



# TROPICAL SAVANNAS CRC

Cooperative Research Centre for Tropical Savannas Management

## Quolls decline as cane toads advance into Territory

Surveys of quoll populations reveal grim news as cane toads invade Kakadu, writes *Meri Oakwood*



*The cane toad (*Bufo marinus*) was been steadily spreading across Australia since its introduction in 1935. Top right, northern quoll at the Mary River Study site, February 2002. This quoll population is now extinct. Photo: Katrina Reid*

As their range has expanded into the Northern Territory, there has been considerable debate over what impact cane toads will have on the native fauna (See: 'The cane toad dialogues: disaster or disruption', *Savanna Links*, 16, p. 1).

Some experts, such as Professor Mike Tyler from the University of Adelaide, forecast an ecological disaster affecting a range of predatory species. Other scientists, such as Dr Bill Freeland, former head of the NT Parks and Wildlife Commission, believe that although species may suffer massive declines initially, they will bounce back within a few seasons. Unfortunately, in the areas

of Queensland that experienced toad invasion years ago, no methodical scientific monitoring was conducted. We only have a couple of field studies in the Gulf country<sup>1,2</sup> and anecdotal stories from Queensland on which to base predictions.

Cane toads reached Kakadu in 2001, and were first recorded in the south-east at the junction of Gimbat Creek and a creek from Mt Evelyn in April of that year. Since then they have spread northwards and westwards across the Park with sightings now occurring in Jabiru.

There have been several projects instigated in the Park to monitor the effect

### MISSION:

*To achieve sustainable use and conservation of Australia's tropical savannas through excellence in collaborative research, communication and education*

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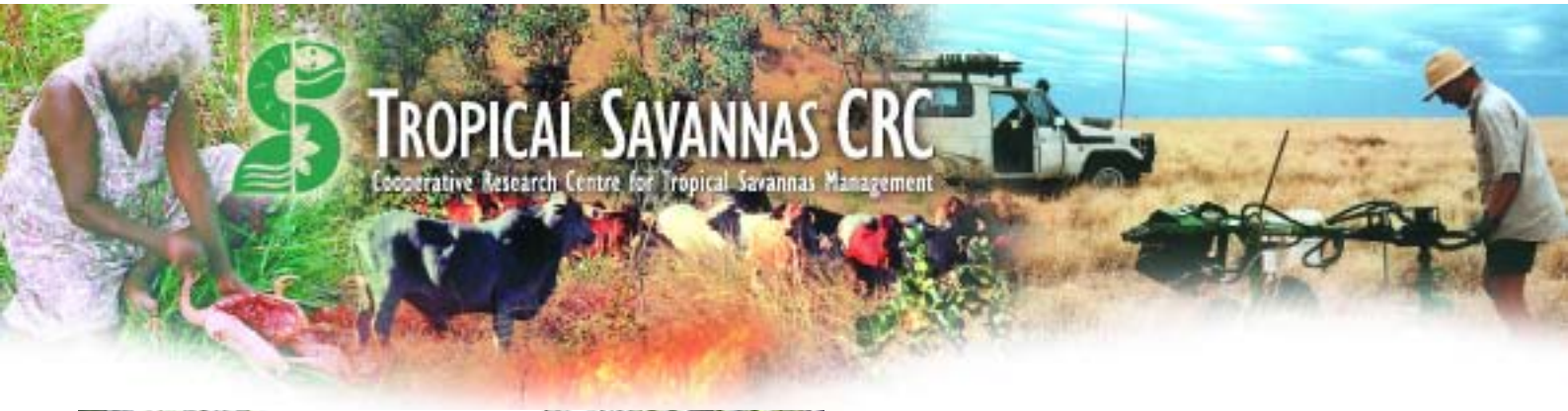
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View with quoll den in foreground, Mary River district, NT. Quolls frequently den in rocky boulder piles, often at the highest points of hills or outliers. Photo: Meri Oakwood

of cane toads on the native fauna. Professor Gordon Grigg (University of Qld), Dr Andrew Taylor (UNSW) and Hamish McCallum (UQ) installed audio monitors at six sites to determine whether the composition of the native frog community changes. Dr Dan Holland has radio-tracked the two largest species of woodland goannas, *Varanus panoptes* and *V. gouldii*. Michelle Watson (Charles Darwin University) has been conducting broad-scale fauna surveys before and after toad invasion. I have been monitoring two populations of northern quolls, *Dasyurus hallucatus*, considered to be a high-risk species of carnivorous mammal.

### Profile of the northern quoll

Northern quolls are opportunistic predators, consuming anything that moves that is within a size range that they can manage. They eat several species of native frogs<sup>3</sup> and cane toads are easy prey. Unfortunately, all the quoll has to do is mouth the toad to cause it to exude poison from its parotoid

glands (the swellings on each shoulder behind the eardrum). The poison is then ingested by the quoll. An individual of a closely related species of quoll was observed mouthing a toad and dying ten minutes later<sup>4</sup>.

Some social native species, such as crows, have been reported to be able to consume toads safely by turning them over and only devouring the stomach region. Unfortunately, northern quolls are solitary hunters<sup>5</sup>, so there is little chance that they will learn safe toad-consuming behaviour by observation of other individuals.

### Deaths at the study sites

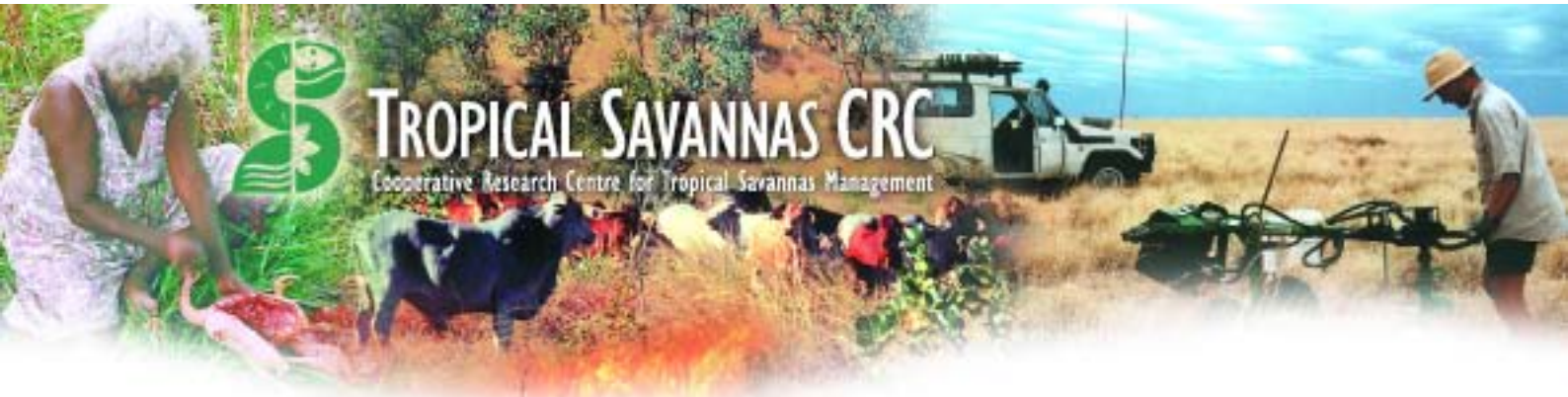
The quoll/cane toad project has two study sites: one in southern Kakadu (Mary River District) and one in northern Kakadu (East Alligator District)<sup>6</sup>.

Trapping, radio-tracking and post-mortem examinations are being used to monitor the quolls and road surveys are conducted to monitor the progress of the toads. The cane toads reached the Mary River District in December 2001 and were first recorded at the study site in February 2002.

Immediately some of the radio-tracked quolls were found dead of apparent toad-poisoning. However, the wet season is normally a time of high quoll abundance and high mortality as the juveniles become independent and compete for the limited number of territories, so these deaths had little impact on the population as a whole.

The dry season arrived, the toads became less obvious as they retreated to shelter sites near water and the quoll population followed the usual pattern of slight decline as the dry season progressed. The mating season was normal, all of





the females had pouch young and by October, the young were kept in nursery dens. In October the population was similar to that of the previous year, at its lowest abundance for the year. But then the rains began, the toads began dispersing again and it appears that as mothers died from poisoning, whole litters of young starved to death. By December, the population had crashed with only three individuals detected during trapping. In January 2003, there were still only three. In March, there were none. No quolls were caught in May and July. Toads are still increasing in numbers.

### Are toads the cause?

How can we be sure that this sudden decline is due to toads? To begin with, quolls that appeared to have been poisoned by toads, began dying the same month and in the same area that toads were first observed at the site.

These individual quolls had been monitored intensively, being trapped every two weeks, and they were healthy with no disease and no heavy parasite infestations. At death, they had no signs of predator damage or accidental injury, the only unusual sign being red irritation on the lips in some



Katrina Reed radio tracks quolls during the study

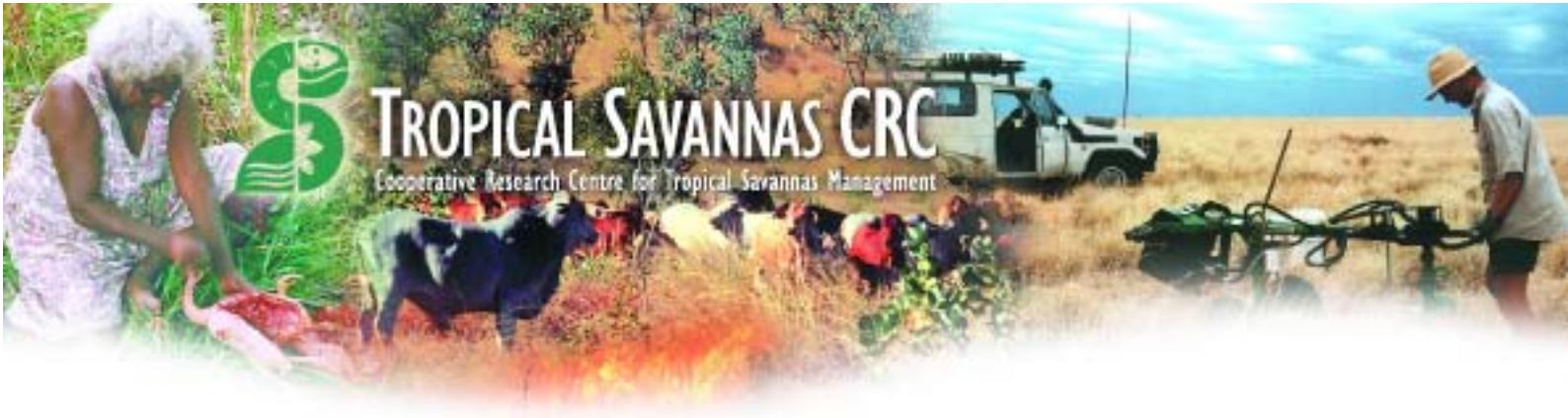
animals. There were no obvious changes in the habitat at the time except for the arrival of the toads. The most compelling evidence is that the toad-free East Alligator area still has a super-abundant quoll population.

The quolls at East Alligator are currently being intensively monitored in preparation for the cane toad invasion, which may occur this coming wet season. We expect that the pattern of decline will

### References

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4. Prof. M Archer, Director of the Australian Museum, pers. comm.
5. Oakwood, M, 'Spatial and social organisation of a carnivorous marsupial, *Dasyurus hallucatus* (Marsupialia: Dasyuridae)', *Journal of Zoology, London* 257, 237–248.
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probably be similar. This is very sad as East Alligator has the highest density of quolls that I have ever observed in 12 years of working on this species.

This massive decline of quolls to the point of local extinction was also observed in Michelle Watson's study in Kakadu which found that quolls were not recorded at all in quadrats invaded by toads, though they had been present the year before<sup>7</sup>.

So, it certainly appears that in the short-term at least, the arrival of the toads has been disastrous

for the northern quoll. Quolls were already declining throughout the Top End and the toad has certainly hastened the process. So, will numbers bounce back as predicted by Dr Freeland? Only time will tell. We will re-trap at Mary River at least once more this year, and hope to continue to monitor the site (and East Alligator) throughout 2004. The only way to address the question of long-term impact, is to conduct methodical long-term monitoring, so hopefully we will be able to revisit these sites at least once a year until about 2010.

### **Reference**

7. Watson, M., & Woinarski, J. 2003. *Vertebrate monitoring and re-sampling in Kakadu National Park*, 2002. Report to Parks Australia North.

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