The Minister approved this conservation advice and retained this species in the Endangered category, effective from 15 February 2019

Conservation Advice

Zyzomys palatalis

Carpentarian Rock-rat

Summary of assessment

Conservation status

Zyzomys palatalis has been found to be eligible for listing in the Endangered category, as outlined in the attached assessment.

Reason for conservation assessment by the Threatened Species Scientific Committee

This advice follows assessment of information provided by the Northern Territory as part of the Common Assessment Method process, to systematically review species that are inconsistently listed under the EPBC Act and relevant state/territory legislation or lists.

More information on the Common Assessment Method is available at:
http://www.environment.gov.au/biodiversity/threatened/cam

The information in this assessment has been compiled by the relevant state/territory government. In adopting this assessment under the EPBC Act, this document forms the Approved Conservation Advice for this species as required under s266B of the EPBC Act.

Public consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 32 business days from 30 May 2018 to 13 July 2018. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Recovery plan

A recovery plan for this species under the EPBC Act is not recommended. An approved Conservation Advice alone provides sufficient direction to implement priority actions, mitigate key threats and enable recovery. A recovery plan would not add significant benefit.

Recommendations

(i) The Committee recommends that *Zyzomys palatalis* retain its currently listing status of Endangered in the list referred to in section 178 of the EPBC Act, as there is insufficient evidence to support transferring it to a different category and inclusion of the species in that category is having a beneficial impact on the continued survival of the species.

(ii) The Committee recommends that there not be a recovery plan for this species.

Threatened Species Scientific Committee

04/09/2018

NORTHERN TERRITORY GOVERNMENT

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Evidence on Listing Eligibility and Conservation Actions 2017

Zyzomys palatalis Kitchener 1989 (Carpentarian Rock-rat, Aywalirroomoo)

Current EPBC Act status: Endangered (B1ab(iii)+2ab(iii))
Current TPWC Act status: Critically Endangered (B1ab(iii)+2ab(iii))

Proposed Action: CAM-compliant assessment needed under FPAL
Nominated Status: Endangered (B1ab(iii)+2ab(iii))

Taxonomy

Scientific name:	*Zyzomys palatalis* Kitchener, 1989		
Common name:	Carpentarian Rock-rat, Aywalirroomoo		
Family name:	Muridae	Fauna ☒	Flora ☐

Species Information

Description

The Carpentarian Rock-rat is a small rodent with grey-brown fur. Growing to a body length of 120-160mm and weighing on average 125g, the Carpentarian Rock-rat has a carrot shaped, relatively hairy tail in which fat deposits are stored. The tail is generally not longer than the body and has longer hairs at the tip. As with other rock-rats, the Carpentarian Rock-rat is known to lose its tail, fur and skin very easily (Puckey *et al*. 2004) and the species is often captured with a broken-off tail forming a stump (Puckey & Woinarksi 2006).

Distribution

The Carpentarian Rock-rat is restricted to isolated rainforest thickets and broad-leaved vegetation on scree slopes in rugged sandstone gorges. The species was described in the late 1980s from a single adult female collected from Banyan Gorge on Wollogorang Station, Northern Territory. Comprehensive surveys across the region in the early 1990s located the species at a further two sites on Wollogorgang Station (McDermott Springs and Moonlight Gorge; Churchill 1996). None were found outside of Wollogorgang, including over the border into Queensland. Further local colonies were found at Camel Creek (1995) and Redbank Mine (2003) on Wollogorgang. Recent surveys (2017) using camera traps at all previously known sites and other areas of potential habitat recorded the species at nine sites, including four new sites (DENR *unpublished data*; Appendix A), although there is some doubt over the species identification from the images from McDermotts Springs. Some of the spatial data from historic records appear to have a margin of error, such that the two records from Camel Creek could represent a single population. The closest camera trapping location to the historic Camel Creek records did not detect any Carpentarian Rock-rats. The nine sites are all within a radius of 35 km, with an EOO of c. 1200 km^2. All are within Wollogorang pastoral station, in the Northern Territory (adjacent to the Queensland border).

There are contrary views on whether habitat for the species is expanding or degrading. Trainor *et al*. (2000) concluded that the Carpentarian Rock-rat's habitat is undergoing continuing decline as a result of fire degrading, diminishing, or altering the composition of monsoon rainforest patches. However, Brook and Bowman (2006) and Bowman *et al*. (2006) proposed there has been longer-term expansion of suitable habitat, based on comparisons of imagery from 1996 with imagery from 1947. Brook and Bowman (2006) used canopy density to differentiate between closed forest (>20%) and savannah woodland (<20%) and considered closed forest as key habitat for Carpentarian Rock-rats. The relationship between the closed

forest mapped by Brook and Bowman (2006) and habitat requirements of this species has not been clearly demonstrated. Radio-tracking studies by Puckey *et al* (2004) found that Carpentarian Rock-rats preferred slope and valley floor habitats over plateau habitats (spinifex-dominated) and that most home ranges were focussed on the ecotone between closed forest and woodland. The canopy cover for the valley floor habitat was 25% and only 5.5% for the favoured slope habitat. Bowman *et al* (2006) reclassified the radio-tracking data and concluded that the rock-rats spent a majority of their time (57.1%) in closed forest and a margin with the savannah woodland (within 30m). Whichever interpretation is favoured, it is clear that both closed and slope habitats are used by rock-rats and the relatively narrow ecotone is the most important feature, so the classification of closed forest as key habitat for Carpentarian Rock-rats is likely to be oversimplified. In addition, any expansion of closed forest in these gorges must be limited to up or down the gorge, creating little or no change in the area of ecotone habitat.

Analysis of the frequency and scale of fire scars over 2000-2017 (DENR *unpublished data*) shows that fires have occurred at all known sites between one and five times within this period, typically carrying from the savanna woodland into the edges of the closed forest. Gradual elimination of fire-sensitive plant species typical of the slope and valley floor is of concern because these plants characterise the preferred habitat and consitute the greatest proportion of the diet of this species. There is anecdotal evidence that rock-rats have not re-occupied areas with fire-scars up to 10 years old (Hill *pers*. *comm*.).

Although current trends in the forest-savanna habitat mosaic are uncertain, an assumption will be made that fire is having an impact rather than not. Recommended research actions are to use remote sensing to more carefully explore changes in the extent of habitat at all nine known sites, using genetic techniques to assess connectivity between populations and to research the impacts of fire on habitat quality.

Adequacy of Survey

Distribution

Extensive surveys (including in 47 monsoon rainforest patches) in apparently suitable habitat in the region did not expand the species' known range outside of Wollogorgang Station, including unsuccessful searches at five sites in Queensland (Trainor *et al* 2000). Within Wollogorgang, eleven sites with suitable habitat were surveyed in the early 1990s by Elliott-trapping (Churchill 1996). These sites and an additional seven previously unsurveyed gorges were recently surveyed with camera traps on Wollogorgang Station in 2017. Considerable survey effort has been undertaken on the neighbouring Australian Wildlife Conservancy property Pungalinga Station; no Carpentarian Rock-rats have been detected. Surveys of China Wall to the south of Wollogorang in 2008, 2016 and 2017 have only detected the Common Rock-rat *Zyzomys argurus*.

In 2017, camera traps were deployed at 20 sites with potentially suitable habitat within Wollogorang Station. Two gorges where the species is known to occur, Moonlight and Banyan, had two sites each to evaluate whether the sampling method was adequate to detect the species. Three cameras were deployed per site for approximately four weeks. Carpentarian Rock-rats were detected on cameras at four new sites and at five of the known sites.

Mark-Recapture Surveys

A detailed mark-recapture study was conducted between 1994 and 1996 at Bayan and Moonlight Gorges. In 1999 both gorges were re-surveyed and Camel Creek and Mc Dermott Springs were surveyed in 2000. Banyan Gorge was re-surveyed in 2001, 2002 and 2003. A population monitoring program was set up by the NT Government in 2005 on Wollogorgang Station. Originally the program was to monitor populations at Moonlight Gorge, Banyan Gorge, Camel Creek and McDermott Springs. Moonlight and Banyan Gorges are the most accessible and have been monitored in 2005, 2008 and 2016. Camel Creek and McDermott Springs were sampled in 2008. Carpentarian Rock-rats were re-located in all surveyed patches. A follow up live-trapping survey was undertaken at Banyan Gorge in 2017, as only one individual was caught in 2016. Two individuals were captured at Banyan Gorge in 2017, and these low numbers may also be a cause for concern. However, camera traps deployed in as part of a larger survey (above) included two of these monitoring sites, and at least three individuals were caught on camera at one trap site and two at the other.

Relevant Biology/Ecology

Carpentarian Rock-rats generally have a 1:1 sex ratio and a short life-span (Puckey *et al*. 2004, Trainor 1996). As with all rock-rats, reproductive output is characteristically low, with females giving birth to 1-3 young per litter (Trainor 1996; Trainor *et al.* 2000). Breeding in the Carpentarian Rock-rat has been reported in most months of the year (Puckey *et al*. 2004, Trainor *et al*. 2000). Carpentarian Rock-rats have

been reported living up to five years in captivity, although longevity in the wild is likely to be lower . There is evidence of females surviving to their second year in the wild, having produced up to four litters (Trainor 1996).

Faecal analysis indicates that 84% of the Carpentarian Rock-rat's diet consists of fruits and seeds of dicotyledonous plants (Puckey *et al*. 2004). Foods recorded include seeds of Wild Peach (*Terminalia carpentariae*), Pandanus (*Pandanus aquaticus*), Fan Palm (*Livistona inermis*) and Emu Apple (*Owenia vernicosa*) (Churchill 1996). Its large incisors allow it to chew through the woody nuts of many of these species to access the kernel, and distinctively chewed nuts are a characteristic sign of its presence. This diet is common to all of the rock-rats, and information from the more intensively-studied Arnhem Land Rock-rat is probably generally applicable to the Carpentarian Rock-rat (Puckey *et al*. 2003).There is no significant difference in the size of the home range or core area of males and females of this species, though juveniles have a significantly smaller home range than adults. The species is noted to prefer the slopes and valley area of gorges, or the ecotone between these two areas, rather than the surrounding plateaus, making many short distance foraging moves irregularly interspersed with longer forays (Puckey *et al*. 2004).

The main habitat requirements of the Carpentarian Rock-rat appear to be large, rugged, sandstone gorges with scree and rock slopes covered with a type of rainforest, specifically dry monsoon vine thicket and broadleaf woodland (Lee 1995; Trainor *et al*. 2000). Based on a radio-tracking study of 21 individuals, Puckey *et al*. (2004) calculated a mean home range size of 1.1 ha. Individuals may move up to 2 km in one night, and while most activity occurred within monsoon rainforests, some individuals would also forage within nearby areas of savanna woodland. No animals moved more than 80 m away from the edge of rainforest (Puckey *et al*. 2004).

The majority of colonies are within 100 m of permanent spring water. Vine thicket species including Banyan (*Ficus virens*), Rock Fig (*F. platypoda*), Stinkwood (*Gyrocarpus americanus*), Emu Apple (*Owenia vernicosa*), Wild Peach (*Terminalia carpentariae*), Pouteria (*Sersalisia sericea*), Celtis (*Celtis philippinensis*) and Wild Mango (*Buchanania obovata*) with an understorey of Grey-nicker Nut (*Caesalpinia bonduc*), Opilia (*Opilia amentacea*), Pisonia (*Pisonia aculeata*) and Caustic Bush (*Sarcostemma australe*). The surrounding vegetation is predominently Ghost Gum (*Corymbia bella*)/ Woolybutt (*Eucalyptus miniata*) woodland with Spinifex (*Triodia pungens*) understorey (Lee 1995).

Threats

Threat *(describe the threat and how it impacts on the species. Specify if the threat is past, current or potential)*	Extent *(give details of impact on whole species or specific subpopulations)*	Potential Impact *(what is the level of threat to the conservation of the species)*
Inappropriate fire regime (Past, current and future)	All monsoon vine thicket habitat patches exist in a flammable matrix of spinifex and eucalypt woodland. Rock-rats forage both within and on the margins of habitat surrounding monsoon vine thicket habitat. Fires can kill trees and vegetation on the edges of vine thicket patches. Grassy weed invasion may also aid penetration of fires into vine thicket patches. Brook et al (2002) considered fire (particularly intense fire) the most significant threat, operating through reduction in habitat and other intrinsic stochastic hazards associated with small	High

	populations that may result post-fire or due to habitat degradation. Complete absence of fire may also affect food availability, particularly in grassy areas of the ecotone habitat. For the Central Rock-rat (*Z. pedunculatus*), burning of surrounding habitat increases seed production and therefore food availability (P. McDonald & C. Nano, DENR, pers. comm.) and the same may be true for the Carpentarian Rock-rat.	
Grazing, trampling and rooting by feral animals (horses, cattle, pigs) causing habitat loss and degradation (Past, current and future)	Large feral mammals can access all major gorge systems from the plains below, but access to smaller side gorges can be variable. Pigs are particularly damaging to the spring-fed waterholes and surrounding vegetation.	Low-moderate
Predation by feral cats (Past, current, future)	No direct evidence but plausible; the rugged nature of their habitat may constrain the incidence and impact of predation by cats. Known threat to Central Rock-rats.	Moderate
Climate Change (Future)	Kutt *et al* (2009) predicted a 90% decline in area of suitable habitat due to climate change for the period 2009-2030, by modelling possible future distributions under IPCC climate change scenarios.	High
Habitat Loss and fragmentation due to mining (Past, potential future)	Redbank Mine is no longer in operation. However, any potential future mining activities may result in localised loss of habitat (Puckey *et al* 2003).	Low

Numbers of Locations and Subpopulations

The threats with the highest potential impact are inappropriate fire regimes and climate change, and the impact of climate change is most likely to be expressed through increased frequency of high intensity fires. Analysis of the frequency and scale of fire scars over 2000-2017 shows a northern pattern or fire path influencing sites North 1, North 2 and Camel Creek, and a southern fire path across sites Aquarium, Moonlight Gorge and McDermott Springs (DENR unpublished). Across the centre of the property the pattern is less clearly defined. Single fires did not impact both Rocky Creek and Banyan sites, but the Redbank site shared fires with both Rocky Creek (connected by tributaries) and with Banyan (5 km away but in a different catchment). Consequently, the number of locations for the species is at least three and no more than five.

The species has limited ability to disperse over larger distances, but some of the known sites that are closer together probably have demographic and genetic exchange between them. The population is considered to comprise of three sub-populations: northern, central and southern.

Summary of IUCN attributes

EOO	1212 km^2	AOO	48 km^2, based on the 2 km x 2 km grid method	Generation length	2 years (Woinarski et al. 2014)

No. locations	3-5	Severely fragmented	Yes ☒ No ☐ Unknown ☐
No. subpopulations	3	No. mature individuals	c. 2000

Percentage global population within Australia	100%
Percentage population decline over 10 years or 3 generations	Unknown, possibly stable

EOO and AOO calculations

The distribution of this species is limited to a small number of gorges on Wollogorang Station. Neither the location of these gorges nor the presence of Carpentarian Rock-rats at known locations have changed over time. Historic spatical data is not accurate, however in many cases the location of the data point could be determined by the description, with the exception of Camel Creek. All spatial records available were used to calculate EOO and AOO where the location could be accurately determined. All of these sites have been sampled and recorded Carpentarian Rock-rats in the past 20 years.

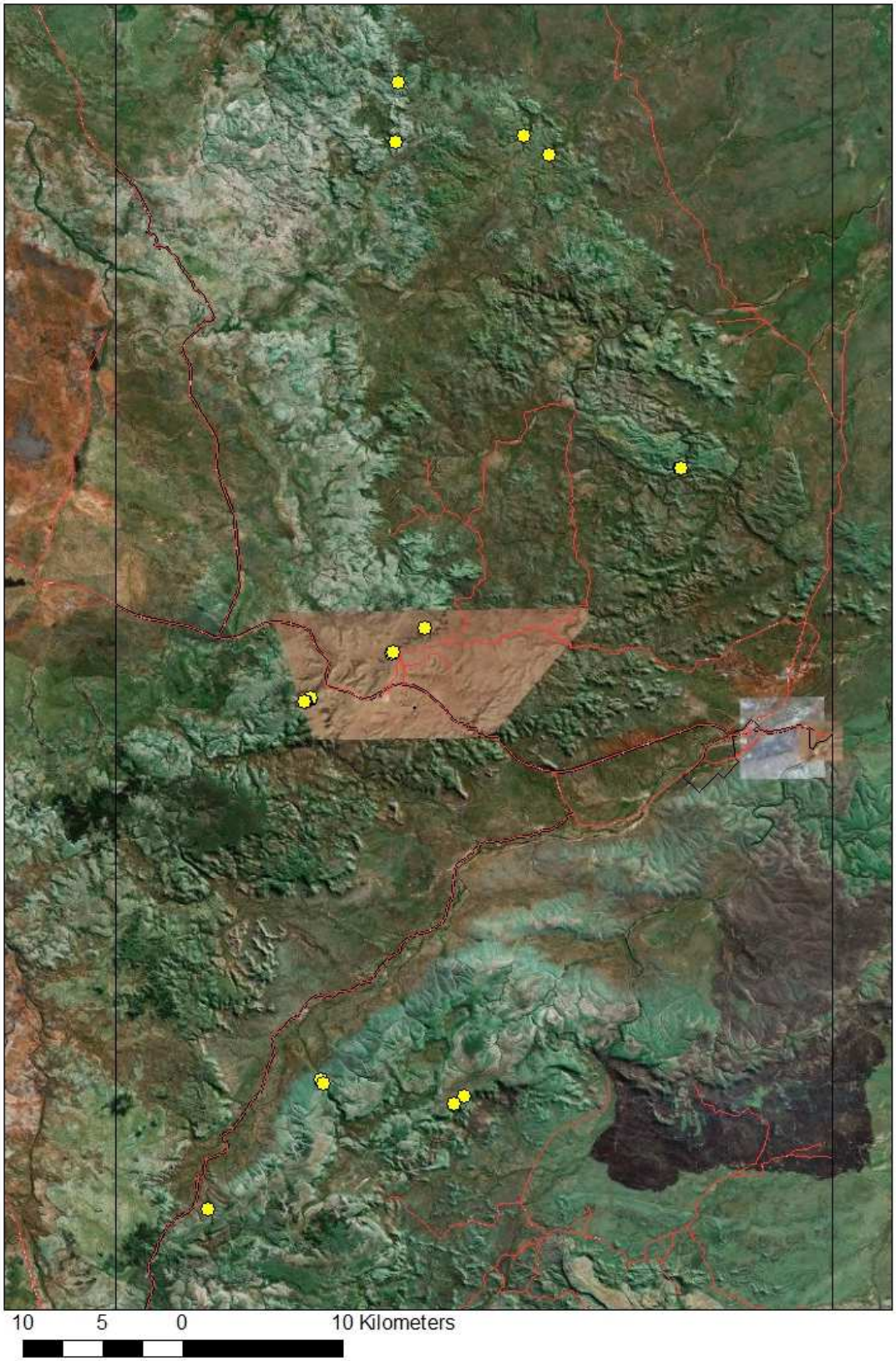

Figure 1. Current records (1997-2017) of the Carpentarian Rock-rat *Zyzomys palatalis*. Black rectangular boundary is Wollogorgang station, other lines are roads.

Assessment of available information in relation to the listing Criteria

Criterion A. Population size reduction (reduction in total numbers) Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	**Endangered Severe reduction**	**Vulnerable Substantial reduction**
A1	**≥ 90%**	**≥ 70%**	**≥ 50%**
A2, A3, A4	**≥ 80%**	**≥ 50%**	**≥ 30%**

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

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.

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*]

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.

based on any of the followin

(a) direct observation [*except A3*]

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Evidence:
There are insufficient data on population size reduction to assess the species against this criterion

Criterion B. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	**Endangered Restricted**	**Vulnerable Limited**
B1. Extent of occurrence (EOO)	**< 100 km²**	**< 5,000 km²**	**< 20,000 km²**
B2. Area of occupancy (AOO)	**< 10 km²**	**< 500 km²**	**< 2,000 km²**
AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(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:
The Carpentarian Rock-rat is known from nine sites (Appendix A), all within one cattle station, comprising 3-5 locations and 3 subpopulations (see discussion above). The EOO is c. 1212 km^2 and the AOO is 48 km^2 based on 2km x 2km grids using all known point records from 1997 to 2017. The actual area occupied by the species is likely to be much smaller based on the area of suitable habitat. The species' habitat is undergoing continuing decline as a result of fire degrading, diminishing, or altering the composition of monsoon rainforest patches (see Distribution section above for discussion). Other threats include habitat damage by cattle, feral herbivores and pigs, and predation by feral cats.

Based on the evidence presented above, the Carpentarian Rock-rat has EOO and AOO areas smaller than the IUCN thresholds for Endangered (B1+2); the number of locations is less than the threshold for Endangered (a); and is subject to threats that are leading to declines in area and quality of habitat (b(iii)).

Consequently, *Zyzomys palatalis* is **eligible** for listing as **Endangered** under this criterion (B1ab(iii)+2ab(iii)).

Criterion C. Population size and decline			
	Critically Endangered Very low	**Endangered Low**	**Vulnerable Limited**
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)	**Very high rate 25% in 3 years or 1 generation (whichever is longer)**	**High rate 20% in 5 years or 2 generation (whichever is longer)**	**Substantial rate 10% in 10 years or 3 generations (whichever is longer)**
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:
The population size across the nine known sites is estimated to be no more than 2000 mature individuals, spread across three sub-populations. The most recent population estimates for Moonlight and Banyan Gorges are 280 (95% confidence intervals 254-380) and 204 (128 – 224) mature individuals based on 2008 data. Population sizes at other previously live-trapped sites (McDermotts Spring, Camel Creek and Redbank mine) are unknown but presumed to be much smaller in most cases, as fewer individuals were caught there (NTG *unpublished data*). Camera trapping also returned fewer Carpentarian Rock-rat detections from sites that were not Banyan or Moonlight Gorges, but this is not a suitable method for estimating population size for this species. Previous estimates of less than 2000 individuals have been cited for this species (Woinarski *et al* 2014), which may be reasonable even with an upper average of 200 animals per site, and an increased number of sites. The habitat quality may be declining (Trainor *et al*. 2000 and see Distribution section), but the few data on capture rates are insufficiently robust to confidently estimate any current decline, or infer future declines. The species has relatively low fecundity and there is no evidence to indicate that it experiences extreme fluctuations in numbers or range.

Based on this evidence, the species has a population size smaller than the threshold for Endangered (C) and it exists across three subpopulations, each of which is less than 1000 mature individuals (2a(i)), but although habitat quality is likely declining it is not clear whether numbers are declining. Consequently, there is insufficient evidence that the Carpentarian Rock-rat is eligible for listing as threatened under this criterion.

Criterion D. Number of mature individuals			
	Critically Endangered Extremely low	**Endangered Very Low**	**Vulnerable Low**
D. Number of mature individuals	**< 50**	**< 250**	**< 1,000**
D2. *Only applies to the VU category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	**-**	**-**	**D2. Typically: AOO < 20 km² or number of locations ≤ 5**

Evidence:
The population size across the nine known sites is estimated to be no more than 2000 mature individuals (see justification under cirterion C) and the AOO is estimated to be 48 km^2; neither of these meet the thresholds for Vulnerable. The number of locations (3-5) meets the threshold for Vulnerable under D2, but the greatest threat (of fire) is not likely to drive the taxon to Critically Endangered or Extinct in a very short time.

Based on this evidence, the species is **not eligible** for listing under this criterion.

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

Evidence:
A population and habitat viability assessment by Brook *et al* (2002) found that the best estimate model provided a low probablility of extinction (1%) over 50 years, but population size will be substantially reduced. The projected continued population decline leads to a high (54%) likelihood of extinction over 100 years, which exceeds the threshold for listing as **Vulnerable.** The risk of extinction within 50 years remained low under a number of different management options; only reducing wildfire had a major impact of reducing risk in the long-term (100 years). The four key parameters important to the probability of extinction were frequency of hot fires, habitat growth, juvenile survival and adult survival.

Based on this evidence, the species is **eligible** for listing under this criterion as **Vulnerable.**

Summary

The Carpentarian Rock-rat has a very small distribution (EOO c. 12121 km^2 and AOO 48 km^2), occurs across three sub-populations and three to five locations, and the quality of its habitat is declining due to the impacts of inappropriate fire regimes and feral herbivores. The species is eligible for listing as **Endangered** (B1ab(iii)+2ab(iii)), and as **Vulnerable** (E).

Management and Recovery [1]

Is there a Recovery Plan (RP) or Conservation Management Plan operational for the species?	Yes ☒	No ☐

List all relevant recovery or management plans (including draft, in-preparation, out-of-date, national and State/Territory recovery plans, recovery plans for other species or ecological communities, or other management plans that may benefit or be relevant to the nominated species).

- Puckey, H., J. Woinarski & C. Trainor (2003). *Revised Recovery plan for the Carpentarian Rock-rat* Zyzomys palatalis. Parks and Wildlife Commission of the Northern Territory. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/z-palatalis/index.html.

List current management or research actions, if any, that are being undertaken that benefit the conservation of the species.

- Property managers have been kept informed on work to date and collaborated on a grant application for the recent camera trapping work. They will be contributing to the development of a Management Plan for this species.
- A management plan for Carpentarian Rock-rats is being developed for Wollogorang Station in consultation with the current land managers. To be completed in 2018.
- Monitoring of Carpentarian Rock-rats has been undertaken at some sites but not consistently to enable an on-going comparable population estimate. The 2017 camera trap survey potentially provides baseline data for on-going monitoring based on occupancy.

List further recommended management or research actions, if any, that would benefit the conservation of the species. Please ensure that this section addresses all identified threats.

- Monitor and control feral animals in Aquarium Gorge (buffalo and cattle), Banyon Gorge (pigs) and McDermott Springs (pigs).
- Develop a plan to trigger captive breeding and translocation.
- Fire management to reduce wildfire and increase habitat complexity.
- Engagement with Traditional Owners and neighbouring managers for fire management
- Use remote sensing techniques to further explore changes in the extent of habitat at all nine known sites.
- Research the impacts of fire on the quality of habitat and identify optimal fire management.
- Undertake a population genetic analysis, to identify levels of connectivity between the gorges.

Further comment.

Brook *et al*. (2002) used population viability models to prioritise management actions for this species, and considered that the most effective conservation action would be to enhance fire management, with some further potential gain from strategic translocations.

Two trial translocation programs have been attempted, in apparently suitable habitat at Limmen National Park, but neither was successful. Brook *et al* (2002) considered the gorge system at Aquarium Springs, on Wollogorgang Station, a potential site for translocation, however Carpentarian Rock-rats were detected there in 2017 surveys.

[1] There should be at least one action for each identified threat (and vice versa)

Consistency with CAM MOU

Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:	
• this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria;	Yes ☒ No ☐
Comments:	
• surveys of the species were adequate to inform the assessment;	Yes ☒ No ☐
Comments:	See section above under **Adequacy of Survey**
• the conclusion of the assessment remains current and that any further information that may have become available since the assessment was completed supports or is consistent with the conclusion of the assessment.	Yes ☒ No ☐
Comments:	

Nomination prepared by:	
Contact details:	
Date submitted:	22 November 2017
If the nomination has been refereed or reviewed by experts, please provide their names and contact details: The nomination has been reviewed by the NT Threatened Species Expert panel. The recommendation of the Panel is the species be listed in the NT as Endangered.	

References cited in the advice

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Department of the Environment (2005). *The Threat abatement plan for the predation, habitat degradation, competition and disease transmission by feral pigs*. Available from: http://www.environment.gov.au/biodiversity/invasive-species/feral-animals-australia/feral-pigs

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Puckey, H. (2003). Additional records of the Carpentarian rock-rat *Zyzomys palatalis* at Redbank, close to the type locality. Northern Territory Naturalist 17, 43-45.

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Summary of subpopulation information *(detailed information to be provided in the relevant sections of the form)*						
Site, Location or subpopulation *(include coordinates)*	Land tenure	Survey information: Date of survey and No. mature individuals	Area of subpopulations*	Site / habitat Condition	Threats *(note if past, present or future)*	Specific management actions
Banyan Gorge	Wollogorang Pastoral Lease	2008 monitoring population estimate 204 (128-224 95% confidence) 2016 one individual caught 2017 two individual caught 2017 multiple individuals detected		Showing signs of degradation by pig/s.	One pig present in 2017 Evidence of a past hot fire. Fire scars from NAFI suggest no burning for 8 or more years. Rock-rats were not captured in the sites within or adjacent to the burnt area.	Pig control, fire management
Redbank Mine	Wollogorang Pastoral Lease	2009 two individual caught 2017 detected on camera traps		Good condition	Mine is now a legacy area. Any future development may threaten habitat.	Fire management, protection form habitat removal
Moonlight Gorge	Wollogorang Pastoral Lease	2008 monitoring population estimate 280 (254-380, 95% confidence interval)	91ha	Good condition	Cattle present in lower reaches of the gorge where no Carpentarian Rock-rats occurred.	Fire management
McDermott Springs	Wollogorang Pastoral Lease	2008 one individual caught 2017 detected on camera traps	7ha	Poor at the lower reaches	Pigs Large Hiptis infestation	
Aquarium Spring	Wollogorang Pastoral Lease	2017 detected on camera traps	No rainfore	Poor	Pigs, Buffalo, Cattle	Pig, Buffalo and Cattle control

			st mapped			Fire management
Rocky Creek	Wollogorang Pastoral Lease	2017 detected on camera traps	7.6ha			
Camel Creek	Wollogorang Pastoral Lease	2008 two individuals caught 2017 detected on camera traps	6.7ha			
North 1	Wollogorang Pastoral Lease	2017 detected on camera traps	3.5ha**			
North 2	Wollogorang Pastoral Lease	2017 detected on camera traps	11.7ha			

*Area of site based on rainforest (closed forest) mapping which includes dry monsoon vine thicket. This is likely to be an underestimate as the upper scree slopes are also used. However, radio-tracking studies by Puckey *et al* (2004) found the Carpentarian rock-rats will infrequently move up to 1.5km across the upper slope in the broadleaf vegetation communities to forage when preferred fruits within the gorge are scarce.

** used nearest rainforest polygon to camera trap site