



Consultation Document on Listing Eligibility and Conservation Actions

***Mesembriomys macrurus* (golden-backed tree-rat)**

You are invited to provide your views and supporting reasons related to:

- 1) the eligibility of *Mesembriomys macrurus* (golden-backed tree-rat) for inclusion on the EPBC Act threatened species list; and
- 2) the necessary conservation actions for the above species.

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
Wildlife, Heritage and Marine Division
Department of the Environment
PO Box 787
Canberra ACT 2601

Responses are required to be submitted by Friday 1 June 2018.

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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/biodiversity/threatened/pubs/guidelines-species.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>.

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.

Mesembriomys macrurus

Golden-backed Tree-rat

Note: The information contained in this Conservation Advice was primarily sourced from 'The Action Plan for Australian Mammals 2012' (Woinarski et al., 2014). Any substantive additions obtained during the consultation on the draft will be cited within the advice. Readers may note that Conservation Advices resulting from the Action Plan for Australian Mammals show minor differences in formatting relative to other Conservation Advices. These reflect the desire to efficiently prepare a large number of advices by adopting the presentation approach of the Action Plan for Australian Mammals, and do not reflect any difference in the evidence used to develop the recommendation.

Taxonomy

Conventionally accepted as *Mesembriomys macrurus* (Peters, 1876). No subspecies are recognised.

Species Information

Description

The golden-backed tree-rat is a large rodent weighing approximately 260 g and measuring approximately 535 mm from the head to the tip of the tail (Strahan 1995). It is midway in size between two other large semi-arboreal species in northern Australia; the smaller brush-tailed rabbit-rat (*Conilurus penicillatus*) and the larger black-footed tree-rat (*Mesembriomys gouldii*).

Its fur is grey above and on the sides, and creamy white below. The feet are white. The basal third of the long tail is grey while the remainder is white; the terminal third has a white brush. A distinctive mid-dorsal stripe of orange-brown fur, which stretches along the back of the crown to the base of the tail, distinguishes it from all other tree-rats (McKenzie & Kerle 2008).

Distribution

The golden-backed tree-rat has historically been recorded from the top end of the Northern Territory, and the Kimberley and Pilbara in Western Australia. It has undergone a substantial range contraction and appears to have disappeared from the Northern Territory, the Pilbara and the south-west Kimberley. It is now restricted to the north-west Kimberley, from near Kalumburu south to the Yampi Peninsula (e.g. Kitchener et al., 1981), including several Kimberley islands in the Buccaneer Archipelago (DPaW 2012).

In the Northern Territory (NT) it has been recorded at three sites: 'Balanbrinni' (probably Balbarini) in the upper McArthur in 1901; Nellie Creek (in the upper Mary River) in 1903; and Deaf Adder Gorge in 1969 (Parker 1973). It has not been confirmed anywhere else in the NT despite many surveys across much of the Top End of the NT over the last 30 years (Woinarski 2002). However, an assessment of Indigenous knowledge across the Top End has suggested that the final phase of its decline in the NT was very recent, with plausible records between the late 2000s and early 2010s (Ziembicki et al., 2013).

In Western Australia, subfossil records from Cape Range show that it once had a Pilbara distribution (Baynes & McDowell 2011), with the type specimen originating from near Roebourne in 1875 (McKenzie & Kerle 2008). However, since 1903 all known records have come from the near-coastal, higher rainfall areas of the north-west Kimberley, and the species has disappeared from the Pilbara (McKenzie & Kerle 2008) and drier parts of the Kimberley (McKenzie 1981).

In the Kimberley it has been recorded on nine islands: Augustus (189 km²), Carlia (4.2 km²), Conilurus (2.5 km²), Hidden (19 km²), Jar (1.8 km²), Lachlan (11.8 km²), an unnamed island in

Scott Strait (0.2 km²), Uwins (32.5 km²) and Wollaston (8.6 km²) (Abbott and Burbidge 1995; Gibson and McKenzie 2012). However, in the 2006-2009 Kimberley Islands survey, the species was not recorded from five of these islands (DPaW 2015).

At the Artesian Range it has been recorded at seven of ten survey sites spread over approximately 40 000 ha of plateau and riparian habitat adjacent to the Charnley River and Walcott Inlet (Woinarski et al., 2014).

Relevant Biology/Ecology

In its current range the golden-backed tree-rat occurs in rainforest patches on volcanic, lateritic, sandstone and floodplain surfaces, eucalypt-dominated savanna woodlands, *Livistona* palm woodlands, and rugged sandstone plateaux and scree. It is largely nocturnal, but individuals have been seen foraging shortly before dusk and soon after sunrise. In thick vegetation and near vertical rock faces, it is mainly arboreal (on trees or rocks) but spends time on the ground. It can quickly move long distances, often through dense grass, scampering along with its tail held high. In sparser vegetation and rocky areas, it spends most of its time on the ground. It has been observed denning in tree hollows and in rock scree, or occasionally in loose woven nests under the spiky crown of pandanus (McKenzie & Kerle 2008).

The species utilises the edge of rainforest patches, feeding in both the rainforest and adjacent eucalypt woodland. The home range can be up to 600 m and is occupied by one pair of adults and probably some juveniles (McKenzie & Kerle 2008). Individuals are known to travel up to 300 m from their refuge into open savanna to forage at night (R. Hohnen pers. comm., cited in Woinarski et al., 2014). Flowers, fruits and termites were recorded as the main dry-season foods, but grasses, ants and beetles were occasionally eaten (Morton 1991).

Pregnant females and juveniles have been recorded in August, October and November, suggesting a mid- to late-dry-season breeding period. The litter size is usually two, but one and three have been recorded (McKenzie & Kerle 2008). Key breeding populations are likely those known from the 2006 Kimberley Islands Survey (Hidden, Uwins, Augustus, and Lachlan Islands) (DPaW 2012). Longevity in captivity is 7 years (Weigl 1971, in AnAge 2012). Generation time is here assumed to be around 3 years.

Threats

The probable decline on the Kimberley mainland can be attributed to inappropriate fire regimes and predation by feral cats.

Woinarski et al. (2014) and Palmer et al. (2003) identify current and potential threats to the species as follows:

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Frequent, intense fires	Severe	Large (mainland range); fires less frequent on islands	Certain for mainland subpopulations. Increasingly likely for some islands as visitation increases, however ameliorated by the rugged nature of much of the habitat that breaks up fire patterns, and by their occurrence in rainforest patches which burn infrequently. Frequent intense fires are also likely to reduce the availability of fruiting trees (Hohnen et al., 2015).

Predation by feral cats	Moderate	Large (mainland range)	Not demonstrated but highly plausible on the mainland; however, ameliorated by the rugged nature of their habitat (which offers some protection from cats) and by their partially arboreal behaviour.
Habitat degradation by introduced fauna and cattle	Moderate	Large (mainland range)	Not demonstrated but may have altered the availability of tall fruit bearing understorey shrubs
Bauxite mining on the Bougainville Peninsula	Severe for some subpopulations	Currently nil, minor if mining proceeds	Bougainville Peninsula deposits proven but mining currently uneconomic

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

Criterion 1. 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%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>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.</p> <p>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]</p> <p>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.</p>	<p>based on any of the following:</p> <p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>		

Evidence:

The golden-backed tree-rat is thought to be undergoing a population size reduction, however there is limited to no information about the magnitude and timing of the declines. The *Action Plan for Australian Mammals 2012* noted the loss of a Northern Territory subpopulation within the last 10 years and inferred that the subpopulation in the Kimberley was declining, however they concluded that declines were unlikely to be >30% in 10 years (Woinarski et al., (2014).

Evidence of decline in the golden-backed tree-rat's range can be seen in the regional extinctions in the Northern Territory, southwest Kimberley and the Pilbara (Palmer et al., 2003). Most of these declines happened considerably more than three generations ago, however the loss of the Northern Territory subpopulation likely occurred between the late 2000s and early 2010s

(Ziembicki et al., 2013). In the survey, 20 sites on 13 islands were sampled twice: once during the wet season and once during the dry season. Furthermore, surveys conducted in the Kimberley Islands from 2006 to 2009 failed to record the species on five of the nine islands where it was previously recorded by Burbidge and MacKenzie (1978) (DPaW 2015).

Conversely, in 2012 the species was recorded for the first time at a number of Mitchell Plateau sites that had been surveyed repeatedly from 2007 to 2012, suggesting the species may be expanding its range locally. Monitoring on Mitchell Plateau is conducted under the Kimberley Science and Conservation Strategy Landscape Conservation Initiative (Radford et al., 2011).

There are no robust estimates of population trends. The species is locally common at some Kimberley mainland sites and on some islands. It was recorded at 15 out of 119 sites surveyed throughout the North Kimberley from 1994 to 2011, and at eight of 41 sites surveyed during the North Kimberley Land Conservation Initiative monitoring program in 2012 (I. Radford pers. comm., cited in Woinarski et al., 2014). Conversely, repeated surveys in the Northern Territory in recent years have failed to detect the species, including: targeted surveys across mammal hotspots in Kakadu between 2005 and 2010 (Palmer, 2010); and surveys in the vicinity of Mbrik in 2009 where a local indigenous woman had possibly seen the species four years earlier (NRETAS and Warddeken Land Management Limited 2009). There are no data demonstrating a current, ongoing population decline, though a decline is inferred based on changed fire regimes and predation by feral cats (DPaW 2015). Woinarski et al. (2014) assessed that this decline is unlikely to be >30% in 10 years.

The data presented above appear to demonstrate the species is not eligible for listing under this criterion. 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.

Criterion 2. 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 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
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:

Published estimates of the golden-backed tree-rat's EOO and AOO vary considerably. Extent of occurrence estimates range from 13 300 km² (IUCN data cited in Woinarski et al., 2014) to 37 125 km² (DPaW 2015). While area of occupancy estimates range from 56–60km² (DPaW 2015) to 80 km² (Woinarski et al., 2014). However, Woinarski et al. (2014) noted that their calculations of AOO were likely to be significant underestimates due to limited sampling across the occupied range and they considered that the AOO was likely to be >2000 km².

This assessment uses figures calculated by the Department of the Environment and Energy based on the most recent dataset available. The extent of occurrence is estimated at 38 446 km², and the area of occupancy is estimated at 72 km². These figures are based on the mapping

of point records from 1997 to 2017, obtained from state governments, museums and CSIRO. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2014 (DotEE 2017).

There is varying opinion around the number of locations at which the species occurs. According to IUCN guidelines “The term ‘location’ defines a geographically or ecological distinct area in which a single threatening event can rapidly affect all individuals of the taxon present” (IUCN 2012). The Department of Parks and Wildlife estimated that the species occurs at nine locations in Western Australia (DPaW 2015), including: five coastal sites from which it is currently known, including the Mitchell Plateau and Prince Regent River where it was captured in an intensive survey in 2003/2004 (Start et al., 2007); and four islands (Uwins, Augustus, Hidden, and Lachlan Islands) where it was recorded in the Kimberley Islands Survey 2006-2009 (DPaW 2015). Based on the IUCN definition, it could be extrapolated that the four islands are likely to represent distinct locations, while the five coastal sites may constitute five or less locations. Conversely, Woinarski et al. (2014) estimated, using the IUCN definition, that the species occurs at >10 locations. However, they appear to be including all nine islands in the Kimberley, some of which may no longer be inhabited, in their count. Recent surveys suggest that the species may have become locally extinct in the Northern Territory (Palmer et al., 2003).

A continuing decline in the area/quality of habitat and the number of individuals is inferred based on the species’ susceptibility to predation by feral cats and changes in fire regimes (DPaW 2015). The species is not known to undergo extreme fluctuations. This assessment considers the species area of occupancy as <2000 km², the number of locations it occupies as <10 and there is an inferred decline in the area/quality of habitat and the number of individuals.

The data presented above appear to demonstrate the species is eligible for listing as Vulnerable under this criterion. 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.

Criterion 3. 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:

There are no estimates of population size due to low numbers of records. Between 2000 and 2014 there have been 23 records of sightings of this species, compared to 36 sightings between 1970-1990, all located within the Kimberley region (DPaW 2015). The number of subpopulations and number of mature individuals in each subpopulation is unknown. The *Action Plan for Australian Mammals 2012* was unable to provide an estimate of population size, but surmised the number of mature individuals was likely to exceed 10 000 (Woinarski et al., 2014).

The data presented above appear to demonstrate the species is not eligible for listing under this criterion. 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.

Criterion 4. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low (Medium-term future)¹
Number of mature individuals	< 50	< 250	< 1,000
D2 ¹ Only applies to the Vulnerable category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time	-	-	D2. Typically: area of occupancy < 20 km ² or number of locations ≤ 5

¹ The IUCN Red List Criterion D allows for species to be listed as Vulnerable under Criterion D2. The corresponding Criterion 4 in the EPBC Regulations does not currently include the provision for listing a species under D2. As such, a species cannot currently be listed under the EPBC Act under Criterion D2 only. However, assessments that demonstrate eligibility for listing under other criteria may include information relevant to D2. This information will not be considered by the Committee in making its assessment of the species' eligibility for listing under the EPBC Act, but may assist other jurisdictions to adopt the assessment outcome under the [common assessment method](#).

Evidence:

There are no estimates of population size due to the low numbers of records, however Woinarski et al. (2014) thought the number of mature individuals was likely to exceed 10 000. (see Criterion 3).

The golden-backed tree-rat exceeds the thresholds for listing under IUCN Criterion D2 as its AOO is >20km² and the number of locations is >5.

The data presented above appear to demonstrate the species is not eligible for listing under this criterion. 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.

Criterion 5. 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:

Population viability analysis appears not to have been undertaken, and there are insufficient data to demonstrate if the species is eligible for listing under this criterion. 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.

Consideration for delisting

Under s186 of the EPBC Act (Amending list of threatened native species), the Commonwealth Minister for the Environment must take certain matters into consideration before deleting native species from a category, as follows:

- (2A) The Minister must not delete (whether as a result of a transfer or otherwise) a native species from a particular category unless satisfied that:
 - (a) the native species is no longer eligible to be included in that category; or
 - (b) the inclusion of the native species in that category is not contributing, or will not contribute, to the survival of the native species.

- (2B) In deciding whether to delete a native species from a particular category (whether as a result of a transfer or otherwise), the only matters the Minister may consider are matters relating to:
 - (a) whether the native species is eligible to be included in that category; or
 - (b) the effect that the inclusion of the native species in that category is having, or could have, on the survival of the native species.

The golden-backed tree-rat is currently listed as Vulnerable under the EPBC Act. The Action Plan for Australian Mammals 2012 (Woinarski et al. 2014) assessed the species as being near threatened. However, new evidence presented in this Consultation Document suggests the species may be eligible for listing under the EPBC Act. Alternatively, the species could be considered data deficient. Little monitoring has been undertaken and the population size and trends are poorly known. The population is suspected to be declining due to current and ongoing threats from frequent, intense fires and predation from feral cats. It is possible that the species may meet Criterion 2 under B2(a)(b)(iii)(v). Given the uncertainty in the assessment and the suspected population trajectory, there appears to be insufficient evidence to demonstrate that the golden-backed tree-rat is ineligible for listing as Vulnerable under the EPBC Act.

Furthermore, it is not clear whether or not inclusion of the golden-backed tree-rat in the Vulnerable category is contributing to the survival of the species. The EPBC Act requires project proponents to refer a proposal for assessment if it may have a significant impact on a threatened species. Thus any proposals within the distribution of golden-backed tree-rat currently need to consider, and if necessary mitigate, any potentially significant impacts to the species. Where necessary, the Department can issue conditions requiring proponents to avoid, minimise or mitigate impacts on listed species. Therefore, inclusion of the golden-backed tree-rat on the list of threatened species, could potentially have an impact on its survival.

Conservation Actions

Recovery Plan

There is no recovery plan currently in place for this species. The 'Recovery plan for the Golden Bandicoot *Isodon auratus* and Golden-backed Tree-rat *Mesembriomys macrurus* 2004 – 2009' (Palmer et al., 2003) ceased to be in effect from 1/10/2015. The primary objectives of the recovery plan were: to maintain or improve the conservation status of the golden bandicoot and the golden-backed tree-rat; to achieve an accurate assessment of population trends for both species; and to identify threatening processes. A review of the plan concluded that these objectives have not been achieved due to lack of funding for surveying, monitoring programs and studies on the ecology of the species'.

A decision about whether there should be a new recovery plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

Primary Conservation Actions

1. Reduce the frequency, intensity and extent of fires within the species' range.
2. Undertake long-term monitoring and targeted surveys to determine the species' distribution, population size and trends.
3. Undertake research to identify the impacts of threatening processes on the species.

Conservation and Management Priorities

There is some regional fire management and feral animal control in the southern and northern parts of its range and management of fire at the Artesian Range. Land on which the golden-backed tree-rats occurs includes indigenous land, reserves and national parks (Prince Regent Nature Reserve, Mitchell River National Park, Lawley River National Park) and land managed by the Australian Wildlife Conservancy. A research program on golden-backed tree-rats at the Artesian Range (AWC/University of Tasmania) began in late 2012, to describe the impacts of fire patterns and feral cats on their ecology and survival.

Recommended management actions are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Active mitigation of threats	Continue to develop and implement appropriate fire management in Kimberley habitat	High
Quarantining isolated populations	Prepare and implement biosecurity plans for Kimberley islands	Medium
Translocation	Consider options and benefits of possible translocation to suitable Northern Territory sites	Medium
Community engagement	Involve Aboriginal communities and Aboriginal rangers in conservation of species	High

Survey and Monitoring priorities

Theme	Specific actions	Priority
Survey to better define distribution	Conduct additional surveys on Kimberley mainland and islands, including mangroves, to better quantify distribution, including through use of Indigenous knowledge	Medium
	Continue sampling attempts at and around last-recorded sightings in the Northern Territory, and comparable environments	Medium
Establish or enhance monitoring program	Develop cost-effective monitoring programs	High
	Monitor at selected mainland sites and on selected islands	High

Information and Research priorities

Theme	Specific actions	Priority
Assess impacts of threats on species	Assess population-level impacts of predation by feral cats	High
	Assess responses to a range of fire regimes, and identify the most suitable fire regime	High
Assess effectiveness of threat mitigation options	Assess effectiveness of current management	Medium
Undertake research to develop new or enhance existing management mechanisms	Develop broad-scale, targeted feral cat eradication methods	High

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Consultation questions

PART 1 – INFORMATION TO AID LISTING ASSESSMENT

1. Do you have any additional information in the **ecology or biology** of the species?
2. Can you provide any additional information or estimates on **longevity, average life span or generation length** for the species?
3. Do you have additional information to support an **estimate of the current population size** of mature adults of the species (national extent)?
4. Do you have additional information on **population trends** over 3 generations, or an historic population size for the species (national extent)?
5. Do you have additional information on **current range** (national extent) or **location of populations** for the species?
6. Can you provide additional information on any **change in range or location of populations**, or an **historic range** (national extent)?

PART 2 – INFORMATION FOR CONSERVATION ADVICE ON THREATS AND CONSERVATION ACTIONS

7. Do you further information on the historic, current or potential **threats** facing the species?
8. Do you have further information on current or potential **management actions** to support protection and recovery of the species?
9. Do you have further information on current or potential **monitoring or research activities** for the species?
10. Are you aware of **other knowledge** (e.g. traditional ecological knowledge) that may help better understand the threats and management actions to aid recovery of the species?
11. Are you aware of any **cultural importance or use** that the species has?
12. What **individuals or organisations** are currently, or potentially could be, involved in management and recovery of the species?

PART 3 – ANY OTHER INFORMATION

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