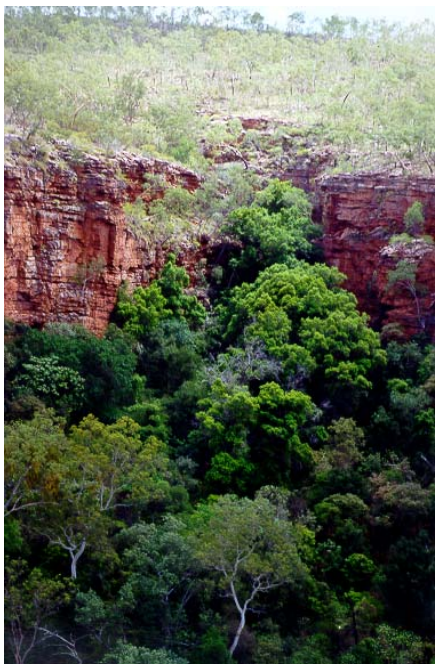
A Management Program

for

The CARPENTARIAN ROCK-RAT

Zyzomys palatalis

IN THE NORTHERN TERRITORY OF AUSTRALIA


1. INTRODUCTION

1.1 Species Subject to Management

Class:	Mammalia (Subclass: Eutheria)
Order:	Rodentia
Family:	Muridae
Species:	*Zyzomys palatalis* (Kitchener 1989)
Common name:	Carpentarian Rock-rat

1.2 Responsible Authority

Parks and Wildlife Commission of the Northern Territory
PO Box 344, Katherine NT 0851

Telephone:	61 (08) 89738862
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1.3 Legislation and Internal Obligations

1.3.1 Northern Territory

This management program for the conservation of the Carpentarian Rock-rat has been developed in accordance with the requirements of section 32 of the *Territory Parks and Wildlife Conservation Act 2000*.

The Carpentarian Rock-rat *Zyzomys palatalis* is defined as Threatened under section 30 of the *Territory Parks and Wildlife Conservation Act 2000*.

It is an offence to take, keep or export live or dead Carpentarian Rock-rat individuals or parts thereof without a permit issued by the Director of the Parks and Wildlife Commission of the Northern Territory. A permit to take Carpentarian Rock-rats may only be issued with the written permission of the Minister for Parks and Wildlife (section 56 (2)(b) *Territory Parks and Wildlife Conservation Act 2000*). The maximum penalty for breaches of these provisions is a $100 000 fine or 10 years imprisonment for an individual and a fine of $500 000 for a body corporate.

Section 122 of the *Northern Territory Parks and Wildlife Conservation Act 2000* provides for traditional harvest of native fauna for food, ceremonial and religious purposes by Aboriginal people. However, there is no suggestion that usage of Carpentarian Rock rats has occurred in the past or is likely to occur in the future.

Habitat known to support Carpentarian Rock-rats is eligible for declaration as an area of *essential habitat* under section 37 of the *Northern Territory Parks and Wildlife Conservation Act 2000.*

1.3.2 Other States and Territories

The Carpentarian Rock-rat is not known to occur in any other State or Territory in Australia, despite extensive targeted surveys conducted in north-west Queensland.

1.3.3 Commonwealth

The Carpentarian Rock-rat is listed as Critically Endangered by the Australian and New Zealand Environment Conservation Council (ANZECC), and specified in the list of

threatened species referred to in section 178 of the *Environment Protection and Biodiversity Conservation Act 1999*. The species was listed as endangered by the Australian Rodent Specialist Group (Lee 1995). Carpentarian Rock-rats are subject to a national Recovery Plan established in 1996. This Recovery Plan has recently been revised and re-submitted to the Federal Minister for Environment for approval.

The export of Carpentarian Rock-rats or their parts from Australia requires a permit from Environment Australia under the *Environment Protection and Biodiversity Conservation Act 1999.*

1.3.4 International

Carpentarian Rock-rats qualify as Critically Endangered under the World Conservation Union (IUCN) Red List criteria B (extent of occurrence <100km^2 and area of occupancy <10 km^2), sub-criteria 1 (severely fragmented or known to exist at only a single location) and 2 (continuing decline, observed, inferred or projected, in…(c) area, extent and/or quality of habitat) (Baillie 1996). The ANZECC Threatened Fauna List 1999 also lists *Z. palatalis* as critically endangered.

2. AIM AND OBJECTIVES

The aim of this management program is to improve the long-term conservation status of *Z. palatalis* and its habitat in the Northern Territory.

The objectives of the management program are:

- To declare known Carpentarian Rock-rat sites as areas of *essential habitat* under section 37 of the *Northern Territory Parks and Wildlife Conservation Act 2000;*
- Establish Management Agreements under relevant NT legislation concerning pastoral leasehold land for the conservation of Carpentarian Rock-rats;
- To undertake scientific research to improve understanding of *Z. palatalis* ecology;
- To maintain a genetically viable captive breeding colony at the Territory Wildlife Park;
- Develop and apply sound conservation management practices for known *Z. palatalis* populations as well as any further populations found, to ensure that the wild population is conserved in both number and extent;
- Establish a sound experimental release program for Carpentarian Rock-rats based on research, monitoring and modelling;
- Employ adaptive management practices to revise the management of Carpentarian Rock-rats as new information becomes available;
- Foster cooperation with the Commonwealth Government and other interested parties in the conservation management of Carpentarian Rock-rats;
- Promote public awareness of and involvement in the conservation of the Carpentarian Rock-rat.

3. CARPENTARIAN ROCK-RAT STATUS AND THREATENING PROCESSES

The Carpentarian Rock-rat is a threatened conilurine rodent. The conilurine rodents include many 'old endemic' Australian rodents which have proven highly susceptible to population declines and extinction. The Carpentarian Rock-rat has an extremely limited total range (entirely restricted to one pastoral property); small number of fragmented populations within the range (4); presumed small total population size (probably less than 2000 individuals); specific habitat and dietary requirements; and presumed deterioration in the condition of habitat generally.

3.1 Potential threatening processes

3.1.1 Fire

Population and habitat viability modelling based on the best available information suggests the frequency of hot fires has a significant bearing on the long-term viability of the Carpentarian Rock-rat populations (Brook *et al* 2002). The integrity of rainforest patches and the surrounding savanna woodlands in general is greatly influenced by the frequency and severity of fire. Hot, late dry season fires kill sensitive rainforest plants, particularly on the margins, thereby leading to contraction of the patch margins (Russell-Smith and Bowman 1992). Fire-weeds and savanna grasses are promoted in disturbed burnt boundary areas, and provide fuel for subsequent fires, which leads to further damage of patch boundaries (Trainor 1996). The absence of fire maintains extensive and diverse monsoon rainforest communities where permanent water is present, which provide abundant fruit and seed resources for granivores and frugivores like the Carpentarian Rock-rat.

3.1.2 Predators

There is currently no information on predation on Carpentarian Rock-rats. Natural predators probably include Dasyurids, nocturnal raptors and pythons. Feral cats are potential predators of Carpentarian Rock-rats and have been recorded at known Carpentarian Rock-rat sites. Since 1999 all predator scats at known sites have been collected and analysed for the presence of Carpentarian Rock-rat remains. Trapping for feral cats has also been carried out at all sites with a view to reducing their numbers and sampling stomach contents for Carpentarian Rock-rat remains. None have been captured as yet, however hair samples indicate the presence of cats at known Carpentarian Rock-rat sites.

3.1.3 Habitat degradation and competition for food

It is not known how the presence of introduced herbivores like cattle *Bos taurus*, horses *Equus caballus,* donkeys *E. asinus* and pigs *Sus scrofa*, affect Carpentarian Rock-rat populations. However degradation of rainforest patches and watercourses by unmanaged domestic stock has occurred in the Gulf region. Currently there are no managed stock in the areas immediately surrounding the rainforest patches containing Carpentarian Rock-rat populations. However, some unmanaged stock may still occur in the area. Signs of pigs and cattle (or other ungulates such as donkeys and horses) are evident at most sites, especially around the edges of watercourses. Nevertheless, population and habitat viability assessment modelling indicated that feral herbivores were a less immediate threat to the Carpentarian Rock-rat than altered fire regimes.

3.1.4 Weeds

Presently there is little information on the effects of weeds on Carpentarian Rock-rats and their habitat. Weeds may degrade Carpentarian Rock-rat habitat by altering the composition and structure of rainforest patches, thereby reducing the availability of preferred foods for the rats and increasing the susceptibility of sites to fire. Currently there are few weed species present at the known Carpentarian Rock-rat sites and their cover and potential impact is thought to be relatively minor. However there have been Mexican poppy (*Argemone ochroleuca*) and Parthenium weed (*Parthenium hysterophorus*) outbreaks on Wollogorang Station and Rubbervine (*Cryptostegia grandiflora*) occurs less than 100km away in Queensland and poses a very real threat to habitats such as monsoon vine thickets.

4. MANAGEMENT STRATEGIES

Management of the Carpentarian Rock-rat will be flexible and guided by adaptive management. Should monitoring indicate that the management goals are not being met, management prescriptions may be altered in accordance with the aim and objectives of this management program. Such changes will only be made with the approval of the Director of the Parks and Wildlife Commission. A matrix linking the actions of this management program with project milestones for the next five years is attached in Table 1.

4.1 Research and monitoring actions

4.1.1 Monitoring Carpentarian Rock-rat populations

Monitoring is an important part of this management program and will guide management actions required for Carpentarian Rock-rat conservation. Populations were surveyed extensively between 1994 and 1996 when a detailed mark-recapture study was conducted. Banyan Gorge and Moonlight Gorge were re-surveyed in 1999 and Camel Creek and McDermott Springs, were surveyed in 2000. Banyan Gorge was re-surveyed in 2001, 2002 and 2003. Carpentarian Rock-rats were re-located in all surveyed patches. These surveys provide a baseline for future monitoring events to be repeated every two years under this management program or until results of the monitoring indicate a need for modification to the program.

4.1.2 Habitat use and diet

Little is known of the movements and habitat utilisation by Carpentarian Rock-rats in the wooded savanna outside of the rainforest patches. Further trapping and radio telemetry studies have been carried out to provide relevant information on habitat use and particularly the species dependence on mesic woodland and savanna habitats adjacent to rainforest patches. This research has commenced at Banyan Gorge and is currently in the analysis phase, due for completion by June 2003.

Habitat utilisation at different times of the year will no doubt be affected by diet and food availability. Scat analysis, vegetation assessment and current radio telemetry studies will be used to determine how fruit and seed phenology is affecting habitat use by Carpentarian Rock-rats. By October 2003 the Parks and Wildlife Commission will publish a preliminary description of the diet of the Carpentarian Rock-rat based on scat analysis currently underway.

4.1.3 Habitat dynamics

A plausible influence on the present restricted and fragmented distribution of the species is that suitable habitat patches have been reduced in number, size and quality, and linkages among them have broken down to the extent that occupancy by Carpentarian Rock-rats has been compromised. Climate change and fire effects may be implicated in such change in the prehistoric and more recent past. Given uncertainties about present trends in habitat availability and quality, monitoring the condition and extent of remaining occupied patches is a high priority. Parks and Wildlife and the Key Centre for Tropical Wildlife Management at the Northern Territory University are presently engaged in examining change over the last 50 years using aerial photographs from 1947–1997 on each of the five know patches and surrounding landscapes. This work will provide a base for determining approaches to management of the landscape and monitoring change into the future.

4.1.4 Population Size

An extrapolation of density estimates suggests the population of Carpentarian Rock-rats is approximately 340 at Banyan Gorge and 520 at Moonlight Gorge. Little is known of the population sizes at McDermott Springs and Camel Creek. It is important to determine the population size at these sites, and priority will be given to McDermott Springs which is the smallest site in area and the most vulnerable to fires driven by prevailing dry season winds from the south-east. It is expected that these population estimates will be available by October 2004.

4.1.5 Threatening processes

Ongoing research on threatening processes for the Carpentarian Rock-rat will include:
1) assessment/ evaluation of the impact of fire on rainforest patches and adjacent vegetation
2) using historical aerial photography to map changes in gross vegetation structure in Carpentarian Rock-rat habitat over large spatial and temporal scales
3) assessment or evaluation of the impact of feral stock on rainforest patches

By May 2008 the Parks and Wildlife Commission will have investigated and reported on these key gaps in knowledge.

4.1.6 Modelling Habitat and Population Parameters

Population and habitat modelling has been undertaken in association with the Key Centre for Tropical Wildlife Management at the Northern Territory University. The purpose is to define and predict key habitat features required for experimental release sites, to quantify the relative importance of threats, to define demographic parameters of a potential release population and to highlight key gaps in the knowledge base on Carpentarian Rock-rats. The model development was based on data collected at sites from which Carpentarian Rock-rats were known to be present and from data collected in other *Zyzomys* studies. The results of the first stage of this modelling are reported in Brook *et al*. (2002). This modelling will continue to be used and further developed in an adaptive way as new data are collected.

4.1.7 Captive breeding and behaviour

Captive breeding colonies will be maintained as a safeguard against the possible catastrophic decline of wild populations. Breeding individuals are currently held at the Territory Wildlife Park. Observations have been recorded on behaviour of Carpentarian

Rock-rats in captivity. Other information collected from the captive population includes longevity, health, rearing of young and age-based mortality. The Parks and Wildlife Commission will continue to collect this information for better management of captive, experimentally introduced and wild populations. The captive-breeding program will be expanded to assist in the experimental release program and to ensure the genetic integrity of the captive population. Management of the captive Carpentarian Rock-rats at the Territory Wildlife Park will be guided by the procedures of the Australian Species Management Program which is coordinated by the Australasian Regional Association of Zoological Parks and Aquaria. An annual report on the breeding program will be provided to the Recovery Team by December each year.

4.1.8 Experimental release

Modelling based on the best available data indicates that the establishment of a new population (through translocation of captive-bred individuals) will not appreciably reduce extinction risk of the current populations, but could provide valuable additional data on the impact of threats, if conducted as an adaptive management experiment. An experimental release programme will allow the Parks and Wildlife Commission to experimentally gauge the suitability of habitat patches located in close proximity to currently occupied patches, measure the maximum intrinsic population growth rate at low densities, and assess the effectiveness/feasibility of low-cost methods of population re-establishment and recovery. It will provide an opportunity to gain a greater understanding of population dynamics, life history characteristics and the ecological processes which affect these populations, through a process of controlled field experiments and the application of adaptive management principles. The experimental release program is not aimed to satisfy the Northern Territory Parks Masterplan objective of acquiring or protecting land containing populations and habitat of all threatened species.

The Parks and Wildlife Commission will experimentally introduce Carpentarian Rock-rats to at least one currently unoccupied site in the proposed Limmen National Park (which contains habitat identified as suitable through correlative modelling of the presently occupied patches) and rigorously monitor their survival and establishment. The first introduction of >20 animals will occur in June 2003 and will be guided by an experimental procedure endorsed by the Carpentarian Rock-rat Recovery Team. A further three releases of similar sized groupings should occur over the following three years and population monitoring should then indicate whether further supplementation is required in later years.

All released individuals will be individually tagged, and radio-telemetry of at least half of the individuals at release will be included in the monitoring process. This will help to determine post release dispersal and survival. After this initial monitoring period of five weeks, radio collars will be removed and trapping will be the method of on-going monitoring at intervals of three months for the first year where persistence/survivorship in the habitat, changes in weight or condition and reproductive effort will be recorded. Monitoring will then continue at less frequent intervals over at least a further three years assuming that a viable population is established. Monitoring reports will be written 6, 12 and 18 months after the initial release and a final report and publications written at three years. A clear experimental procedure will be written to cover the post-release research and monitoring phase

4.2 Land management actions

4.2.1 Inclusion of Carpentarian Rock-rat populations in Parks and Reserves

Currently there are no populations of Carpentarian Rock-rat in the PWCNT reserves system. The Northern Territory Parks Masterplan has a specific objective of acquiring land containing populations and habitat of all threatened species for inclusion within the protected areas system. Carpentarian Rock-rats are specifically identified as a threatened species requiring such protection. Creation of a reserve including known Carpentarian Rock-rat populations on Wollogorang Station has been investigated in the past and is further recognized as a priority by this Management Program.

4.2.2 Cooperative land management agreements

In the absence of reserved or otherwise specially protected populations of Carpentarian Rock-rats in the wild, efforts will be made to negotiate with the lessee of Wollogorang Station for a joint management agreement under section 35 of the *Territory Parks and Wildlife Conservation Act 2000*. Any management agreement entered into will include detailed conservation management commitments and actions from PWCNT and the lessee for the protection of Carpentarian Rock-rat sites.

4.2.3 Declaration of areas of *essential habitat*

Until such time as a management agreement is in place, all known Carpentarian Rock-rat sites will be declared as areas of essential habitat under Section 37 of the *Northern Territory Parks and Wildlife Conservation Act 2000*. This will allow for the immediate management of sites specifically for conservation of the Carpentarian Rock-rat.

4.3 Management of threatening processes

4.3.1 Fire Management

A fire management plan is currently being developed by Parks and Wildlife and will be implemented at Carpentarian Rock-rat sites to reduce fuel loads in surrounding vegetation and exclude destructive late season fires from rainforest patches, based on the management recommendations of the PHVA modelling. The application of this fire management plan will be the responsibility of the lessee, Parks and Wildlife and Bush Fires Council. Any formal management agreement with the lessee for the conservation of Carpentarian Rock-rat populations will incorporate these fire management objectives.

4.3.2 Predator Control

The Parks and Wildlife Commission will carry out opportunistic trapping and/or shooting to reduce feral cat numbers. This will occur at times when rangers or scientists are already at sites carrying out other management actions. Currently there are no effective methods known for eradicating feral cat populations in Northern Australia. When techniques to control feral cats become available they may be evaluated and incorporated into the management of Carpentarian Rock-rats (see 3.1.2 above).

4.3.3 Control of unmanaged domestic stock

The Parks and Wildlife Commission will undertake control of feral herbivores on any land on which Carpentarian Rock-rats are found to be present if research indicates that management is warranted. Gorge entrances at some known Carpentarian Rock-rat sites will be fenced to prevent intrusion by grazing ungulates if there is any change in the current zero stocking regime.

4.3.4 Control of weeds

The Parks and Wildlife Commission will undertake control of weeds on any land on which Carpentarian Rock-rats are found to be present if research indicates that such management is warranted.

4.4 Cooperation, education and interpretation

4.4.1 Cooperation

The Parks and Wildlife Commission will encourage cooperation between the NT Government, Commonwealth Government, the landholder of Wollogorang Station and other interested parties in the conservation management of Carpentarian Rock-rat populations. The Parks and Wildlife Commission will endeavor to implement the recommendations of the Carpentarian Rock-rat Recovery Plan established under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

4.4.2 Public Awareness and involvement

The landholder of Wollogorang Station will be comprehensively informed of conservation objectives and the methods proposed to achieve them, and encouraged to be involved in all stages of this management program. This includes participation in the setting of goals and the formulation of approaches to realising those goals. Public involvement in the implementation of the management program will be encouraged through the Parks and Wildlife Commission's volunteer program. Effort will be made to keep the public well informed through the print media, the internet, and the publication of scientific papers. The Territory Wildlife Park plays an important and on-going role in promoting public awareness of the species and it's conservation management and this educational and interpretive role will continue.

5. REPORTS

Progress with this management program will be reported in the annual report by the Parks and Wildlife Commission of the Northern Territory. This will include but not be limited to:

1. any change in the conservation status or distribution of Carpentarian Rock-rats;

2. results of the captive breeding program;

3. progress in, or changes to, the management of wild populations;

4. progress and results of the experimental release program; and

5. summaries of the results of monitoring and research programs.

6. COMPLIANCE

6.1 Permits

Permits to take or keep Carpentarian Rock-rats or to move them inter-State are issued under the *Territory Parks and Wildlife Conservation Act 2000*. Conditions are included on permits, and permits will be cancelled by the Director if those conditions are contravened.

6.1.1 Permits to Take

No permits to take Carpentarian Rock-rats will be issued other than as part of the approved captive breeding or translocation program.

6.1.2 Permits to Keep

No permits to keep Carpentarian Rock-rats will be issued other than for captive breeding or display for educational purposes.

6.1.3 Animal Welfare

The welfare of individual Carpentarian Rock-rats will be of primary concern. The Commission will fulfill its obligations for Carpentarian Rock-rat welfare as provided for under the *Territory Parks and Wildlife Conservation Act 2000* and *the Animal Welfare Act 2000*. Research undertaken on Carpentarian Rock-rats will be subject to approval of the Parks and Wildlife Commission and the Northern Territory University Animal Ethics Committee.

7. REVIEW OF PROGRAM

A full review of this management program will be carried out within five years of its approval.

9. BACKGROUND

9.1 Taxonomy

The Carpentarian Rock-rat was described as a new species by Kitchener in his 1989 review of the rat genus *Zyzomys*. It was described from three specimens collected in 1987 and 1988 at Banyan Gorge on Wollogorang Station. Five species of *Zyzomys* occur in Australia including *Z. argurus* (Northern Australia*)*, *Z. woodwardi* (Kimberley), Z. *maini* (western Arnhem Land), *Z. pedunculatus* (central Australian ranges) and *Z. palatalis*.

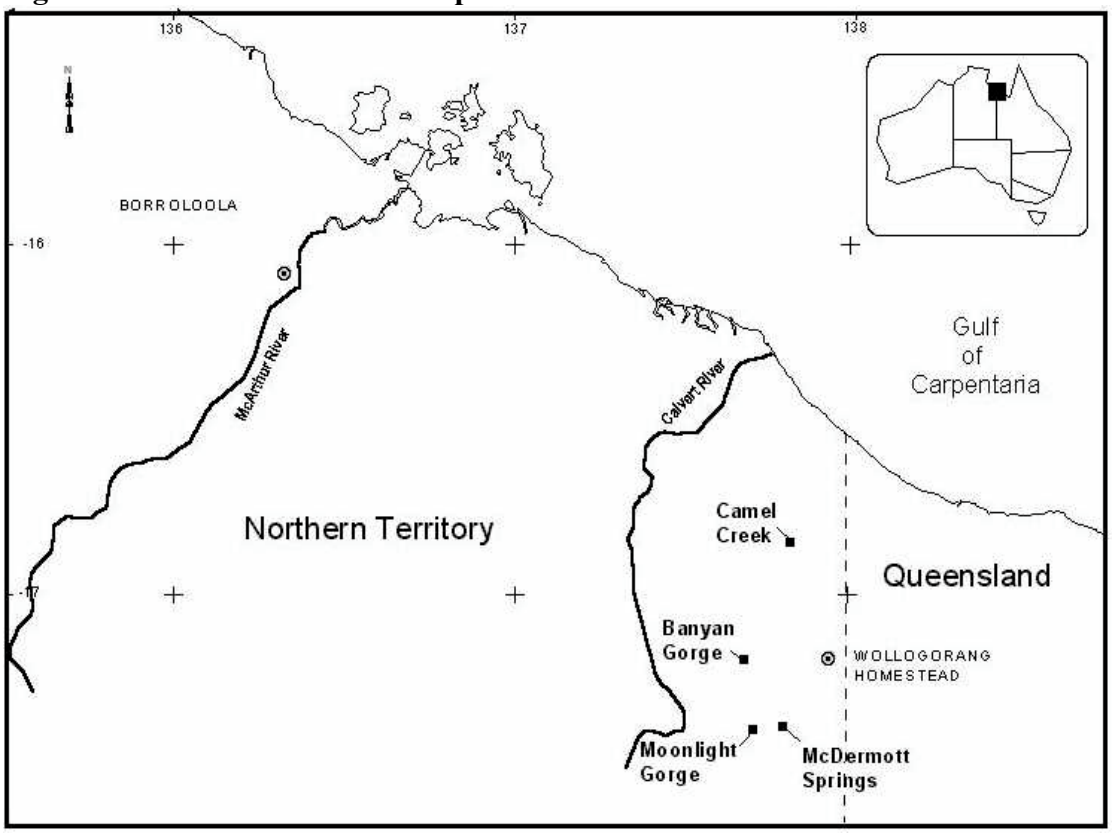
9.2 Distribution and Habitat

The Carpentarian Rock-rat has a narrow distribution, reported from only four small gorges on Wollogorang Station centered in the Carpentarian sandstone refuge (Morton et al 1995) of the semi-arid Gulf region.

The species was discovered in 1987 adjacent to a spring in rainforest at Banyan Gorge and a second population was discovered in 1990 at McDermott's Spring, 35km southeast of the type location, in a large dry monsoon rainforest. Additional populations were discovered in 1993 and 1995 at Moonlight Gorge and Camel Creek Gorge respectively, the latter 70km northeast of the type location.

Extensive surveys in the Gulf region of the Northern Territory and Queensland have failed to find Carpentarian Rock-rats outside these four known sites.

Figure 1: Location of known Carpentarian Rock-rat sites.



9.3 Conservation Status

The Carpentarian Rock-rat is regarded as critically endangered (Lee 1995). It has a small distribution, reported from only four small gorges on a single cattle station centred in the Carpentarian sandstone refuge (Morton *et al* 1995) of the semi-arid Gulf region. Population sizes are believed to be low (Churchill 1996). They are strongly associated with small rainforest patches which are highly fragmented and sensitive to disturbance by cattle and fire. No populations of *Z. palatalis* are known to occur on reserves.

9.4 Biology and Ecology

The Carpentarian Rock-rat averages 120 grams in weight, has a characteristic Roman nose, and a fattened tail which is notably fragile. The tail skin strips off easily and does not re-grow.

The Carpentarian Rock-rat has many behavioral and physiological characteristics in common with other species of rock-rats. It is a nocturnal rodent sheltering during the day in cracks between rocks. Much of the diet comprises fruits and seeds of rainforest plants including *Terminalia subacropa*, *Terminalia carpentariae* (also common in surrounding savannas), *Ficus spp* and *Pandanus aquaticus*. Large incisors allow Carpentarian Rock-rats to chew through the woody nuts of many of these species to access the kernel.

As with all Rock-rats, reproductive output is characteristically low, with females bearing only four nipples. However growth of young is rapid, allowing more frequent breeding events. Breeding in Carpentarian Rock-rats has been reported in most months, however there seems to be a peak in young in the mid- to late-dry season when food availability in the rainforest patches is most abundant.

There are few data on longevity, sex ratios, territoriality, and age structure of Carpentarian Rock-rats. In captivity they can live up to five years and males can continue to breed for at

least four years. However, they are unlikely to live for more than 2 years in the wild and actual recruitment rates are probably substantially lower than observed in the captive population.

10. REFERENCES

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Table 1: Milestone matrix for PWCNT Carpentarian Rock-rat management program.

	Milestone	Action Officer	Year				
			2003/2004	2004/2005	2005/2006	2006/2007	2007/2008
1	Monitoring Carpentarian Rock-rat populations at two of the known sites.	Scientific Officer		Aug-04		Aug-06	
2	Radio-telemetry study of habitat utilisation complete and compared with scat analysis data and vegetation assessment.	Scientific Officer	Mar-04				
3	Manuscripts on habitat utilisation and dietary analysis complete and submitted for publication.	Scientific Officer	Jul-03 Oct-03				
4	Population estimates available for McDermott Springs and Camel Creek Gorge.	Scientific Officer		Oct-04			
5	Assessment/evaluation of the impact of putative threatening processes (fire, cattle, feral cats) complete and addressed in report form.	Scientific Officer				May 07	
6	Annual data incorporated into modelling of habitat and population parameters.	Scientific Officer and Key Centre for Tropical Wildlife Management.	Dec-03	Dec-04	Dec-05	Dec-06	Dec-07
7	Annual report on captive breeding colony provided to Recovery Team.	TWP stud book keeper	Dec-03	Dec-04	Dec-05	Dec-06	Dec-07
8	Experimental release of >20 rats at the proposed Limmen National Park.	Scientific Officer and Gulf District Rangers	Aug-03	Jul-04	Jul-05	Jul-06	
9	Monitoring reports on experimental release population (monitoring carried out every three months for first year and population dependent there after).	Scientific Officer	Dec-03	Dec-04	Jul-06		
10	Final report complete and publications submitted on experimental release.	Scientific Officer				Dec-07	
11	Early dry season fuel reduction burns implemented at all known sites.	Gulf District Rangers	Apr-04		Apr-06		Apr-08
12	Landscape-scale analysis of long-term vegetation change in habitat patches	Key Centre for Tropical Wildlife Management and Scientific Officer	Jan-04				
13	Final review of the management program complete and report available.	Scientific Officer					Jun-08