

The Cane Toad (*Bufo marinus*)- Unwelcome in Australia?

“Here today- in next week to-morrow!

Village skipped, towns and cities jumped-

Always somebody else’s horizon”

-Mr. Toad, in *Wind in the Willows*, by Kenneth Graham

Introduction

The Cane Toad (*Bufo marinus*) is an amphibian native to Central and South America. It was first introduced to Queensland, Australia in 1935 as a means of controlling two species of beetle (the grey backed cane beetle (*Lepidoderma albohirtum*) and the frenchie beetle), which were causing significant damage to sugar crops (Northern Territory Government, 2008).



<http://www.ypsidixit.com/blog/archives/toad2.jpg>

However, the toads failed to control the beetles (as beetles can fly and toad cannot!), and became a major pest themselves (NHT, 2004).

Cane Toads are considered to be a pest species in Australia due to the fact that they (NHT, 2004):

- Can injure humans with their toxins (poisonous toxins in their parotid glands)
- Can injure pets and other domestic species with their toxins
- Prey on native (often endangered) fauna
- Eat bees, causing huge problems for bee keepers

- May carry diseases that can be transmitted to native species, particularly frogs. Cane toads readily eat faeces and where humans hygiene is poor, the toads have been known to transmit diseases such as Salmonella
- Compete for food with vertebrate insectivores

To date, there is no known method available to control the toads across large areas, but scientists are searching for a biological control agent, such as a virus, that would act specifically on the toads (NHT, 2004).

Invasive Species

An invasive species is a species that is non-native and whose introduction does, or is likely to, cause economic or environmental harm, or harm to human, animal or plant health (NISC, 2006). The cane toad is considered to be an invasive species on the continent of Australia.

An invasive species can destroy and devastate natural ecosystems.

If native organisms can adapt to the presence of the invasive species, the severity of impact will decline with time (Phillips & Shine, 2004).

An invasive species that expands its range slowly is potentially less difficult to deal with, as there is more time to plan ahead and anticipate the actions that will be needed to conserve native flora and fauna. In contrast, an invasive species that spreads rapidly, such as the cane toad, or at varying rates through either time or space, poses a far greater challenge (Phillips *et al.*, 2007).

Expansion

A study by Phillips *et al.* (2007) investigated the rate of expansion of the cane toad.

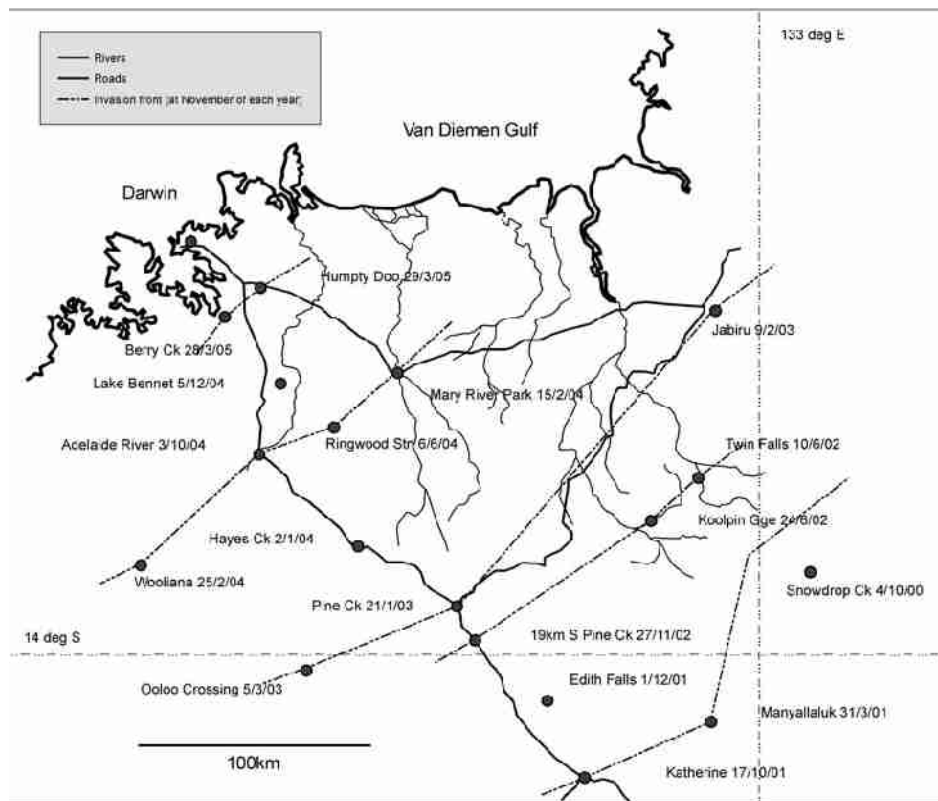
From 2001-2005, surveys at the location of the toad invasion front and radio tracking of toads near Darwin were carried out. This study revealed a much faster westwards expansion than that which had been previously recorded.

Since the toads reached the Northern Territory, Phillips *et al.* calculated that the toads had progressed an average of 55km per year (264m per night). The radio tracking suggested that this displacement was due to rapid location by free-ranging toads, rather than human-assisted dispersal (for example: being transported amongst deliveries etc.).

So, the question was asked, “why have cane toads expanded their range more rapidly in recent years (2001-2005) than was the case several decades earlier?”. Phillips *et al.* suggested two possible explanations for this temporal shift:

1. the environments that the toads are invading are different (such that the wet-dry tropics of the Northern Territory somehow facilitate more rapid expansion/dispersal) and/or
2. the toads themselves have become modified in some way over the course of their invasion, such that natural selection has produced toads that are more rapid colonisers (for example: more active, more mobile or adapting a more consistent direction of dispersal).

Both of these scenarios are plausible, however, the fact remains that the cane toad's expansion appears to be getting faster.



The advancing toad front in the Northern Territory, 2000–2005. Dotted lines represent records up to November of each year (the end of the dry season).
Phillips *et al.* (2007)

Affects on Other Species

Ways in which the presence of the cane toad may affect other species shall now be outlined, giving examples of each of the following:

1. Possible cause of extinction
2. Altering numbers/abundance
3. Altering morphology of predator species

Clavero and García-Berthou (2005) investigated whether or not it was true to say that invasive species are a leading cause of animal extinctions. They did this by using the IUCN database. The IUCN database includes a hierarchical classification of threat to wildlife (for example: harvesting, habitat loss, invasive species and so on). Detailed information relating to the causes of extinction is also provided within the database.

Clavero and García-Berthou showed that, of the 680 listed extinct animal species, causes of extinction could be compiled for 170 of them, of which 91 (54%) of these species' extinctions were caused partially by the presence of invasive, non-native species. For 34 cases (20%), invasive species were the only noted cause of extinction.

So, if invasive species can cause such devastating affects to local native flora and fauna, should there be concern regarding the cane toad's presence in Australia?

The northern quoll, *Dasyurus hallucatus*, a small carnivorous marsupial is a declining species now listed as "lower risk, near threatened" by the IUCN. Local extinctions of this species have already occurred, most probably as a result of the cane toad's presence. The northern quoll was determined by the ERISS Risk Assessment of Cane Toads in Kakadu National Park to be the single highest risk species within the national park (Oakwood & Hooke, 2005).

Other species have been suggested to be threatened by extinction due to the toad's presence, but no scientific evidence exists to prove this. These species include:

1. Australian pygmy crocodile (www.telegraph.co.uk)
2. Goannas (WWF website)

Greenlees *et al.* (2006) investigated the effects that the cane toads were having on the invertebrate fauna of the tropical Australian floodplain. They carried out experimental trials to investigate the effect of the toads' presence on invertebrate fauna in small (2.4 x 1.2m) outdoor enclosures on a floodplain near Darwin.

Greenless *et al.* showed that the toad significantly reduced the abundance of invertebrates and species richness. However, this reduction was approximately to the same degree as an equivalent biomass of native anurans. Therefore, they predicted that if cane toads simply replaced native anurans, the off take of invertebrates might not be substantially different from that due to native anurans before the toad invasion.

The presence of cane toads, as shown by Phillips & Shine (2004), can induce morphological changes in other species. They hypothesised that the presence of toads should favour an increase in mean body size and a decrease in relative head size of four species of native snakes (potential predators of the toads). They believed maximum relative prey mass (and the probability of eating a toad large enough to be fatal) decreases with an increase in snake body size.

The results showed that, as predicted, two toad-vulnerable species showed a steady reduction in gape size and a steady increase in body length with time since exposure to toads.

These results provide strong evidence of adaptive changes in native predators as a result of the invasion of toxic prey.

Control

As previously mentioned, to date there is no known method of controlling the toads across large areas. However, a study by Brown *et al.* (2006) suggests that simple habitat manipulations and changes of roadside verges may help to reduce the rate of dispersal of cane toads across Australia. This conclusion was reached by investigating the idea, which was first suggested after carrying out surveys of the compass orientation of dispersing toads on the roads, that most toads move along the main axis of the road (thus travelling along the road), rather than crossing it.

Brown *et al.* tested the hypothesis that roads enable toads to disperse more rapidly and easily than would be possible across more densely vegetated sites. As predicted, toads rapidly slowed down in dense roadside vegetation but continued to move steadily through open areas. These results suggest that simple habitat manipulation of roadside verges may help to reduce the rate of dispersal of cane toads across tropical Australia.

Conclusions

When researching for this essay, I was surprised at how few scientific papers and literature have been published regarding the invasion of the cane toad.

Given that massive public concern over cane toad invasion has brought about very high levels of funding for research on this topic (to date > \$ 9,000,000), it is surprising not to find more available information on this subject. One explanation for this lack of information may be due to the fact that not everybody sees the cane toad invasion as being totally negative. Below are some examples of relatively positive aspects relating to the invasion.

- There are numerous accounts of Australians keeping the toads as family pets. The Australian Museum website in the past even included instructions on how to care for pet toads (Trigger *et al.*, 2008)
- There is potential for the toads to be used as a biological control method of other invasive species. Caudell *et al.* (2002) tested the cane toad as a way to control brown tree snakes (*Boiga irregularis*) on Guam (island off Indonesia). However, it was unfortunately not successful.
- In the State of Queensland, the National Trust has accepted a nomination to add the cane toad to its list of state icons. To become a state icon, items must have represented an important part of the state's history or contributed to its cultural identity. It is without a doubt difficult to deny the fact that the cane toad fits into this category, especially if the abundance of cane toad souvenirs in tourist shops is considered. Not surprisingly, this decision received considerable opposition from the public. However, the Executive Officer of the National Trust points out in defence of the decision that "icons are not necessarily meant to be loveable" (Trigger *et al.*, 2008)
- Finally, Queensland state rugby team has for 20 years unofficially adopted the cane toad as its emblem. Clearly the animal's alleged quality of toughness is thereby put to use as a form of proud self identification (Trigger *et al.*, 2008).

With the help of media coverage, the race to “Stop the Toad” has captured the attention of many citizens throughout Australia.



<http://www.stophthetoad.org.au/index.php>



<http://www.frogwatch.org.au/images/toadbuster.jpg>

Opinions at a public symposium held in Perth in August 2005, reflected a battle strategy. A representative from the “Stop the Toad” action group spoke of the need to make “a pre-emptive strike against the toad outside of our borders” and encouraged “community surveillance” to prevent the spread of this “immediate and irreversible threat”. In conclusion to the symposium, the final speaker summed up the days discussions with the famous quote “ask not what your country can do for you but what you can do for your country”. (Trigger *et al.*, 2008).

It is clear that more negative aspects than positive ones are attached to the presence of the cane toad in Australia.

It is rather obvious that the toads need to be controlled. However, this should be carefully considered first, especially if a predator species is to be introduced, seeing as the toads were first introduced in order to control other species that had become pests.

Control should perhaps involve environmental manipulation or the introduction of a biological control agent which would act specifically on the toads.

Some suggestions have been made in the past, as a way on controlling the toad, which would never be tolerated in relation to native or domesticated species, such as bludgeoning them with golf clubs or cricket bats as publicly recommended by a member of parliament in the Northern Territory. It was also suggested that the toads could be deposited in “toad detention centres” from where they would be collected and humanely destroyed with the aid of carbon dioxide (Trigger *et al.*, 2008).

It is necessary for the Australian Government to come up with a sophisticated, fool-proof, humane plan to control this invasive species as soon as possible. Cane toads pose threat to native fauna, human health and Australian wildlife and ecosystems. The presence of the cane toads in Australia today, is without a doubt, a mostly unwelcome one.

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