Australian Government
Department of Agriculture, Water and the Environment

Consultation Document on Listing Eligibility

Bettongia anhydra (Desert Bettong)

You are invited to provide your views and supporting reasons related to the eligibility of *Bettongia anhydra* (Desert Bettong) for inclusion on the EPBC Act threatened species list in the **Extinct** category.

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

or by mail to:

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

Responses are required to be submitted by 11 September 2020.

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/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2018.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.

Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the Privacy Act 1988 (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the 'common assessment method'. As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: http://environment.gov.au/privacy-policy.

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 anhydra

Desert Bettong

Taxonomy

Conventionally accepted as *Bettongia anhydra* Finlayson, 1957.

Species/Sub-species Information

Description

Bettongia anhydra (Desert Bettong) is recognised from skull fragments preserved from a single specimen collected in 1933 from the Northern Territory (NT) and subfossil material taken from sites in Western Australia (WA) (Woinarski et al. 2014a). No physical description is available, but the Desert Bettong is believed to have been similar to *B. lesueur* (Boodie). However, the skull showed different cranial and dental morphology to that of the Boodie, and analysis of extracted DNA revealed substantial genetic differences from other bettongs (McDowell et al. 2015). These differences, together with an absence of preserved specimens and a lack of historical accounts, prevent the Desert Bettong from being described beyond a basic comparison to the Boodie.

The Boodie is a thickset bettong, weighing around 1.3 kg, with an average head and body length of 36 cm. The hind limbs are longer than the forelimbs, and the Boodie has large hind feet and a long thick tail. The Boodie is the only bettong known to build and shelter in burrows during the day (DEC 2012; Woinarski et al. 2014b).

Distribution

The Desert Bettong is believed to have been distributed across southern WA, from the Nullarbor through to Merkanoota (100 km southeast of Geraldton in the WA Wheatbelt), and up to the Tanami Desert, NT (Woinarski et al. 2014a). This distribution range lies in a predominantly arid to semi-arid environment (McDowell et al. 2015).

Extinction date

The extinction date of the Desert Bettong is unknown but (like other bettongs) it may have survived in the Tanami Desert up until the 1950s or 1960s. The last specimen was collected in 1933 (Woinarski et al. 2014a).

Relevant Biology/Ecology

Almost nothing is known about the biology of the Desert Bettong. Like other bettongs, it may have sheltered in underground warrens or in nests under shrubs, before emerging at night to excavate much of its food, consisting of underground fungi, tubers, roots, bulbs, fruit, seeds and arthropods (Woinarski et al. 2014b; McDowell et al. 2015).

Likely Causes of Decline and Extinction

Likely causes of decline and extinction are surmised from threats known to have occurred in the mid-20th century and an assumption that the threats that affect many bettong species would also impact on the Desert Bettong.

Table 1: Probable causes of decline towards extinction for the Desert Bettong in approximate order of impact, based on available evidence.

Threat factor	Threat status and severity*	Evidence base
Introduced predators		
Predation by feral cats (*Felis catus*)	– Status: Historical – Confidence: Suspected – Consequence: Severe – Extent: Across the entire range	Feral cats are thought to have been present throughout the distribution range of the Desert Bettong by 1890–1900 (Abbott 2008) and are found to be widespread and common in the Tanami Desert (Gibson 1986). Predation by feral cats has been implicated in the extinction and ongoing decline of many terrestrial, non-volant, mammal species (Dickman 1993; Smith & Quin 1996; Woinarski et al. 2014c; Hardman et al. 2016; Davies et al. 2017; Radford et al. 2018; Woolley et al. 2019), particularly in arid and semi-arid habitats (Christensen & Burrows 1994; Moseby et al. 2011; Davies et al. 2018; Woolley et al. 2019), with vertebrate prey up to four kg taken (DoE 2015). Woinarski et al. (2014c) considered predation by feral cats to be the most critical factor in the decline and extirpation of Australia's mammal fauna. Fire and stock grazing can amplify the impacts of predation on small mammals by reducing ground cover, particularly following high-intensity burns (Smith & Quinn 1996; Leahy et al. 2015). The number of predators attracted to the burnt area (Hradsky et al. 2017), individual predator activity (Leahy et al. 2015), and hunting success (McGregor et al. 2015) have all been observed to increase where habitat has been modified through frequent burning. Therefore, threats from predation would have increased as European settlement spread throughout the accepted distribution range.
Predation by European red fox (*Vulpes vulpes*)	– Status: Historical – Confidence: Suspected – Consequence: Severe – Extent: Across the entire range	The European red fox arrived in the Nullarbor around 1915, and advanced westward through to Geraldton, WA by 1925 (King & Smith 1985; Richards & Short 1996). The red fox entered the NT around 1920-1930 but was recorded as being rare in the Tanami Desert as late as the 1980s (Gibson 1986). However, even at low densities, foxes are capable of eliminating remnant populations of threatened species (Smith & Quin 1996). Predation by foxes has been implicated in the extinction and decline of many terrestrial, non-volant, mammal species in Australia (Woinarski et al. 2014c; Radford et al. 2018) and its spread across Australia is identified as a

		primary reason for the demise of bettongs across much of the mainland in the early to mid-20th century (Short 1998). The impact from foxes has been most severe on species in open habitats, such as much of arid and semi-arid Australia, and the red fox has been observed to preferentially target bettongs (Boodie) despite the presence of European rabbits (*Oryctolagus cuniculus*) (Short et al. 2002). As identified above, fire can amplify the impacts of predation on small and medium-sized mammals (Leahy et al. 2015; McGregor et al. 2015; Hradsky et al. 2017).
Habitat loss and fragmentation		
Habitat degradation and resource depletion by livestock	– Status: Historical – Confidence: Suspected – Consequence: Severe – Extent: Across the entire range	Stock grazing in WA began in the mid-19th century, and by 1930 almost all of the semi-arid and arid western half of WA were under pastoral lease (van Etten 2013). However, the WA portion of the Nullarbor was largely untouched before 1955 (although where pastoral leases existed, mismanagement led to over-grazing in many parts) (McKenzie & Robinson 1987). In the NT significant pastoral settlement date from the 1880s, although pastoral interests never became a major industry in the Tanami Desert (Gibson 1986; Rose 2008). Grazing by stock removes both shelter and the flora that likely comprised part of the Desert Bettong's diet (Dennis 2001; McDowell et al. 2015) and degrades or destroys potential refuges for native species during times of drought (Tunbridge 1993; Morton et al. 1995). Trampling by stock compacts and powders topsoil, destroying burrows and surface runways, and renders soil too loose for digging (Dickman 1993). It is unknown whether the Desert Bettong was a sub-surface burrower, but it likely excavated much of its food, which would have been more difficult following the arrival of stock.
Habitat degradation and resource depletion by introduced European rabbits (*Oryctolagus cuniculus*)	– Status: Historical – Confidence: Suspected – Consequence: Severe – Extent: Across the entire range	European rabbits were first release in 1859, and by 1910 they were recorded throughout the distribution range of the Desert Bettong (Fenner 2010). Gillieson et al. (1996) observed that the major land degradation of the Nullarbor had occurred by the beginning of the 20th century, with rabbits held to be the principal cause of accelerated soil loss on pastoral lands. Richards & Short (1996) recorded early settler observations of the impact of rabbits to the habitat, including intensive grazing on native vegetation and ring-barking

		trees. In large numbers, rabbits turn areas of productive, well vegetated country into a virtual desert, greatly impacting sympatric mammals (Johnson 2006). Rabbits, with high standing biomass and high rate of increase, provide abundant prey for predators as native species decline. Therefore, rabbit presence supports elevated predator populations and predation pressures on native mammalian species. Native species are also easier to catch, being without the behavioural or morphological defences to avoid detection or capture (Richards 2004; Pedler et al. 2016; Radford et al. 2018). Despite these suspected impacts, Robley et al. (2002) suggest rabbit abundance may not have been an important factor in the decline of bettongs. They observed a reintroduced population of the Boodie co-existing with rabbits and was able to maintain their population numbers despite variation in rabbit abundance.
Fire		
Change in fire regime	– Status: Historical – Confidence: Suspected – Consequence: Unknown – Extent: Across the entire range	The degree to which a change in fire regime impacted the Desert Bettong is unknown. Johnson (2006) believes that a change in fire regime, following European settlement, made little direct contribution to mammal extinctions, with declines related to increased predator activity after fire rather than the fire itself (Leahy et al. 2015; McGregor et al. 2015; Hradsky et al. 2017).

*“

Status: “historical/ current/ future” – identify the temporal nature of the threat
Confidence: “suspected/ inferred/ known” – identify the extent to which we have confidence about that threat
Consequence: “severe/ moderate/ low/ unknown” – identify the severity of that threat
Trend: “decreasing/ static / increasing / unknown” – identify the extent to which it will continue to operate on the species
Extent: “across the entire range/across part of its range / unknown.” – identify its spatial context

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

The Desert Bettong is recognised only from skull fragments preserved from a single specimen collected in 1933 from the NT and subfossil material taken from sites in WA (Woinarski et al. 2014a). So little information is available on the Desert Bettong that the extinction date cannot be readily estimated. However, Woinarski et al. (2014a) estimate the possible date could be as late as the 1960s, as other bettong species are known to have survived in the Tanami Desert to this date.

The Desert Bettong is presumed Extinct under the WA *Biodiversity Conservation Act 2016* and not listed under the NT *Territory Parks and Wildlife Conservation Act 1976*. The Desert Bettong is listed Extinct under the IUCN Red List (Burbidge & Woinarski 2016) and in the Action Plan for Australian Mammals (Woinarski et al. 2014a).

The Desert Bettong has not been recorded in biological surveys in either WA or the NT, including surveys conducted in the Nullarbor (McKenzie & Robinson 1987), WA Wheatbelt

(Kitchener et al. 1980) and the Tanami desert, NT (Gibson 1986). Indigenous knowledge of Central Desert mammals, surveyed by Burbidge et al. (1988), revealed no indication that the Desert Bettong is extant or existed in the living memory of Indigenous people of the area, but this may be due to this species not being differentiated from other identified bettong species (the Boodie and *B. penicillata* (Brush-tailed Bettong).

Bettongs were once broadly distributed across Australia but since European settlement all of the known species have been extirpated from much of their former range or gone extinct (McDowell et al. 2015). In particular, the arid zone of WA has suffered a severe decline in native fauna. Burbidge & McKenzie (1989) reported that since the mid-20th century almost 90 percent of medium sized arid zone mammals in the critical weight range (35–5500 g) have declined or gone extinct from this region.

The data presented above appear to demonstrate that the species is **eligible for listing as Extinct**. 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.

Collective list of questions – your views

Information to aid listing assessment

1. Do you have further information on past or potential searches or research activities for the species?

2. Can you provide information on specimen records, including collection location and date?

3. Can you provide additional information on the range or location of populations, or a historic range (national extent)?

4. Do you have any additional information in regard to the ecology or biology of the species?

5. Do you further information on the historic threats that faced the species?

6. Are you aware of other knowledge (e.g. indigenous ecological knowledge) that may help better understand the species?

7. Are you aware of any cultural importance or use that the species had?

Any other information

8. Do you have comments on any other matters relevant to the assessment of this species?

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