

**Responses are required to be submitted by 25 November 2015.**

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## **General background information about listing threatened species**

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at: <http://www.environment.gov.au/biodiversity/threatened/index.html>.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at: <http://www.environment.gov.au/biodiversity/threatened/pubs/guidelines-species.pdf>.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at: <http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at: <http://www.environment.gov.au/biodiversity/threatened/recovery.html>.

## **Information about this consultation process**

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

# *Bettongia garmardi*

## Eastern bettong

*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 will be 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 are reflective of the desire to achieve efficiency over preparation of a large number of advices by adopting the approach of the Action Plan for Australian Mammals in presentation of information and do not reflect any difference in the evidence used to develop the recommendation.*

### **Taxonomy**

Conventionally accepted as *Bettongia garmardi* (Desmarest, 1822). Two subspecies are recognised: *B. g. cuniculus* (Tasmania), and *B. g. Gaimardi* (mainland) which is extinct. As there is only one extant subspecies, this account is also for *B. g. cuniculus*.

### **Species Information**

#### **Description**

The eastern bettong is a small macropod with a head and body length of 31-33 cm and a tail length of 29-34 cm. Its fur is brownish-grey above, pencilled with white, merging to a greyish-white beneath. The prehensile tail is well furred, often with a white tip. The back of the ears are furry. The central claws of the fore-paws are very long and curved, and presumably quite adept at digging (Rose & Johnson, 2008; Rootourism, 2010).

#### **Distribution**

The eastern bettong formerly occurred throughout much of mainland south-eastern Australia, from south-eastern Queensland to south-eastern South Australia, but is now extinct on the mainland. It remains widespread in eastern Tasmania from sea level up to 1000 m, however, its distribution there is fragmented by land clearing. It occurs naturally on Bruny Island (367 km<sup>2</sup>; Driessen et al., 2010) and was introduced to Maria Island (104 km<sup>2</sup>) in 1971. Rounsevell et al. (1991) recorded it in 33% of 10 km x 10 km grids in Tasmania, all in the eastern half of the state. In 2011 some eastern bettongs were brought from Tasmania to establish a captive-breeding colony at Tidbinbilla Nature Reserve, Australian Capital Territory. In May 2012, eastern bettongs were translocated to Mulligans Flat Woodland Sanctuary, A.C.T, a fenced mainland island of approximately 400 ha of yellow box (*Eucalyptus melliodora*) – Blakely's red gum (*E. blakelyi*) grassy woodland.

#### **Relevant Biology/Ecology**

Individuals on the mainland apparently inhabited open forest with a grassy understorey (Seebeck, 1995). In Tasmania, individuals occur in eucalypt and casuarina forests and woodlands with grassy or heath ground cover. During the daytime they reside in nests built under a fallen limb or amongst short bushes or tussocks, sited in a depression dug by the animal in dry open eucalypt forests and grassy woodlands. The nests are domed, ovoid structures that are well camouflaged and constructed by collecting nesting material bundled and transported in the animal's curved prehensile tail. The diet mainly consists of hypogeous fungi but also includes seeds, tubers and bulbs (Johnson, 1994). Their home range is 65-135 ha and an individual can travel up to 1.5 km between its nest and feeding areas (Rose & Rose, 1998; Rose & Johnson, 2008).

The eastern bettong has been described as having 'the most secure status of any member of the seriously depleted genus *Bettongia*' (Rose & Johnson, 2008, p. 287). However, the same

authors state 'It has often been suggested that it survived in Tasmania because the fox has not become established there' (p. 288). The red fox (*Vulpes vulpes*) is now present in Tasmania (Berry et al., 2009; Sarre et al., 2013; DPIPWE, 2013) and experience on mainland Australia suggests that fox predation will, if it establishes, have a severe to catastrophic impact on this species (e.g. Short, 1997).

Feral cats (*Felis catus*) have been shown to be a significant predator of woylies (*B. penicillata*) in south-western Western Australia (Wayne et al., 2013; N. Marlow, P. de Tores and K. D. Morris et al. pers. comm., cited in Woinarski et al., 2014) and may have an impact on eastern bettongs. There is evidence that feral cats are increasing in abundance in Tasmania, possibly as a result of decline of the Tasmanian devil (Hollings, 2012). This could cause increased mortality, and possibly disease, in populations of the Tasmanian bettong in the near future. The eastern bettong is a continuous breeder and sexual maturity is reached in one year. Longevity is unknown; however in the woylie it is up to 18 years in captivity (AnAge, 2012) and less in the wild, mainly due to high levels of predation. Generation time is assumed to be 8 years.

### Threats

Threats to the eastern bettong are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Predation by feral cats	moderate	entire	feral cats are a significant predator of <i>B. penicillata</i> ; abundance and impacts of cats in Tasmania possibly increasing due to decline of Tasmanian Devils
Predation by red foxes	currently negligible to low, projected to be severe to catastrophic if foxes become widespread	entire, except offshore islands	red fox strongly implicated in extinction and decline of bettongs on mainland Australia
Habitat clearing, fragmentation and degradation	moderate	moderate	spotlight surveys show that the eastern bettong is declining
Habitat degradation due to livestock and feral herbivores	minor	moderate	impacts uncertain
Inappropriate fire regimes	minor	moderate	impacts uncertain

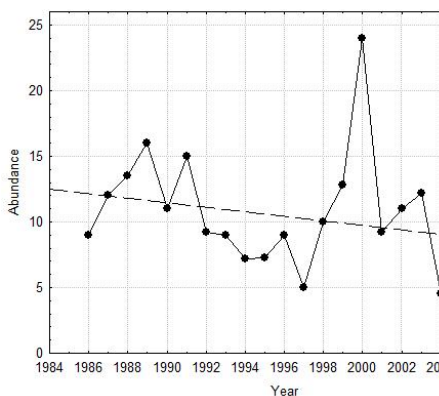
### Assessment of available information in relation to the EPBC Act Criteria and Regulations

<b>Criterion 1. Population size reduction (reduction in total numbers)</b>			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	<b>Critically Endangered Very severe reduction</b>	<b>Endangered Severe reduction</b>	<b>Vulnerable Substantial reduction</b>
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>		
			<p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>

**Evidence:**

In Tasmania, the eastern bettong is moderately common in suitable habitat but has been affected by the clearing of bush areas, with new growth forest being less suitable for its needs. Little of the bettong's habitat is protected within reserves and the highest densities occur on private land (DPIPWE, 2012). Annual spotlight surveys between 1985 and 2008 by the Department of Primary Industries, Parks, Water and Environment reported in the Tasmanian State of the Environment Report, showed a statistically significant decline in numbers observed (Figure 1), suggesting a decline of >30% since 1988 (3 generations) (<http://soer.justice.tas.gov.au/2009/indicator/113/index.php>).



**Fig. 1. Data from DPIPWE spotlight monitoring transects.**

Spotlighting data is often difficult to interpret because of variability in sighting rates. However, the decline is supported by other information and is also projected. The species has declined in some fragmented habitats (M. Pauza pers. comm., cited in Woinarski et al., 2014) while remaining abundant in others. The population size reduction is projected to be >30% in 3 generations (24 years) due to effects of introduced taxa (Woinarski et al., 2014).

The data presented above appear to demonstrate that the species is **eligible for listing as Vulnerable** under criteria A2b,c,e and A3e. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 2. Geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy</b>			
	<b>Critically Endangered Very restricted</b>	<b>Endangered Restricted</b>	<b>Vulnerable Limited</b>
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
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:**

Woinarski et al. (2014) estimate the extent of occurrence to be 27 100 km<sup>2</sup> and the area of occupancy likely to be > 2000. The species exists at 2 locations and the population, extent of occurrence, and area of occupancy are continuing to decline. There have been no extreme fluctuations in population size or distribution, and the distribution is not severely fragmented (Woinarski et al., 2014).

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 3. Small population size and decline</b>			
	<b>Critically Endangered Very low</b>	<b>Endangered Low</b>	<b>Vulnerable Limited</b>
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	<b>Very high rate 25% in 3 years or 1 generation (whichever is longer)</b>	<b>High rate 20% in 5 years or 2 generations (whichever is longer)</b>	<b>Substantial rate 10% in 10 years or 3 generations (whichever is longer)</b>
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:**

Woinarski et al. (2014) estimate the population size at > 20 000 mature individuals. The species is moderately common in suitable habitat in Tasmania but has been affected by the clearing of bush areas, with new growth forest being less suitable for its needs. The species has declined in some fragmented habitats (M. Pauza pers. comm., cited in Woinarski et al, 2014) while remaining abundant in others.

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 4. Very small population</b>			
	<b>Critically Endangered Extremely low</b>	<b>Endangered Very Low</b>	<b>Vulnerable Low</b>
Number of mature individuals	<b>&lt; 50</b>	<b>&lt; 250</b>	<b>&lt; 1,000</b>

**Evidence:**

As for Criterion 3, the population size is estimated at > 20 000 mature individuals (Woinarski et al., 2014).

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 5. Quantitative Analysis</b>			
	<b>Critically Endangered Immediate future</b>	<b>Endangered Near future</b>	<b>Vulnerable Medium-term future</b>
Indicating the probability of extinction in the wild to be:	<b>≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)</b>	<b>≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)</b>	<b>≥ 10% in 100 years</b>

**Evidence:**

No population viability analysis has been undertaken.

There are insufficient data to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.



## **Conservation Actions**

### **Recovery Plan**

A decision about whether there should be a national recovery plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

### **Primary Conservation Objectives**

1. Maintain the eastern bettong distribution and abundance in Tasmania
2. Eradicate or effectively control red foxes in Tasmania

### **Conservation and Management Actions**

There is no targeted management for this taxon. However, it occurs in several national parks and other conservation reserves, in which some threats are managed. Recommended management actions are outlined in the table below (Woinarski et al., 2014).

<b>Theme</b>	<b>Specific actions</b>	<b>Priority</b>
Active mitigation of threats	eradicate the red fox in Tasmania	high
	establish suitable fire regimes	medium
	maintain or restore habitat connections	medium
Captive breeding	n/a	
Quarantining isolated populations	develop biosecurity plans to prevent establishment of red foxes on Bruny and Maria Islands	high
Translocation	consider translocation to previously inhabited islands (especially if fox impact appears high) and to woodland fragments in Tasmania	low
Monitoring	monitor eastern bettongs at selected sites and on a broad scale to measure impact of threats including, climate change, land use changes, fire regime and introduced predators including the red fox	high
Community engagement	involve the community in monitoring bettongs	medium
	establish covenants on freehold land of high significance for this species	Medium

### **Information and research priorities**

Information and research priorities are outlined in the table below (Woinarski et al., 2014).

<b>Theme</b>	<b>Specific actions</b>	<b>Priority</b>
Surveys to better define distribution, occupancy and population abundance data	enhance long-term population monitoring to determine species range and changes in distribution and abundance	high
Assess impacts of threats on species	assess impacts of feral cats	high



	assess impacts of red foxes	medium-high
	identify occurrence and viability of populations in fragments of varying size	medium
	assess impacts of livestock grazing, and identify an acceptable threshold stocking rate	medium
	assess impacts of changing land use	medium
	assess impacts of climate change	medium
	assess population-level responses to a range of fire regimes, and model population viability across all fire scenarios	low-medium
Establish or enhance monitoring program	establish monitoring protocols to measure impact of red foxes and other threats	high
Assess effectiveness of threat mitigation options	assess efficacy of a range of management regimes for non-native predators	high
Resolve taxonomic uncertainties	n/a	
Assess habitat requirements	define key factors of habitat preference and how these are influenced by various climate change scenarios	medium
Assess diet, life history	develop life history and population viability models to assess long-term persistence	low-medium

### **References cited in the advice**

AnAge (2012). The animal aging and longevity database.

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### **Consultation questions**

1. Do you agree with the current taxonomic position of the Australian Faunal Directory for this taxon (as identified in the draft conservation advice)
2. Can you provide any additional references, information or estimates on longevity, age of maturity, average life span and generation length?
3. Has the survey effort for this taxon been adequate to determine its national distribution and adult population size?
4. Do you accept the estimate provided in the nomination for the current population size of the taxon?

5. For any population with which you are familiar, do you agree with the population estimate provided? If not, are you able to provide a plausible estimate based on your own knowledge? If so, please provide in the form:
  - Lower bound (estimated minimum):
  - Upper bound (estimated maximum):
  - Best Estimate:
  - Estimated level of Confidence: %
6. Can you provide any additional data, not contained in the current nomination, on declines in population numbers over the past or next 10 years or 3 generations, whichever is the longer?
7. Is the distribution as described in the nomination valid? Can you provide an estimate of the current geographic distribution (extent of occurrence or area of occupancy in km<sup>2</sup>) of this taxon?
8. Has this geographic distribution declined and if so by how much and over what period of time?
9. Do you agree that the taxon is eligible for inclusion on the threatened species list, in the category listed in the nomination?
10. Do you agree that the threats listed are correct and that their effects on the taxon are significant?
11. To what degree are the identified threats likely to impact on the taxon in the future?
12. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect this taxon at any stage of its life cycle?
13. In seeking to facilitate the recovery of this taxon, can you provide management advice for the following:
  - What individuals or organisations are currently, or need to be, involved in planning to abate threats and any other relevant planning issues?
  - What threats are impacting on different populations, how variable are the threats and what is the relative importance of the different populations?
  - What recovery actions are currently in place, and can you suggest other actions that would help recover the taxon? Please provide evidence and background information.
14. Can you provide additional data or information relevant to this assessment?