

The Endangered Species Conservation Unit Territory Wildlife Park



Carpentarian Rock-rat (Photo: Steve Templeton)



Brush-tailed Tree-rat (Photo: Ron Firth)



Northern quoll (Photo: Jenny Kirwan)

Jenny Kirwan & Jodie Gogler
Endangered Species Conservation Unit
Territory Wildlife Park, Darwin NT

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Introduction

The role and responsibility of the Endangered Species Conservation Unit (ESCU) at the Territory Wildlife Park (TWP) is to concentrate on the breeding or research of threatened or endangered Australian fauna. Many of these projects are collaborative in that they are run in conjunction with outside agencies such as Charles Darwin University, the Conservation and Biodiversity Unit -Dept. of Natural Resources, Environment and the Arts (NRETA) scientists and researchers, and may also include independent professionals such as geneticists and other experts in various fields. Many species are managed under federal Recovery Plans that often involve a captive component.

ARAZPA

The Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA) is the leading zoo and aquarium organisation in the Australasian region. ARAZPA's membership includes major zoos and aquariums in Australia, New Zealand, Papua New Guinea and the South Pacific Islands. ARAZPA is an active member of the World Association of Zoos and Aquaria (WAZA) - the world body representing zoos and aquariums. Under ARAZPA's Australasian Species Management Program (ASMP), member institutions collaborate to plan and manage their animal collections to improve their sustainability and contribute to species conservation. The ASMP generates recommendations regarding appropriate actions for ASMP managed species to ARAZPA institutional members such as TWP (Regional Census & Plan, 2006). Approximately 100 programs are run for threatened and rare species through the ASMP including conservation programs that assist in the recovery of wild populations. Education and research are also a major focus. Several other standardised ARAZPA documents are also required to assist with species management such as Program outlines, Annual Reports and Recommendations, Management Plans and comprehensive Husbandry Manuals.

The ESCU is TWP's specialist area for captive breeding and research and currently has three projects running:

CARPENTARIAN ROCK-RAT (*Zyromys palatalis*)

NATURAL HISTORY

Description

The Carpentarian Rock-rat is one of five species of conilurine rodents of the genus *Zyromys*. The *Zyromys* genus contains one arid adapted species, the Central Rock-rat (*Z. pedunculatus*), with the remaining four species being tropical rats. The small Common Rock-rat (*Z. argurus*) is widely distributed throughout tropical northern Australia. The remaining three large tropical rock-rats (*Z. woodwardi*, *Z. maini* and *Z. palatalis*) whilst similar in appearance, have geographically distinct distributions.

Carpentarian Rock-rats have a grey-brown torso and white abdomen, a pronounced 'Roman nose', protruding eyes, long whiskers and a fragile, carrot shaped tail in which fat stores are deposited. The tail is sparsely haired with longer hairs towards the tip. Carpentarian Rock-rats weigh on average 120 grams; have a head-body length of 120-160mm and a tail length of 100-130mm (Cole & Woinarski 2002). Carpentarian Rock-rats, like all rock-rat species often lose fur, skin and parts of the tail with minimal levels of trauma (Puckey et al. 2003).

Distribution

The Carpentarian Rock-rat is currently known from five localities (Banyan Gorge, Moonlight Gorge, McDermott's Spring, Camel Creek Gorge and a new site at Redbank Springs) all occurring within a 37km radius. The closest of the four sites are 6km apart (Puckey *pers. com.*). All sites are within Wologorang pastoral lease in the gulf area of the Northern Territory, close to the Queensland border. This Rock-rat is restricted in habitat to monsoon forests on scree slopes within sandstone gorges, largely associated with permanent water (Puckey 1999).

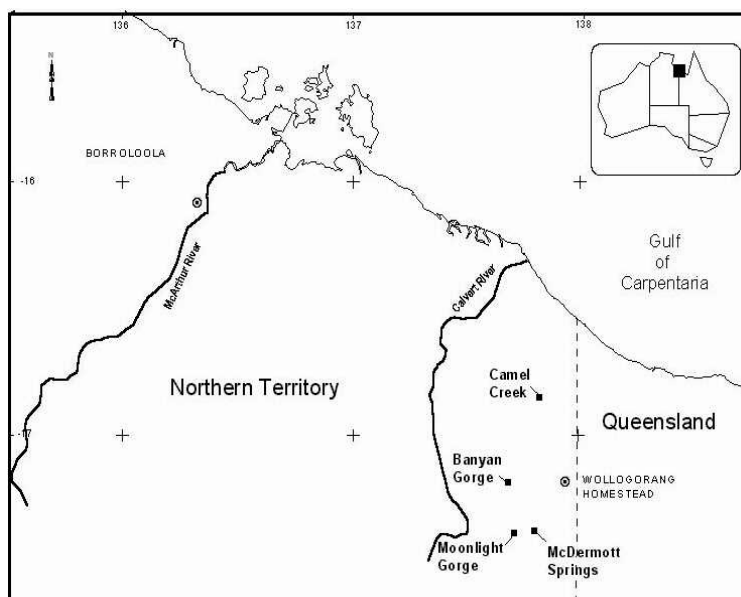


Figure 1. Current known locations of Carpentarian Rock-rat populations

Status

World Conservation Union (IUCN): Critically endangered

Federal Environmental Protection and Biodiversity Conservation (EPBC): Endangered

Territory Parks & Wildlife Conservation Act 2000 (NT): Critically endangered

The Carpentarian Rock-rat is extremely limited in range with the total population size thought to be small. It has specific habitat requirements and there has been a demonstrated decline in the condition of that habitat.

Threatening processes

These habitats are limited and highly fragmented in the Gulf region (Churchill 1996) and are currently under threat from fire and weed encroachment as well as the potential threat of feral pigs and cattle. Introduced predators such as cats occur in the area. The Carpentarian Rock-rat belongs to the Conilurini tribe of old-endemic rodents, known to be highly susceptible to population declines with all the extinct, critical, endangered and vulnerable rodent species belonging to this tribe (Trainor 1996). The Carpentarian Rock-rat has a weight range of 110 - 140gms which fits the criteria of a "Critical Weight Range mammal" as described by Burbidge and McKenzie (1989) and may be susceptible to significant population declines as a result.

Diet

The wild diet is dominated by large rainforest fruits and seeds such as *Syzigium angophoroides*, *Antidesma parvifolium* and *Terminalia sp.* Grass seeds and sedges are consumed at other times of the year when fruits are unavailable.

The captive diet consists of various commercially available seeds, fruits and vegetables. The diet is also supplemented with extra protein sources such as mealworms, dog kibble and hard-shell nuts. Bush tucker is collected and supplied as often as possible.

Reproduction

Field records (Puckey pers. com.) show pregnancies recorded in most months of the year indicating that there is no defined breeding season. Females have four teats so are capable of producing one to four pups with two being the average. Breeding of *Z. palatalis* in the wild may be triggered by diet as changes in both food availability and nutrient levels may stimulate animals to breed. *Z. palatalis* is thought to be capable of breeding all year round, peaking during the dry season.

Z. palatalis can be difficult to breed in captivity due to aggression levels, with females being the main aggressor. Large enclosure space is required to alleviate this. In captivity the wild dietary variation is replicated as closely as possible to keep pairs in breeding condition all year round. Animals not yet being introduced are kept on regulated quantities to enable the animal to be kept lean. A slight increase in dietary quality and quantity is supplied on introduction, simulating high food availability with the hope of stimulating reproduction.

PROJECT COMPONENTS

Federal Recovery Plan

The overall objective of the Recovery Plan is to down-list the species to Vulnerable or Conservation Dependent within 10 years of revised Recovery Plan implementation (Puckey *et al.* 2003).

TWP

The captive breeding at Territory Wildlife Park has been very successful, and to date two releases have been carried out. TWP will continue to manage a genetically viable captive population as required by the Recovery Plan. Staff at TWP are also researching oestrus detection techniques to ensure more efficient breeding procedures. As part of this species management, a regional studbook is ongoing for ARAZPA and a comprehensive husbandry manual is being compiled for publication.

Genetic work, population modelling and analyses of habitat change, the captive program, as well as on ground management and research of the wild populations at Wollogorang are ensuring sound conservation management of this species.

BRUSH TAILED TREE-RAT (*Conilurus penicillatus*)

NATURAL HISTORY

Description

The Brush-tailed tree-rat is one of four species of tree-rat. It is a nocturnal medium sized rodent with a grey to golden brown coat and a light underbelly weighing between 110- 220 grams. The tail is long with a brush covering approximately the last third (Cole & Woinarski, 2002) that can be either black or white in colour (Kemper, 1992). An agile, arboreal rodent, it uses tree hollows, logs and pandanus to shelter in and can spend a considerable amount of time foraging on the ground.

Distribution

The Brush-tailed tree-rat is found in northern Australia, adjacent islands and in southern New Guinea. Although sparsely distributed, it can be locally common within its range. It is found on Coburg Peninsular (Gurig Gunak Barlu National Park), in a highly restricted area in Kakadu National Park, the Tiwi and Inglis Islands (Firth *et.al.* 2005). It inhabits coastal woodlands and open eucalypt forest with grassy understorey (Kemper, 1995).

Status

Territory Parks & Wildlife Conservation Act 2000 (NT): Vulnerable

Threatening processes

This genus displays all the traits of mammal contraction, decline and extinction (species showing decline in the northern parts of their range following early extinctions in the southern areas of their range). Habitat destruction or change, fire and predation are possible causes for decline.

Diet

The wild diet consists mainly of grass seed predominantly *Alloteropsis semialata*, with lower amounts of leaf, insect matter and possibly some fruit seasonally (Firth *et.al.* 2005).

The captive diet was predominantly made up of a mixture of commercially available seed mixes with various fruits, vegetables and insects offered. Various species of grasses were available and bush tucker was collected seasonally.

Reproduction

The Brush-tailed tree-rat breeds throughout the year but peaks in the dry season with females producing 1-3 young (Cole & Woinarski, 2002). They are able to produce several litters per season with an average gestation period of 36 days, possibly longer if still suckling a previous litter. The pups are born quite large and are able to reach sexual maturity as early as six to eleven weeks of age (Kemper, 1992).

The Brush-tailed tree -rat breeds relatively easily in captivity with little or no aggression shown by either male or female.

PROJECT COMPONENTS

Collaborative project

The brush tailed tree-rat is an ideal species to conclusively determine threatening processes, enabling management efforts to be focused to halt declines in small to medium mammal species of northern Australia (R. Taylor unpublished, 2004). A collaborative pilot project between the Biodiversity Conservation Unit (NRETA), Charles Darwin University and TWP, was undertaken to determine these factors. The relationships between species decline, reintroduction, fire frequency and feral predation are being investigated and involve the exclusion of fire and feral cat control at some sites.

TWP

The TWP role entailed the construction and landscaping of suitable enclosures for breeding. 80 animals were available for release after the successful breeding of 60 animals from the original 20 founders. Founders were originally collected from Gurig Gunak Barlu National Park National Park on Coburg Peninsula.

Four releases took place over a two week period into four suitable mainland sites coinciding with adequate food availability. Each individual rat was fitted with a radio-collar containing a mortality switch to alert the researchers to any lack of movement indicating possible death. Ongoing tracking will enable the movement of each individual to be monitored and any death causes to be determined. Food supplementation was carried out for the first few days to ensure a smooth transition from captivity into the wild.

It is hoped that the results of this study will provide a powerful message for prioritising conservation management actions in this region.

NORTHERN QUOLL (*Dasyurus hallucatus*)

NATURAL HISTORY

Description

The northern quoll (*Dasyurus hallucatus*) is one of six quoll species in the genus Dasyuridae. Four species of these carnivorous marsupials are found in Australia and two in New Guinea. The northern quoll is the smallest of the four quoll species inhabiting Australia recognized by their brown with white spots and their light coloured underbelly. They are distinguished from other Australian quolls by their smaller size, the largely unspotted tail and striated pads on a five-toed hind foot (Braithwaite & Begg, 1998). Adults show marked sexual dimorphism, with males averaging 760 g and females 460 g (Oakwood, 1997; Oakwood, 2002). Occasionally, males may reach 1200 g (Oakwood, 1997; Oakwood, 2002; & Rankmore, pers. comm.) and females, 690 g (Oakwood, 1997). They are predominantly nocturnal and are both aboreal and terrestrial.

Distribution

All of the quoll species in Australia have declined since European settlement, although the decline of the northern quoll is the most recently recognised. Studies reveal that the geographical range of this species is diminishing, particularly from lowland savanna

(Braithwaite & Griffiths 1994; Oakwood 1997). The northern quoll once occupied a broad band across the north of the country but is now restricted to isolated populations across the top end of Australia. The distribution has contracted mainly in southern Queensland, Cape York, the East Kimberley region of Western Australia, and the gulf country of the Northern Territory. Remnant populations are found around isolated rocky regions such as Carnarvon National Park (Queensland) and the Pilbara (Western Australia). It also occurs naturally on several islands of N.T. and W.A. coasts (EPBC listing 2005).

Northern quolls are found in a variety of habitats but are most common in open lowland savanna forest and rocky dissected plateau. The home range of northern quolls in savanna woodland is large. Female territories average 35 hectares and are exclusive with only some foraging overlap. Male home ranges are in excess of 100 hectares especially in breeding season (Oakwood, 1997). Although male home ranges may overlap with other males and females, northern quolls are solitary and do not share dens or travel together and seldom occupy the same area, except when mating or occasionally when foraging (Oakwood 1997).

A study of northern quoll genetics has been undertaken to determine the extent of variability between different populations. Preliminary data indicates that northern quolls within an approximate 500 km radius of Darwin are of the same genetic population, although there are variations between populations from other areas such as Queensland and probably Western Australia.

Status

Federal Environmental Protection and Biodiversity Conservation (EPBC) Act: Endangered.
Territory Parks and Wildlife Conservation Act- N.T: Critically Endangered 2006.

Threatening processes

There may be number of factors resulting in the decline of the northern quoll. Land clearing, overgrazing, introduced species and increased fire regimes are all possible causes. A recent study on number of factors including relationships between fire regime, habitat loss and fragmentation, found that the cause of mammal decline in northern Australia is not yet clear (Price *et. al.*, 2005).

The most recent threat has been the rapid advance of the cane toad (*Bufo marinus*) into the tropical Northern Territory. Its advance has been catastrophic for the northern quoll with studies revealing that some populations have been decimated and are unlikely to recover in the areas from which they have already disappeared (Watson & Woinarski, 2003 & Oakwood, 2004). Remnant populations are known to survive in Queensland where cane toads are present, although precise factors that have led to remnant population's survival are as yet, not fully understood (EPBC listing 2005). Research into the viability of these wild populations in the long term and the conditions that have led to their survival, may assist with the management or preservation of any surviving remnant quoll populations in the Northern Territory and Western Australia. It is not yet known if local NT extinctions of quolls will be permanent or whether they will recover and recolonise after a period of time (Oakwood, 2004).

Diet

This marsupial species is predominantly insectivorous, but the diet also includes fleshy fruit and a wide range of vertebrates during times of abundance (Oakwood 2000). Scats almost completely made up of crab exoskeletons have been noted in more than one location suggesting that *D. hallucatus* forages along watercourses (B. Rankmore pers.com. 2003, S. Hirst pers. comm. 2003). Northern quolls are opportunistic feeders and are renowned for raiding rural chook pens if not adequately secure.

The captive diet consists largely of insects such as commercially available wood roaches, mealworms and crickets. Whole foods such as mice, day old chicks and quail are fed as well as a variety of fruits. A minced meat mix with added supplements and specific commercial small carnivore foods are also included. Native fruits and flowers that are part of the wild diet are collected seasonally.

Reproduction

The northern quoll exhibits a highly synchronous reproductive cycle occurring around the same time each year around May/June. The timing, although synchronous, may vary between different populations and different years (Oakwood 2000). Females possess 5-10 teats with the average being 8 (Braithwaite & Griffiths, 1994; Oakwood, 2000). Females can give birth to up to twenty young with the first individuals to reach the teats surviving (Nelson, 2003). Young are attached to the teats for approximately 8-10 weeks after which they are placed in a den. Northern quolls den their young in tree hollows, rock crevices, logs, termite mounds and goanna burrows. Greater densities of northern quoll dens may be found in rocky habitats (Oakwood, 1997). Young are weaned at 5-6 months of age and dispersal is around November, December. Despite their size, most wild male northern quolls in savanna areas have been found to die after mating in their first year. Northern quolls are the only *Dasyurus* species that has been found to exhibit complete male post mating mortality (Oakwood, 1997). Wild females may live for up to 3 years, rarely failing to breed in their first year. However less than half produce young in their second year and none have been recorded to breed in their third year (Oakwood, 2000).

Problems associated with breeding this species in captivity include their limited breeding life but relatively long captive lifespan, susceptibility to stress, relatively large exclusive spatial requirements and aggressive male behaviour. In captivity both sexes can live for up to 5-6 years but are considered post reproductive after their first or second year.

PROJECT COMPONENTS

Recovery plan

A Federal Recovery plan is to be produced for this species by the Biodiversity and Conservation Unit (NRETA). The 2005 EPBC listing documentation advises that a recovery plan for this species is a high priority.

Collaborative projects

As a result of the recent threat to Northern Territory quoll populations, the Island Ark project was undertaken by the Biodiversity Conservation unit of the Department Of Natural Resources, Environment and the Arts (NRETA) in cooperation with traditional owners CDU and TWP. In 2003 a number of quolls were relocated to the un-inhabited,

toad free islands, Pobassoo and Astell located off the Northern Territory coast. The Island Ark populations represent some of the valuable northern quoll genes from eastern Top End areas including Kakadu National Park. These translocated populations are thriving but it is possible that the cane toad may colonise some offshore islands, as it tolerates high levels of salinity (EPBC listing 2005). The Territory Wildlife Park contributed to the Island Ark program by temporarily housing and processing the quolls before departure. All were micro-chipped to enable their ongoing progress to be monitored and DNA tissue samples were taken to determine genetic variability of the original population.

TWP

Due to the suspected incursion of the cane toad, a small pilot quoll breeding program was undertaken at TWP in 1998. The project was aimed at building on the work done by Dr. Oakwood, as there were a number of life history and reproductive strategies that were difficult to observe in the field. In addition to gaining knowledge of their breeding biology, optimal techniques for hand-rearing were investigated, incorporating collection of milk for analysis.

A formal captive breeding program has now been undertaken at TWP (2006) to act as a genetically viable insurance population to the translocated quolls. The captive group also includes genes of the remaining N.T. mainland quoll populations not previously translocated to offshore islands. A genetically sound captive population will enable a reintroduction and recovery program to be established if required in the future.

The 2006 TWP breeding season has been very successful with most females producing young. All quolls included in the breeding program or housed as display animals in zoos are recorded in the Regional Studbook to allow important genetic and demographic management to be carried out prior to any breeding.

It is hoped that as an endangered species, any quolls trapped as nuisance animals or any orphans that may be found in the coming year or two will be donated to the TWP for hand-raising and/or inclusion in the breeding program to ensure valuable genetics are maintained for the long-term survival of the species.

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