The Habitat, Distribution and Conservation Status of the Tasmanian Bettong, \textit{Bettongia gaimardi} (Desmarest)

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Abstract
The Tasmanian bettong, \textit{Bettongia gaimardi}, appears to be the most common member of its genus. Though formerly distributed on the Australian mainland, \textit{B. gaimardi} is now found only in the open forest habitats of eastern Tasmania, the vast majority of which are susceptible to forestry operations, such as clearfelling, burning and the laying of 1080 poison. Unless carefully managed, all of these practices in the long term are likely to reduce bettong populations. This and the fact that only 5\% of bettong habitat lies within National Parks, leads to the conclusion that the conservation status of this species should be regarded as 'vulnerable'.

Introduction
The Tasmanian bettong has the most secure status of any member of the seriously depleted genus \textit{Bettongia} (Johnson and Rose 1983). However, surprisingly little information has been published on this small rat-kangaroo. Wakefield (1967), on the basis of skull morphology, synonymized the Tasmanian species (then \textit{B. cuniculus}) with the Australian mainland form, \textit{B. gaimardi}, but considered the Tasmanian population should be given subspecific status: \textit{B. gaimardi} \textit{cuniculus}. The mainland form (\textit{B. g. gairnardi}) is believed to be extinct (Poole 1979), having suffered a dramatic decline in range and numbers since the advent of European man and his introduced eutherian mammals. Fire and the introduction of the fox and rabbit are thought to have had a major role in the marked contraction in the distribution of the genus (Jones 1924; Christensen 1980; King \textit{et al.} 1981).

This paper discusses the distribution of the Tasmanian bettong and describes its habitat and conservation status.

Distribution
\textit{B. g. gaimardi} was formerly distributed along the coastal areas of eastern Australia, from south-east Queensland to the south-east tip of South Australia (Wakefield 1967). On the basis of the distribution maps in Burbidge (1983) and Christensen (1983), it may have been allopatric with south-eastern populations (now extinct) of \textit{Bettongia lesueur} and \textit{B. penicillata}.

Today the Tasmanian bettong is found over most of the eastern half of Tasmania (Fig. 1) and extends to parts of the central highlands at altitudes above 1000 m. Populations occur on Bruny I. and Maria I. but not on the larger Bass Strait islands, King I. and Flinders I., nor is there evidence of them having been there in the recent past (Hope 1973). Le Souëf (1929) states that '... another species of Rat-Kangaroo, probably \textit{Bettongia cuniculus} (= \textit{gaimardi}) is reported as still being occasionally seen on Flinders and Barren islands.' \textit{Aepyprymnus rufescens} has been found as a sub-fossil on Flinders I. (Hope 1973) and it is possible that \textit{Aepyprymnus} was identified as \textit{Bettongia}. The absence of \textit{B. gaimardi} from all Bass Strait islands is intriguing in view of...
its distribution on both sides of the strait. One explanation may be that these islands were covered with thick shrubland until cleared within the last 180 years (Guiler 1967), so that bettong habitats were not available (Hope 1973).

There has been no systematic survey of the present distribution of the bettong in Tasmania, and as there is little historical data in the literature and museum records, it is not known if its range has contracted. However, there can be no doubt that its distribution is far more patchy at present than in the past. Certainly, the following quotation from Gould (1863) is no longer correct: '... Few of the indigenous quadrupeds of Van Diemen's Land are better known than the present, which may be said to be universally dispersed over that island, wherever localities occur favourable to its habits and mode of life ...'.

![Fig. 1. The distribution of the Tasmanian bettong (●) plotted on a 10-km grid; some points represent more than one record. Based on published records (see References), personal communications, the Tasmanian National Parks and Wildlife Service files (1967–84) and the author's own records (1976–84). Stippled areas, open forest (from Jackson 1965).](image)

**Habitat**

The distribution of the Tasmanian bettong coincides with that of open forest [as defined by Specht *et al.* (1974) and mapped by Jackson (1965)]. In Fig. 1, many of the points that appear outside the region of open forest are in smaller pockets of this forest (Kirkpatrick and Dickinson 1984; Jackson, personal communication) that are not included in Jackson's (1965) vegetation map.

Details of the habitat are available for some of the trapping sites where bettongs were caught. The understorey (Fig. 2) is usually low (0–1 m) and comprises a number of grass species, e.g. tussock grass *Poa rodwayi*, wallaby grass *Danthonia* sp., and browntop *Agrostis* sp. The most
common understorey species is common sag *Lomandra longifolia*. In recently burnt areas bracken *Pteridium* sp. may be common. Other ground species include everlasting daisy *Helichrysum* sp., *Hibbertia* spp., and guitar plant *Lomatia tinctoria*, and in wetter areas cutting grass *Gahnia* sp., cord rush *Restio* sp., and sedge *Empodisma minor*. Heath species, such as *Epacris* sp. and beard-heath *Leucopogon collinus*, are present in sandy areas. Medium-sized shrubs (0-3 m) consist mainly of *Leptospermum* sp. and *Melaleuca* sp., and in sandy areas *Banksia marginata*.

*Eucalyptus obliqua*, *E. viminalis* or *E. amygdalina*, and to a lesser extent *Acacia dealbata*, *Casuarina stricta* and native cherry *Exocarpos cupressiformis* are the dominant tree species. In the more elevated regions of the Central Highlands, *E. coccifera* and *E. pauciflora* may predominate, as may *E. rodwayi* in wetter sites.

Fig. 2. Typical habitat of the Tasmanian bettong in south-eastern Tasmania: *Eucalyptus viminalis* with *Lomandra longifolia*.

Most bettong habitat in open forest areas is situated on infertile dolerite soils, although occasionally on granite or sandstone. With the exception of the Central Highlands, much of which can be covered with snow for extended periods, the bettong is found only in the warmer parts of Tasmania with relatively low rainfall (50-75 mm per annum). Gould was correct when he informed Waterhouse (1846) that in Tasmania the bettong ‘... prefers the open sandy or stony forest land rather than the thick and humid brushes ...’.

**Nests**

Bettongs build densely woven nests of dry grass and bark, which they conceal with considerable skill under fallen limbs, among clumps of short bushes or at the base of tussocks. They have a prehensile tail with which they transfer nest material, as do other bettongs (Gould 1863; Johnson and Rose 1983). One bettong was obtained from the wild (north-eastern Tasmania) with a tail still grasping vegetation, presumably for nest construction. This comprised a pteridophyte (*Selaginella*), grass (hairy rice grass *Tettrarrhena* sp.), and rushes (cord rush, *Restio* sp.); the weight of the package was approximately 100 g. One nest (at Kempton) contained three species of grass (*Danthonia* sp., *Poa rodwayi* and *Agrostis* sp.) and was wrapped in a basket of leaves and bark of *Eucalyptus obliqua*. The nest also contained seeds from a number of commercial crops including...
millet, sorghum, oats, maize, wheat and sunflower. Further details on nest composition and sites may be found in Kershaw (1952, 1971) and Johnson (1979).

Conservation Status

Only in Tasmania are bettongs relatively common. It is tempting to attribute the principal cause of the mainland decline to the fox, which has not been established in Tasmania. However, rabbits never reached the abundance in Tasmania that they did on the mainland, and consequently may not have been so destructive of the habitat favoured by the bettong; this in turn may have allowed the bettong to maintain levels of population in Tasmania not found on the Australian mainland (Johnson and Rose 1983). Perhaps it is prudent to withhold judgment on this question, because several other species of marsupial are more abundant in Tasmania than on the Australian mainland, e.g. *Thylogale billardierii*, *Potorous tridactylus*, *Perameles gunnii* and *Dasyurus viverrinus*.

At present, 50% of Tasmanian habitat suitable for the bettong is in areas under private ownership and susceptible to forestry and agricultural development; 45% is in areas controlled by the Crown (though also susceptible to forestry and other development); and only 5% lies within lands designated National Parks (Rose 1985). The bettong is found naturally in four Tasmanian National Parks (Freycinet, Asbestos Range, Mt Field and Mt William) and has been introduced into a fifth (Maria I.; D. Rousevell, personal communication). It is totally protected throughout its range; none the less, its status must be regarded as vulnerable. It is not known whether the bettong is prey to feral cats, but the further introduction of other eutherian predators (such as the fox) could endanger it. Both of these predators have been implicated in the decline of *Bettongia* on the Australian mainland (Jones 1924; King et al. 1981). The western quoll, *Dasyurus geoffroii*, is a major predator of *Bettongia lesueur* (Christensen 1980), but although the eastern quoll *D. viverrinus* feeds occasionally upon small mammals (Green 1967), it is unlikely to prey upon the Tasmanian bettong, because they have been kept together in captivity for lengthy periods (Rose, unpublished data). It is possible that the larger tiger quoll, *D. maculatus*, preys upon the bettong.

Forestry practices are likely to have an impact on the distribution of the bettong. Clearfelling for the purpose of woodchipping did not have an immediate impact on bettong numbers in two areas at Buckland (Gowland 1977). In the short term, populations tended to increase immediately after copses were burnt (Kershaw 1971; Gowland 1977). However, Johnson (1978) speculates that burning undoubtedly reduces the availability of suitable nest sites and nest material for bettongs; the transient return of animals to these areas may be because they are able to carry their own nesting material in their prehensile tails. Also, the hypogean fungi on which they are dependent (Rose 1982, 1985), may not be affected immediately by above-ground forestry practices, as suggested by Christensen (1980). However, as forest regeneration proceeds, bettong populations dwindle and no individuals were recorded by Gowland (1977) 2 years after burning. Johnson (1978) suggests that management of bettong habitat would require the exclusion of fire until it became necessary to reduce the shrub layer. He suggests that fire could be then used in patches, but not as a blanket treatment.

The susceptibility of the Tasmanian bettong to poisoning by 1080 is comparable to that of most species of herbivorous animals (King et al. 1981; McIlroy 1982). Statham (1983) found that the laying of 1080 poison resulted in a 50% decline in two populations of the bettong in Tasmania. Although she concluded that some bettong populations would probably recover after once-off poisonings, it seems likely that the laying of poisoned bait, if continued, will inevitably result in a decline in bettong density. Small isolated populations would suffer most, because there is little likelihood of recolonization after disturbance (Statham 1984).

The Tasmanian bettong is relatively abundant and widespread compared with other species of *Bettongia*. However, it remains vulnerable because of susceptibility to the introduction of eutherian predators, and changes in land use, e.g. escalation of forestry practices. As only a small percentage of its preferred habitat is protected in National Parks; and in order to ensure that
it does not suffer the same fate as its mainland congeners, detailed ecological studies are required. Work has started on this project in 1985 (R. Taylor, personal communication).

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