

## **Project Plan SP 2006-004**

# **Impact of cane toads on biodiversity in the Kimberley**

**Animal Science**

### **Project Core Team**

Supervising Scientist	David Pearson
Data Custodian	
Site Custodian	

### **Project status as of Jan. 31, 2021, 5:11 p.m.**

Approved and active

### **Document endorsements and approvals as of Jan. 31, 2021, 5:11 p.m.**

Project Team	granted
Program Leader	granted
Directorate	granted
Biometrician	required
Herbarium Curator	not required
Animal Ethics Committee	not required

# Impact of cane toads on biodiversity in the Kimberley

## Biodiversity and Conservation Science Program

Animal Science

## Departmental Service

Service 6: Conserving Habitats, Species and Communities

## Project Staff

Role	Person	Time allocation (FTE)
Supervising Scientist	David Pearson	0.3

## Related Science Projects

### Proposed period of the project

None – None

## Relevance and Outcomes

### Background

The advance of Cane Toads towards Western Australia has caused tremendous concern about their impacts on the native fauna of the Kimberley region. Despite, the presence of this introduced species in Australia since the 1930s, surprisingly little is known about its ecological effects. While Northern Quolls (*Dasyurus hallucatus*, \_Oakwood 2003), some goannas (Burnett 1997) and a couple of snakes (Phillips, Brown and Shine 2003) are known to be killed by toads; data on impacts on other fauna is either anecdotal or non-existent (for a review, see [www.deh.gov.au/biodiversity/threatened](http://www.deh.gov.au/biodiversity/threatened)). Impacts of cane toads are potentially threefold: competition with native species, predation of native invertebrates/vertebrates and destruction of wildlife due to lethal toxic ingestion. CALM has supported the nomination of Cane Toads as a “key threatening process” under the Environment Protection and Biodiversity Act 1999, noting that “it was a significant threat to biodiversity and ecosystem function.” Most of the limited research conducted in the Northern Territory and Queensland has focused on the impacts of Cane Toads on frogs and those species that might consume toads (e.g. quolls). Vertebrates most at risk would appear to be frogs, frog-eating snakes, goannas and dasyruids. This proposal deals with major reptile, frog and marsupial groups most at risk. Other research is required on turtles, birds and invertebrate groups, especially endemic land snails. Research underway in the Northern Territory is examining the impacts of toads on goannas and a range of terrestrial vertebrates in Kakadu National Park (Watson and Woinarski 2003). Unfortunately, sites were only sampled for 1-2 years prior to the arrival of toads, limiting the interpretation of results. However, it was concluded that quolls, goannas (considered as a group), gilbert’s dragons and perhaps elapid snakes had declined. Other research on impacts on goannas and crocodiles (Griffiths, pers. comm.; Doody, pers. comm.) is ongoing. Cane Toads reached Fogg Dam (NT) this wet season allowing observation on the effects on floodplain snakes and some frogs (Shine, University of Sydney, pers. comm.). Toad competition and predation on native invertebrates has received little attention, but is constrained by sampling/ taxonomic problems and seasonal and temporal variation in invertebrate populations. Much of the information available on Cane Toad impacts is anecdotal or based on studies that have lacked sufficient pre-toad data to determine the impact of cane toads relative to other environmental variables such as rainfall or disturbances such as fire. Further, many species have not been studied at all; at present we can only guess the probable impact of cane toads. CALM has an opportunity to carry out complimentary and novel research on the impact of cane toads which can be used to plan for the conservation of species including localized control of toads, small scale fencing, translocation of threatened fauna, establishment of captive populations; among other options. The Kimberley region contains many endemic vertebrates as well as species with broader tropical distributions that may be severely affected by Cane Toads. Given the proximity of Cane Toads to the East Kimberley, it is important to establish research projects now, in advance of the potential

arrival of cane toads to ensure that adequate data on existing assemblages of terrestrial vertebrates are collected so impacts can be detected. Is this approach fatalistic? Should we be putting all our efforts into stopping cane toads and not worrying about research on impacts? Current trapping efforts will not stop toads. If some research work is not undertaken, we will have lost an opportunity to understand their impacts on East Kimberley and other northern fauna. This would severely limit our capacity to understand the susceptible elements of the fauna and so restrict management efforts to prevent populations declines and extinctions. After discussions with a range of colleagues within and beyond CALM, it appears that where we can target our research most usefully is to examine some of those faunal groups either endemic to the Kimberley, largely restricted to Western Australia or not studied in any detail in the N.T. or Queensland. Those vertebrates most likely to be impacted by cane toads (i.e. frogs, large predatory reptiles and dasyurids) are not well sampled by standard survey techniques such as pitfall trapping (Woinarski \_et al.\_ 2004). This project advocates the use of “cafeteria trials” to quickly assess the susceptibility of a range of fauna to cane toad ingestion with radio-telemetry of large individuals where captive trials are unsuitable.

## Aims

- a. Update an available model on the spread of cane toads based on recent and past data to predict the arrival times of cane toads across the Kimberley.
- b. Identify native frog, snake, dasyurids, skink, dragon and goanna taxa susceptible to cane toad poisoning or predation through captive experiments (proposed ARC linkage with Uni of Sydney).
- c. Document pre-toad species assemblages of reptiles and amphibians at a number of “benchmark” sites in the East and North Kimberley, especially those containing undescribed species such as frogs in the genus *Uperoleia*.
- d. Conduct radio-telemetry of a small number of localized endemic snakes (including the Ord Snake and Rough-scaled Python) to determine their basic ecology and possible susceptibility to toads.
- e. Regular collections and preservation of toads at the “front” for future study of changes to toads as they invade new habitat (morphology, parasite loads, reproductive output) which may assist with the development of control measures in the longer term.

## Expected outcome

- a. Accurate model of the spread of cane toads to allow planning and action by managers in advance of their arrival at various sites in the Kimberley.
- b. The identification of taxa that will ingest cane toads (and those that don't) to guide managers in what species will persist after the arrival of toads and those that may need conservation assistance.
- c. A good understanding of the pre-toad reptile and amphibian communities in the Kimberley to assess their changes over the longer term (also relevant to fire impacts).
- d. Data on the ecology of regional endemics that may be susceptible to cane toads, but for which we have insufficient information.
- e. Samples of preserved cane toads for later research on the nature of their invasive qualities.

## Knowledge transfer

CALM managers, land-holders in the Kimberley region, indigenous communities. Information would be disseminated in publications, newspapers, public talks and in public meetings.

## Tasks and Milestones

- 1) Preparation of a dynamic model of cane toad spread across the Kimberley – May 2007
- 2) Completion of a report on susceptibility trials for frogs, dragons, snakes and dasyurids – June 2007
- 3) Published description of frog assemblages at a range of sites in the East Kimberley – June 2008
- 4) Collection of snake specimens (primarily roadkills) and draft paper on the analysis of the importance of frogs in the diet of several species – June 2008
- 5) Publication of scientific paper and popular articles on the impacts of cane toads on native fauna in the East Kimberley region – December 2009

## References

Burnett, S. 1997. Colonising cane toads cause population declines in native predators: Reliable anecdotal information and management implications. *Pacific Conservation Biology* 3:65-72.

Oakwood, M. 2003. The effect of cane toads on a marsupial carnivore, the northern quoll, *Dasyurus hallucatus*. Unpublished progress report to Parks Australia North. February 2003

Phillips, B. L., G. P. Brown & R. Shine. 2003. Assessing the potential impact of cane toads *Bufo marinus* on Australian snakes. *Conservation Biology* 17:1738-1747.

Watson, M, & Woinarski, J. 2003. A preliminary assessment of impacts of cane toads on terrestrial vertebrate fauna in Kakadu National Park. Unpublished report to Kakadu Research Advisory Committee, February 2003

Woinarski, J.C.Z., Armstrong, M., Price, O., McCartney, J., Griffiths, A.D. and Fisher, A. (2004). The terrestrial vertebrate fauna of Litchfield National Park, Northern Territory: monitoring over a 6-year period and response to fire history. *Wildlife Research* 31: 587-596.

## Study design

### Methodology

The modeling of cane toad advance will build on a model earlier developed by Dr Ben Phillips using data on the known arrival times of toads at various points in the NT. This will enable the calculation of rates of spread and through overlaying environmental information in ArcView, determination of rates of spread in different landscape types.

Determining inventories of species at various sites would be undertaken by hand-searching, road driving, rock-turning and tape-recording calls and sites compared with classification procedures within PATN.

"Cafeteria trials" will use wild-caught animals and be undertaken at the University of Sydney's research facility at Fogg Dam (NT) where there are pens and cages to house a large number of animals. Between 5 and 20 individuals of each species to be tested will be offered cane toad eggs or different sized metamorphs. The metamorphs will have their parotid gland removed prior to the test to minimize the chances of death of the test animals. Sydney University has Animal Ethics approval for this work and is able to supply large numbers of cane toad eggs and metamorphs. It would be exceedingly problematic to carry out this work out in WA due to the restrictions and dangers associated with moving cane toads into WA. At the conclusions of the trials, animals would be sacrificed and lodged either in the WA or NT Museum depending on their original site of origin. Simple stats to compare proportions of animals that took cane toads in subsequent trials would be utilized.

Radio-telemetry work would involved the surgical implantation of Holohil transmitters in a variety of snakes and their regular location. Data would be analysed using various home ranges descriptors in the package "Ranges".

### Biometrician's Endorsement

required

### Data management

#### No. specimens

300

#### Herbarium Curator's Endorsement

not required

#### Animal Ethics Committee's Endorsement

not required

## Data management

Databases will be used to store data collected in cafeteria trials, from radio-telemetry and listings of species and abundances from site based collections.

## Budget

### Consolidated Funds

Source	Year 1	Year 2	Year 3
FTE Scientist			
FTE Technical			
Equipment			
Vehicle			
Travel			
Other			
Total			

### External Funds

Source	Year 1	Year 2	Year 3
Salaries, Wages, Overtime			
Overheads			
Equipment			
Vehicle			
Travel			
Other			
Total			