

Under the radar?: the occurrence, impact and management of feral cats and black rats in Kakadu

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1 Introduction

Most exotic mammals, such as buffalo, are highly conspicuous and their environmental impacts may be obvious. They have a high profile, are writ large in management planning, and may be relatively straightforward to control. When most park managers think of pest management, it is of buffalo, pigs, donkeys, cattle or horses. These are indeed pests, and it is appropriate that managers attempt to control them.

But there are other pests in this region that are far less conspicuous, are rarely considered in management plans, and for which control actions are at best occasional and incidental - and consequently typically ineffective. Here, we consider the feral cat *Felis catus* and the black rat *Rattus rattus*. We briefly review the limited information on the occurrence and impacts of these species, and provide some recommendations for management.

2 The species and occurrence in the region

Feral cats occur across the entire Australian mainland and many offshore islands. There has been considerable argument about whether cats preceded European settlement of Australia, with suggestions of arrival up to several centuries earlier either with Macassan trepanners to northern Australia or from shipwrecks on the Western Australian coast. However, the most thorough recent review of the historical record strongly suggests that the evidence for prior arrival is unconvincing, and that instead they spread from multiple sources subsequent to European settlement (Abbott 2002). Early records from the Top End include around the Port Essington settlement (Cobourg Peninsula) in 1845 (although it is not clear that this record refers to feral individuals) and around 1880 in the Pine Creek area (Abbott 2002). In describing the mammal fauna observed in the Darwin – Pine Creek area in the 1920s, the collector Charles Hoy reported that “the domestic cat ... is very plentiful and was the only introduced pest met with” (Short and Calaby 2001). There have been no detailed published studies of the abundance of feral cats in the Kakadu area, but some information is available from incomplete or unpublished studies by Michelle Watson, Laurie Corbett and Alicia Cameron. Estimating the abundance and distribution of cats may be difficult: they are not readily detected during standard wildlife surveys, are relatively secretive, and may be difficult to trap. The occurrence of tracks in regularly monitored sand plots appears to be the most effective technique for the assessment of distribution and abundance. It is possible that the distribution of feral cats increased with the outstation movement in the 1960s and 1970s, as

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pet cats were commonly taken to newly established outstations for their role in protection from snakes. There is some anecdotal evidence for a recent increase in their abundance in some areas including Kakadu.

The black rat *Rattus rattus* is a European rodent that is now widespread but patchily distributed across much of higher rainfall and coastal Australia. Its history in northern Australia is very imprecisely known. Black rats were common in many ships in the eighteenth and nineteenth century, and probably colonised most early settlements. In the 1890s, Dahl (1897) reported that the black rat was “observed in Arnhem Land, and frequently found in the dwellings of colonists. Except in these houses and their immediate surroundings, I did not observe it”. It remains very abundant in Darwin suburbs and surrounding bushland, and has been regularly reported in some other town areas (including Katherine, Gove and Jabiru) but there have been relatively few records in the Top End bushland until the last two decades, during which extensive wildlife surveys have allowed for a far better appreciation of its occurrence away from town areas. Recent records include Elsey National Park (near Mataranka), Macadam Range (upper Daly area), Victoria River (Gregory National Park area), Truant Island (English Company group), Flora River (Katherine area), Kabulwarnamyo (Arnhem Land plateau), and several areas in Kakadu, including near Mary River ranger station and distant from infrastructure in the Wildman River area (Griffiths 1997; Woinarski 2000; JW *unpubl.*). Its incidence in fixed fauna monitoring plots in Kakadu has increased over the last 10 years, one of the few mammal species to show such a trend; and its occurrence around Kabulwarnamyo is very recent (last 2-3 years). However, there are no adequate data available to estimate population size, density or precise distribution in wild populations in Kakadu or elsewhere in the Top End.

3 Impacts and evidence

There is damning evidence of the detrimental impacts of feral cats and black rats upon biodiversity in many parts of their range. “Predation by feral cats” is a listed key threatening process under the *Environment Protection and Biodiversity Conservation Act*, with a threat abatement plan (www.environment.gov.au/biodiversity/threatened/publications/tap/cats/index.html) that prioritises management actions, particularly for Commonwealth and World Heritage areas. Black rats *per se* are not so listed, but “Predation by exotic rats on Australian offshore islands of less than 1000 km²” is listed, and a review of known impacts is available at www.environment.gov.au/biodiversity/threatened/ktp/island-rats.html. (Note that the restriction of this key threatening process to islands is not because there is less impact on mainland areas, but rather because it was deemed unfeasible to eliminate the threat on mainland areas.)

Feral predators (foxes and cats) are widely accepted to have been important contributing factors in the extinction of about 15 species of mammals in Australia over the last 100 years, and a wide range of recent studies (mostly using predator exclosure fencing or intensive baiting) has provided compelling evidence of the continuing impact of feral predators on native wildlife, particularly mammals, but also birds and reptiles (Johnson 2006).

In the Top End region, there is little evidence against which their impact can be assessed. The most intriguing and concerning evidence is the highly significant decline in native mammals in Kakadu and other areas evident in recent monitoring programs (JW *unpubl.*), with this decline largely occurring in those groups of mammals that have proven particularly susceptible to feral predators elsewhere in Australia (bandicoots, possums, larger rodents, larger dasyurids).

There is some circumstantial evidence that several threatened mammal species (notably including northern brush-tailed phascogale *Phascogale pirata* and brush-tailed rabbit-rat *Conilurus penicillatus*) declined or disappeared from islands in the Sir Edward Pellew group over the last few decades coincident with the introduction of cats to those islands (Taylor *et al.* 2004). Populations of northern quolls *Dasyurus hallucatus* translocated to two islands off north-eastern Arnhem Land reached within five years of their introduction densities far surpassing those of any known mainland populations (Rankmore *et al.* 2007): such population density may reflect lack of interspecific competition and/or lack of predation by feral cats; but it may also be due to particular habitat suitability, absence of disease or superabundant food resources.

Radio-tracking studies focusing on potential prey species provide a good independent measure of the impacts of predation by feral cats, but there have been relatively few such studies in Kakadu or elsewhere in the Top End region. A detailed 10 month study by Sweet (2007) of the tree monitors (goannas) *Varanus tristis* and *V. scalaris* in Kakadu (Baroalba area) involved radio-tracking of 50 individuals (but for transmitter failure or other reasons, most of these were tracked for appreciably less than 10 months). Of these 50 individuals, six were killed by feral cats, by far the largest source of mortality. Dividing the total tracking time (5685 “monitor-days”) by this cat predation rate suggests that a monitor would, on average, be expected to live for 2.6 years after initial capture before being killed by a cat, a relatively short span for what would normally be a relatively long-lived animal (Greer 1989).

In a study (prior to the arrival of cane toads) in the Kapalga area of Kakadu, predation by feral cats was the cause of death for two of 15 radio-tracked northern quolls for which mortality source was determined, surpassed as a mortality source only by dingoes (4) and vehicles (3) (Oakwood 2000). In this study, predation rates were heightened in extensively burnt areas.

Feral cats may have impact on native wildlife not only through predation but also through spread of disease, particularly toxoplasmosis. There has been little assessment of this impact in the Kakadu region, with but one limited study of northern quolls suggesting low incidence of toxoplasmosis (Oakwood and Pritchard 1999).

We acknowledge the qualm that if feral cats have been present in the Kakadu area for perhaps 100 years or so, why should the decline in native mammals over the last 10-30 years be blamed on cats? If cats are contributing to the decline, then this riddle may be explained by a recent increase in cat numbers, by a recent increase in cat hunting efficiency (such as through decline in the number of hollow logs, or increase in extensively burnt areas), by a change in cat hunting behaviours, or by additional threatening factors now compounding cat impact. We acknowledge that these explanations are speculative. However, there is much evidence that even small populations of cats can have large impacts on native fauna, and that there is a recurring pattern of native mammals remaining reasonably abundant in the face of threat for some decades before then suddenly crashing (Johnson 2006).

Black rats are known to have very significant destructive impacts on a broad range of wildlife species, particularly on nesting birds and on islands. In island faunas this is particularly through predation. However, black rats are also vectors for a range of diseases, notably including salmonellosis, leptospirosis and bubonic plague, and it is feasible that their main impact on native fauna may be through spreading exotic diseases (Watts and Aslin 1981). There is reasonable circumstantial evidence of this in some cases, notably the extinction of two rodents endemic to Christmas Island within a decade or so of the arrival of black rats

(Aplin 2008). There have been no studies in the Northern Territory of the disease status of black rats.

4 Management

To some extent, the management of cats and black rats in Kakadu (and elsewhere in the Top End) has been caught in a snag – there has been little research and hence little compelling evidence of impact and hence little management and little incentive to do research. For example, they are given cursory attention only in the otherwise detailed recent feral animals strategy for Kakadu (Field *et al.* 2006). This problem is exacerbated by the relative “invisibility” of these species relative to the larger feral animals or the far more conspicuous cane toads. Further, many managers and others may have difficulty distinguishing black rats from similar-looking native rodents. Additionally, further disincentives for developing management programs for these two species are the relatively high cost and somewhat dauntingly low probability of success.

We suggest that this unconcern is not justifiable, and that an integrated research and management program should be established targetting these two species.

For feral cats, we suggest:

- that one or more moderately large exclosures be established that can serve to demonstrate unequivocally the impact of cats in this region, and (presumably) provide ongoing conservation benefit;
- an intensive study of some additional native (mammal) species likely to be affected by cat predation (such as northern brush-tailed phascogale) and intensive study of cats themselves (including their disease status);
- a broad-scale assessment and monitoring program based on sand plots could be developed to provide indication of trends in cat numbers and identify key areas that could be specific foci for targeted control;
- experimental trials should be conducted to identify the most effective control mechanisms;
- fire regimes be maintained that minimise extensive areas of hot fire;
- an appropriate communication program be implemented to dissuade people keeping cats in Kakadu.

For black rats, we suggest:

- a study be established at one site to determine the ecology of black rats in native vegetation;
- the disease status of all known populations be examined;
- options for control measures be investigated; and
- known populations in Kakadu be exterminated.

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