

Australian terrestrial mammals: how many modern extinctions?

Andrew A. Burbidge^{A,*}

For full list of author affiliations and declarations see end of paper

***Correspondence to:**

Andrew A. Burbidge
Floreat, WA, Australia
Email: amburbidge@westnet.com.au

Handling Editor:

Mark Eldridge

Received: 19 July 2023
Accepted: 22 August 2023
Published: 6 September 2023

Cite this:

Burbidge AA (2024)
Australian Mammalogy **46**, AM23037.
doi:[10.1071/AM23037](https://doi.org/10.1071/AM23037)

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ABSTRACT

This note updates the list of extinct Australian terrestrial mammal species and subspecies and, from published scientific literature, reports 40 species and six subspecies that are presumed to have become extinct since European settlement of Australia.

Keywords: Australia, biodiversity, extinct, modern extinction, species, subspecies, subfossil, terrestrial mammals, up-to-date extinctions list.

Introduction

Australia has the unenviable record of a very high number of terrestrial mammal extinctions since European settlement in 1788, the highest number of any continent (Woinarski *et al.* 2019). Various authors have published different numbers of extinct species and subspecies, and some recent papers have quoted out-of-date data, e.g. Fernandes *et al.* (2023). Here, I summarise the currently known number of modern (post-1788) extinctions, both species and subspecies, based on published scientific literature.

Numbers of extinct terrestrial mammals published in the recent past are:

- McKenzie *et al.* (2007) and Burbidge *et al.* (2008): 22 species (excluded islands, so excluded Tasmania and Australia's External Territories);
- Woinarski *et al.* (2014): 29 species and seven subspecies (included Tasmania and External Territories; included *Zaglossus bruijnii*);
- Woinarski *et al.* (2015): 30 species (added *Melomys rubicola* in the 2012 mammal action plan);
- Woinarski *et al.* (2019): 34 species (included only validly listed species pursuant to Commonwealth, State and Territory legislation; included newly described species; excluded *Z. bruijnii*);
- Australian Mammal Taxonomy Consortium (AMTC) (2022): 34 species and seven subspecies (included External Territories, but three possibly extinct taxa are in their 'Auxiliary List. Unnamed Taxa', with none of these shown as extinct); and
- Burbidge *et al.* (2023): 34 species.

Methods

I review the above references and recent scientific literature and provide an up-to-date list of Australian terrestrial mammal species and subspecies that I consider to have become extinct since 1788.

Results and discussion

Zaglossus bruijnii

Helgen *et al.* (2012) reported a previously overlooked museum specimen of *Zaglossus bruijnii*, the Western Long-beaked Echidna, labelled as having been collected by John T.

Table 1. Australian terrestrial mammal species presumed to have become extinct since 1788.

| | Scientific name | Common name |
|----|--|-------------------------------------|
| 1 | <i>Thylacinus cynocephalus</i> | Thylacine |
| 2 | <i>Dasyercus</i> sp. ^A | – |
| 3 | <i>Chaeropus ecaudatus</i> | Landwang, Pig-footed Bandicoot |
| 4 | <i>Chaeropus yirratji</i> | Yirratji |
| 5 | <i>Perameles fasciata</i> | Liverpool Plains Striped Bandicoot |
| 6 | <i>Perameles eremiana</i> | Desert Bandicoot |
| 7 | <i>Perameles myosuros</i> | Marl |
| 8 | <i>Perameles notina</i> | South-eastern Striped Bandicoot |
| 9 | <i>Perameles papillon</i> | Nullarbor Barred Bandicoot |
| 10 | <i>Macrotis leucura</i> | Yallara, Lesser Bilby |
| 11 | <i>Bettongia anhydra</i> | Desert Bettong |
| 12 | <i>Bettongia pusilla</i> | Nullarbor Dwarf Bettong |
| 13 | <i>Bettongia</i> sp. (Clade I) ^A | – |
| 14 | <i>Caloprymnus campestris</i> | Desert Rat-kangaroo |
| 15 | <i>Potorous platyops</i> | Moda, Broad-faced Potoroo |
| 16 | <i>Lagorchestes asomatus</i> | Kuluwarri, Central Hare-wallaby |
| 17 | <i>Lagorchestes leporides</i> | Eastern Hare-wallaby |
| 18 | <i>Notamacropus greyii</i> | Toolache Wallaby |
| 19 | <i>Onychogalea lunata</i> | Crescent Nailtail Wallaby |
| 20 | <i>Pteropus brunneus</i> | Percy Island Flying-fox |
| 21 | <i>Nyctophilus howensis</i> | Lord Howe Long-eared Bat |
| 22 | <i>Pipistrellus murrayi</i> | Christmas Island Pipistrelle |
| 23 | <i>Conilurus albipes</i> | Parroo, White-footed Rabbit-rat |
| 24 | <i>Conilurus capricornensis</i> ^A | Capricorn Rabbit-rat |
| 25 | <i>Leporillus apicalis</i> | Tjooyalpi, Lesser Stick-nest Rat |
| 26 | <i>Melomys rubicola</i> | Bramble Cay Melomys |
| 27 | <i>Notomys amplus</i> | Yoontoo, Short-tailed Hopping-mouse |
| 28 | <i>Notomys longicaudatus</i> | Koolawa, Long-tailed Hopping-mouse |
| 29 | <i>Notomys macrotis</i> | Noompa, Large-eared Hopping-mouse |
| 30 | <i>Notomys magnus</i> ^A | – |
| 31 | <i>Notomys mordax</i> | Payi, Darling Downs Hopping-mouse |
| 32 | <i>Notomys robustus</i> ^A | Broad-cheeked Hopping-mouse |
| 33 | <i>Notomys</i> sp. (very large) ^A | – |
| 34 | <i>Notomys</i> sp. (medium) ^A | – |
| 35 | <i>Pseudomys auritus</i> | Long-eared Mouse |
| 36 | <i>Pseudomys glaucus</i> | Blue-grey Mouse |

(Continued on next column)

Table 1.(Continued)

| | Scientific name | Common name |
|----|---|------------------------|
| 37 | <i>Pseudomys</i> sp. (large) ^A | – |
| 38 | <i>Rattus macleari</i> | Maclear's Rat |
| 39 | <i>Rattus navitatis</i> | Bulldog Rat |
| 40 | <i>Crociodura trichura</i> | Christmas Island Shrew |

^ASpecies known only from surficial subfossil deposits and judged to have been extant in 1788, but with no certain post-1788 records of live animals.

Tunney in 'conglomerate hills' at Mount Anderson in the south-western Kimberley region of Western Australia in 1901. [Burbidge \(2018\)](#) argued, based on several lines of evidence, that this distinctive species is not, and has not been, part of the Kimberley region's modern mammal fauna, and that the simplest and most plausible explanation is that the tag on the specimen came from another animal. It is not included in [Table 1](#).

Extinct species

[Table 1](#) lists Australian terrestrial mammals species considered to have become extinct since European settlement of Australia in 1788.

Brief descriptions and presumed dates of extinction (where available) are provided in [Woinarski et al. \(2014\)](#), except for the following taxa.

- *Dasyercus* sp. follows [Newman-Martin \(2020\)](#); it occurred in the Western Australian bioregions Esperance Plains, Geraldton Sandplains, Great Victoria Desert, Hampton, Mallee, Nullarbor, Swan Coastal Plain and Yalgoo (Interim Bioregionalisation of Australia (IBRA) version 7 ([DCCEW 2021](#)); [McKenzie et al.](#) in press).
- *Bettongia* sp. (Clade 1) was identified by [Haouchar et al. \(2016\)](#), who referred to it as the 'Nullarbor' form. In Western Australia, it occurred in the Great Victoria Desert, Hampton and Nullarbor IBRA bioregions ([McKenzie et al.](#) in press) and in South Australia it occurred at Venus Bay (Eyre York Block IBRA).
- *Notomys magnus* was described by [Vakil et al. \(2023\)](#) from subfossils from the Broken River region in Queensland. It had an estimated body weight of 83 g. The authors stated 'It is plausible that it was extant after 1788 but never documented as a living animal post-contact' (p. 8), comparing it with *Conilurus capricornensis* and *Notomys robustus*, both described from subfossils obtained from the surface and noting that *C. capricornensis* co-occurs with *N. magnus* in the Broken River cave deposits.
- *Notomys* sp. ('very large'), *Notomys* sp. ('medium'), and *Pseudomys* sp. ('large') were collected as subfossils in 2004 along the Devonian Reef complex in the Dampierland IBRA bioregion. [Start et al. \(2012\)](#) considered these species were widespread in the south-west Kimberley 'during

(at least) the late Holocene, before European settlement’ (p. 44). All three of the Devonian Reef subfossil species are estimated to be within the ‘critical weight range’ of 35–5500 g (Burbidge and McKenzie 1989). None has been formally described.

- *Crocidura trichura* was allocated the conservation status of Critically Endangered in Woinarski *et al.* (2014). There are no confirmed records since 1985. Woinarski *et al.* (in press), using a recently developed IUCN protocol, estimated that there is a 96.2% likelihood that the species is now extinct. They also noted that although the IUCN states that a species with a probability >0.9 of being extinct should be categorised as Extinct, there is considerable uncertainty about the likely detectability of *C. trichura* using different sampling techniques, and therefore uncertainty about the estimate of likelihood of extinction. The species is considered Extinct by AMTC (2022).

Eight of the species listed in Table 1 as Extinct are only known on the basis of collections of surficial subfossils. That these taxa were likely to have been extant in 1788 is based on the professional opinion of subfossil experts; however, although it is plausible that these are of Holocene age and extant in 1788 (see Vakili *et al.* 2023), it is arguable that some may be of Pleistocene age. In this context, it is noteworthy that several extinct taxa are known from very few early non-fossil specimens: *Lagorchestes asomatus*, *Bettongia anhydra* and *Notomys mordax* are each known from a single skull (Finlayson 1934; Watts and Aslin 1981; McDowell *et al.* 2015); *Notomys amplus* and *N. macrotis* are known from two specimens; and *N. longicaudatus* has been collected alive on only four occasions (Watts and Aslin 1981). Four of these species (*Lagorchestes asomatus*, *Bettongia anhydra*, *Notomys amplus* and *N. longicaudatus*) are known, from subfossil and/or oral history data, to have occurred widely in Australia (Woinarski *et al.* 2014; McKenzie *et al.* 2023).

Extinct subspecies

Many subspecies of Australian mammals have been described in the past, but few are accepted today. Even for those accepted currently, few have been subjected to modern molecular analysis. Table 2 follows AMTC (2022).

Subspecies in Table 2 were discussed by Woinarski *et al.* (2014). However:

- *Myrmecobius fasciatus rufus*, although included in AMTC (2022), is not widely accepted because the Numbat occurred more or less continuously across its former range. The subspecies description was based on pelage variation (Wood Jones 1923) and, as pointed out by Calaby (1960), ‘The races differ apparently only in pelage colour, which is very variable in *f. fasciatus* and is in need of analysis’ (p. 186). Wood Jones and Calaby were not fully aware of the broad and semi-continuous former

Table 2. Australian terrestrial mammal subspecies considered to have become extinct since 1788.

| | Scientific name | Common name |
|---|--|---|
| 1 | <i>Lasiorhinus krefftii krefftii</i> | Northern Hairy-nosed Wombat (Queensland) |
| 2 | <i>Lasiorhinus krefftii gillespiei</i> | Northern Hairy-nosed Wombat (New South Wales, eastern Queensland) |
| 3 | <i>Bettongia gaimardi gaimardi</i> | Eastern Bettong |
| 4 | <i>Bettongia lesueur graii</i> | Boodie, Burrowing Bettong (mainland) |
| 5 | <i>Bettongia penicillata penicillata</i> | Brush-tailed Bettong (eastern mainland Australia) |
| 6 | <i>Lagostrophus fasciatus baudineti</i> | Banded Hare-wallaby (South Australia) |

- distribution of the Numbat (Friend *et al.* 1982; Burbidge *et al.* 1988).
- Travouillon *et al.* (2019) described two subspecies within *Chaeropus ecaudatus*: *C. e. ecaudatus* and *C. e. occidentalis*; both subspecies are extinct, so the species is included in Table 1, but not Table 2.
 - Subspecific status within *Lasiorhinus krefftii* requires further research because *L. k. krefftii* is known only from fossil material and *L. k. gillespiei* is based on a single skin. The extant population is known as *L. k. barnardi*.

More to come?

In addition to *Crocidura trichura* (here shown as Extinct), six terrestrial mammal species (*Gymnobelideus leadbeateri*, *Lasiorhinus krefftii*, *Potorous gilbertii*, *Pseudocheirus occidentalis*, *Pteropus natalis* and *Zyzomys pedunculatus*) and two subspecies (*Petrogale concinna concinna* and *Miniopterus orianae bassanii*) are listed as Critically Endangered pursuant to the Environment Protection and Biodiversity Conservation Act 1999 (DCCEE 2023). *Petrogale c. concinna* has not been reliably recorded since 1839.

Conclusion

Currently available published information shows that 40 Australian terrestrial mammal species and six subspecies are presumed to have become extinct since European settlement. It is probable that targeted survey, continuing research into taxonomy and subfossil research will identify further extinct taxa, e.g. Newman-Martin (2020) reported ‘Gen. et sp. nov.’, ‘*Antechinomys* sp. indet.’ (Dasyuridae), and ‘*Notomys* sp. indet.’ (Muridae) from Horseshoe Cave on the Nullarbor Plain, although it is possible that these may be late Pleistocene in age. The very high number of mammal taxa listed as threatened by Australian jurisdictions gives cause for concern that more species and/or subspecies may become extinct.

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Data availability. No new data were generated in order to write this Note.

Conflicts of interest. The author declares no conflicts of interest.

Declaration of funding. This research did not receive any specific funding.

Acknowledgements. I thank John Woinarski for his helpful comments on a draft of this Note. Both John and an anonymous reviewer made helpful comments that improved this Note.

Author affiliation

^AFloreat, WA, Australia.