

Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the list of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

1. Scientific name (common name)

Zygomys maini (Arnhem Rock-rat)

The Arnhem Rock-rat was previously called the Large Rock-rat and considered to be a species that included the Kimberley Rock-rat (*Zygomys woodwardi*) until a revision by Kitchener (1989) separated the two species.

2. Description

The Arnhem Rock-rat is a large (100-150g) grey rat distinguished from most other Northern Territory rodents by its large whiskers, typically swollen tail (especially at the base), the long hairs towards the tip of the tail, and the characteristic roman nose. It shares these features with the much smaller (30-70g) Common Rock-rat (*Zygomys argurus*), from which it can be separated by size, colour (typically more grey than brown), and higher density of long hairs on the tail. The rock-rats have fragile tails and fur, and many individuals may have no or greatly reduced tails, presumably as a consequence of predator attack (NT Conservation Commission 2002).

The diet of this species comprises fruits and seeds collected on the ground surface. Reproductive output is unusually low for a rodent, the average litter size being 2-3 young with most females usually breeding only once per year (Begg 1981; Calaby & Taylor 1983). Individuals may live for 2 years (Fleming 1995).

3. National Context

The Arnhem Rock-rat is endemic to the sandstone plateau of western Arnhem Land where it is restricted to rocky sandstone areas, typically where there are many caves, crevices or boulders, which occur in association with monsoon rainforest, which are floristically-rich and provide the fleshy fruits and seeds that form its principal dietary items (e.g. Begg 1981; Begg *et al.* 1981; Kerle & Burgman 1984; Begg & Dunlop 1985; Woinarski *et al.* 1992; Woinarski 2000, 2004). About 15% of this plateau lies within Kakadu National Park.

Zygomys maini is listed as vulnerable under the Northern Territory *Territory Parks and Wildlife Conservation Act 2000*

4. How judged by TSSC in relation to the EPBC Act criteria.

TSSC judges the species to be **eligible** for listing as **vulnerable** under the EPBC Act. The justification against the criteria is as follows:

Criterion 1 – It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers.

The Arnhem Rock-rat is restricted to rocky sandstone areas that occur in association with monsoon rainforest on the sandstone plateau of western Arnhem Land. It has a very patchy in distribution, even within its preferred habitat (Woinarski & Braithwaite 1991; Watson &

Woinarski 2003, 2004). This species is usually detected, if present, when an area is being surveyed.

There is no direct information on reduction in numbers across the entire population, but there are three measures of trends in the abundance of this species based on surveys in three areas, all within Kakadu NP. These surveys all indicated substantial decline in the last 10-20 years. With a generation time of 1-2 years for the Arnhem Rock-rat (Begg 1981; Calaby & Taylor 1983), declines over the last 10 years are of most relevance when considering the conservation status of this species.

At Nawurlandja (Little Nourlangie Rock), when intensive surveys in 1977-1980 (Begg 1981; Begg *et al.* 1981) were compared to repeated surveys in 2002 (Watson & Woinarski 2003), no Arnhem Rock-rats were found in 2002, and this change in abundance was highly statistically significant across each of the four habitats sampled. Around Jabiluka, 40 sites sampled in 1979-81 (Kerle & Burgman 1984) were re-sampled in 2003 (Watson & Woinarski 2004), and there was an about 31% decline in mean abundance. In Stage III (Mary River district) of the Kakadu NP, 263 sites sampled in 1988-90 were re-sampled in 2001 (Woinarski *et al.* 2002), and there was an about 17% decline in mean abundance. Surveys at all these places indicate a declining trend in population numbers.

These three studies are each separated by at least 50 km, and probably represent that part of this Rock-rat's range that has been subject to the most targeted management. It is possible that the declines observed are representative of the species' population trends across its entire range. However, there are no substantial data on status or trends in that part of the species' range outside Kakadu NP.

There are a number of threatening processes operating in the Arnhem Rock-rat's preferred habitat, monsoon rainforest. The condition of monsoon rainforest in reserves in sandstone plateau was assessed by Russell-Smith & Bowman (1992). They noted the types of disturbances that had affected rainforest patches (in some cases patches were affected by a number of these disturbances), and found that 67% of rainforest patches were "severely disturbed" by fire, 47% "severely disturbed" by feral buffalo and/or cattle, and 27% "severely disturbed" by feral pigs.

Altered fire regimes: Arnhem Rock-rats are affected both by individual fires and, in particular, the longer-term vegetation changes arising from altered fire regimes across the plateau of western Arnhem Land. As a result of the cessation of traditional Aboriginal fire management, mostly since the 1950s, the fire regime has changed from the fine-scale patchy fires to a current regime dominated by frequent, more extensive and typically more intense ("hotter") fires (Bowman 1998; Russell-Smith *et al.* 1998; Yibarbuk *et al.* 2001; Bowman *et al.* 2001, 2004). This changed regime is now directly responsible for marked and continuing reduction in the extent and the plant diversity of monsoon rainforests (Russell-Smith & Bowman 1992; Russell-Smith *et al.* 1993, 1998).

A study on the effect of fires on small mammals in monsoon rainforest in the sandstone plateau of western Arnhem Land indicated small mammals were clearly affected by fire, with results showing that after fire the numbers of animals alive were lower, reproductive output and pattern changed and habitat use changed. The Arnhem Rock-rat was the mammal most affected by fire, the population falling to a low level in the wet season following the fire and still not recovered 2 years after the fire. Amongst other impacts, fires may affect this Rock-rat's food supply by greatly reducing the store of seeds on the ground, and delaying or reducing subsequent fruiting and seeding of food plants (Begg 1981; Kerle & Burgman 1984).

The prevailing fire regimes are unlikely to be improved in the immediate future, although there has been some local successes to reimpose more traditional regimes (Russell-Smith *et al.* 2003).

The threatening process of changed fire regimes on the sandstone plateau of western Arnhem Land is likely to be leading to declines in numbers and habitat quality of the Arnhem Rock-rat across its entire range, and there is quantitative data to support that declines have occurred in three study areas over the last 10-20 years. Therefore, the species is **eligible** for listing as **vulnerable** under this criterion.

Criterion 2 –Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited.

The sandstone plateau of western Arnhem Land is 34,100 km², but a very high proportion of this comprises habitat which is not suitable for this species (Woinarski 2004). Within this area, the distribution of Arnhem Rock-rats is highly fragmented, because the Arnhem Rock-rat's preferred habitat, monsoon rainforest, is highly patchily distributed.

The area of occupancy is not known but can be estimated. The preferred habitat of this species is monsoon rainforests. The main type of the monsoon rainforest on the sandstone plateau of western Arnhem Land are patches dominated by the endemic tree *Allosyncarpia ternata*. Such rainforest occupies about 1140 km² of the plateau (Russell-Smith *et al.* 1993). However, most of the *Allosyncarpia* rainforest patches are probably unsuitable for Arnhem Rock-rats, because they are floristically depauperate (Russell-Smith *et al.* 1993) and do not provide suitable food for this species, and at least some of these patches are not suitable because they do not coincide with the rugged rocky habitat also required by Arnhem Rock-rats. Other monsoon rainforest types not dominated by *Allosyncarpia* on the plateau are far less extensive and probably add to <100 km². Given this set of information, the area of occupancy for Arnhem Rock-rats is probably between 100 km² and 1000 km².

Survey effort for fauna has been substantial in that part of the Arnhem Rock-rat's range that falls within Kakadu NP (e.g. Calaby 1973; Begg 1981; Kerle & Burgman 1984; Braithwaite 1985; Woinarski & Braithwaite 1991; Woinarski *et al.* 1992; Watson & Woinarski 2003, 2004). In contrast, there has been far less survey effort in that part of the range outside Kakadu NP, in Arnhem Land. This effort includes only some limited reconnaissance survey in localised areas (Churchill 1997; Yibarbuk *et al.* 2001; Brennan *et al.* 2003). Substantial surveys in other Top End sandstone ranges and plateaus away from that of western Arnhem Land have consistently failed to record this species - e.g. at Litchfield NP (Griffiths *et al.* 1997b) and Bradshaw (Fisher & Woinarski 2002). Nor are there any incidental records away from the plateau of western Arnhem Land (Parker 1973; Woinarski 2000). The survey effort is sufficient to claim that this species is restricted to the isolated sandstone plateau of western Arnhem Land.

As discussed in criterion 1, the threatening process of changed fire regimes on the sandstone plateau of western Arnhem Land is likely to be causing continuing declines in numbers and habitat quality of the Arnhem Rock-rat.

As the Arnhem Rock-rat has an area of occupancy between 100-1000 km², has a severely fragmented distribution and is undergoing continuing decline in numbers and habitat quality, its geographical distribution is considered to be limited and precarious for the survival of the species. Therefore, the species is **eligible** for listing as **vulnerable** under this criterion.

Criterion 3 – The estimated total number of mature individuals is limited to a particular degree and: (a) evidence suggests that the number will continue to decline at a particular rate; or (b) the number is likely to continue to decline and its geographic distribution is precarious for its survival.

There is little information on the number of mature individuals of Arnhem Rock-rat. Where present, the species can be locally common (Begg 1981; Woinarski *et al.* 1992).

As discussed in criterion 1, the threatening process of changed fire regimes on the sandstone plateau of western Arnhem Land is likely to be causing continuing declines in numbers and habitat quality of the Arnhem Rock-rat.

There is insufficient data available against this criterion.. Therefore, the species is **not eligible** for listing as under this criterion.

Criterion 4 – The estimated total number of mature individuals is extremely low, very low or low.

There is little information on the number of mature individuals of Arnhem Rock-rat. Where present, the species can be locally common (Begg 1981; Woinarski *et al.* 1992).

There is insufficient data available against this criterion.. Therefore, the species is **not eligible** for listing as under this criterion.

Criterion 5 - Probability of extinction in the wild

There are no quantitative data available to assess the species against this criterion.

5. CONCLUSION

The Arnhem Rock-rat is endemic to the sandstone plateau of western Arnhem Land where it is restricted to rocky sandstone areas, typically where there are many caves, crevices or boulders, which occur in association with monsoon rainforest. It has an area of occupancy of between 100-1000 km² and its distribution is severely fragmented. Within its habitat, there are a number of threatening processes operating, however, it is the change from the traditional fire regime of low intensity fires to the current fire regime of more frequent and more intense fires that is likely to be adversely affecting this species across its range, with three places on the plateau recording declines in numbers of individuals. Its geographical distribution is therefore considered to be restricted and precarious for the survival of the species.

The species is **eligible** for listing as **vulnerable** under criteria 1 and 2.

6. Recommendation

TSSC recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the **vulnerable** category:

Zyomys maini (Arnhem Rock-rat)

Associate Professor Robert J.S. Beeton

Chair

Threatened Species Scientific Committee

Publications used to assess the nomination

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