CANE TOADS IN WESTERN AUSTRALIA: a prediction (March, 2005)

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Abstract

The introduced pest the cane toad (Bufo marinus) has devastated suitable habitats throughout Queensland where the Bureau of Sugar Experimental Stations at Meringa introduced it in 1935. Since this biological blunder cane toads have spread from Queensland south into New South Wales where sightings have been confirmed at Byron Bay and the Sydney (Produce) Markets at Homebush (site of the Olympic Stadium). Toads were allowed to access the world class wetlands of the Northern Territory (Sawyer,G. 2004, 2005, pers.comm., Dec/Jan) and have since devastated ecosystems throughout Arnhem Land and Kakadu(Oakwood 2003) with some population estimates indicating that as many as 20 million toads may now inhabit these systems. There has been documented evidence of localised extinctions of northern quolls (Dasyurus hallucatus)(Oakwood 2003), waterbirds have died, freshwater fish and turtles have died, and a severe population decline of large predatory reptiles such as the varanid (monitor) lizards has been reported. Individual toads have been recorded from Adelaide (199?) and Perth (January 2005) and the first confirmed indications of cane toad potential to reach the Kimberley region of Western Australia occurred during late 2004 when several sightings and captures of animals occurred in and near the town of Kununurra. Climate change modelling (CSIRO 2001) has indicated that within 25 years the range of habitats suitable for cane toad habitation will extend into Victoria and South Australia along the Murray River system and eventually into Tasmania. In Western Australia toads will find suitable habitats in the Kimberley region and from Carnarvon south through Perth and east to at least Esperance. There are likely to be significant social, economic, environmental and cultural impacts upon the people of Western Australia (Guého 2004) that will require forward planning, initiative and innovation to manage the imminent threat that cane toads pose to the biodiversity of this state.

Introduction

Natural communities of plants and animals are obviously complex and when man influences one element within the community then the impacts of this action can be felt through the entire system. Determining optimal wildlife management more often becomes a subjective activity than a scientific criteria and this is one reason alone that wildlife managers themselves are often exploited for political reasons rather than any biological skills that they may possess.

The lines can become even more blurred when diametrically opposed values are introduced, in particular, in respect of wildlife welfare issues.

There must be a balance between the forces of anthropomorphism, those who see wildlife as humans in another skin and the equally misleading opposite which refuses to accede that wildlife shares any features that would warrant human concern for their survival.

There is no reason why concern for wildlife welfare should be seen as an alternative to concern for human life; in fact they are both manifestations of a caring attitude towards each other. (McFarlane 1981)

There are several categories of problems involved with wildlife management. How are the rapid declines of endangered species in today's world to be managed?

Is it relevant to sit down and discuss the pros and cons of saving usually obscure creatures from the tombs of extinction – after all many more species have become extinct in the past well before mankind came on the scene?

The gravity of the decisions that wildlife managers have to make can be explained by the irreparable effect of reaching critical population levels. "A work of art that is destroyed can never be replaced." (McFarlane 1981)

Habitat management and conservation is ultimately the most important aspect of wildlife management. Continually burn the Kimberley at inappropriate times and you can forget about conserving the gouldian finch (*Erythrura gouldiae*).

Flood areas to create dams or deplete groundwater reserves to grow inappropriate crops and who can conceive what important wildlife linchpins could be removed.

Allow cane toads unrestricted access to Western Australian habitats and begin the count of species pushed to localised and possibly complete extinction.

Habitats are threatened everywhere, ultimately as a consequence of human population growth and the demands for ever more resources.

The conundrum here is that frequently the decisions are removed from wildlife managers at this level and given over to economists, silviculturists, agronomists and politicians. When decision-making gets to this level then it is unlikely that future generations will ever get to see some of the existing habitats and the creatures that inhabit them.

Cane Toads are less than 300 kilometres from the Kimberley town of Kununurra and the world-class RAMSAR wetlands of Lake Argyle, Lake Kununurra and the Ord

River and potential impacts, upon the special habitats of Western Australia, are causing much speculation. (Hayley,J. 2004, pers.comm., 18 December)

There is still very little information, apart from anecdotal accounts, as to their long-term effect on native wildlife.

The standard government response formulated by bureaucrats and quoted as fact by successive state and federal ministers is that no species has become extinct due to toads.(CALM 2004)

This statement can never be proved and in actual fact evidence produced in the NT has shown several species probably have become extinct and that ecosystems are beginning to collapse.(Oakwood 2003)

In the case of Queensland it could be argued that only minimal baseline inventory data existed before the cane toads began their destructive invasion' so many species were no doubt lost before they could be identified as being at risk. *It is most likely that a whole generation of Queenslanders have grown up not realising what natural heritage they have lost as a result of the introduction.*(Guého 2004)

In the Territory, baseline data for areas such as Kakadu and Arnhem Land does exist but the speed of the invasion has left wildlife managers playing constant catch-up without adequate resourcing to determine present and generational impacts.

Cane Toads are now found from northern and central coast areas of New South Wales (and some Sydney suburbs) through sub tropical Queensland and into the Northern Territory extending west at least as far as Katherine and north to the outskirts of Darwin. The potential range of habitats that they could occupy in Australia includes all coastal areas of the mainland states and in Western Australia from the Carnarvon plantations to Esperance.(CSIRO 2004)

They are most abundant in urban areas, grasslands and woodlands but can also be found in a range of habitats including sand dunes, coastal heath, mangroves and through the margins of rainforest. Cane Toads are extremely adaptable feral pests that possess the undeniable ability to detrimentally modify any habitats that they enter.(CSIRO 2004)

Habits and Reproduction

Adult Cane toads are active, particularly at night, during the warmer months of the year in northern Australia. During cold and dry periods they shelter wherever they can find moisture – in crevices, under logs, rocks and other debris. Adults can lose more than 50% of their body water and absorb replenishment through their skin from damp soil or humidity.(www.fdrproject.org)

They can tolerate a wide temperature range from 5 - 40 degrees celsius and they can eat almost any animal, provided it is not more than half their own body length. In Australia they have been recorded eating mice, birds, lizards, frogs, crabs, spiders, ants, beetles, earthworms and each other.

They are incredibly prolific breeders with large females having been recorded producing in excess of 35000 eggs at a time and these are capable of surviving in freshwater systems and brackish systems where salinity levels are up to 15%. (There is anecdotal support for comments that indicate that toad spawn has been able to survive transportation through sea-water, during wet season run off periods, to offshore islands in the Northern Territory)

Cane toads are an aggressive predator potentially to many small vertebrate species that are unique to Western Australia. Combined with a highly toxic and biologically active substance produced by the parotoid glands and the presence of toxins in the toad's muscles, bones and body organs (as well as in their eggs and tadpoles) makes the cane toad a very efficient killing machine.

Impacts

There have been many observations made indicating that both native predator and prey species become rare when cane toads reach a new area, particularly in the first few years after their arrival. (Start & Done 2003 pp10-15, CSIRO, 2004)

There is evidence of local extinctions occurring as a direct result of cane toads eating or poisoning native animals. (Oakwood 2003)

So do people in Western Australia need to be concerned? The answer is a resounding yes.

Not only will there be massive environmental effects but the development of unwanted economic, social and cultural impacts also.

- Many people are directly employed in nature based tourism industries throughout the state- but if there is an immediate impact on the resource which directly attracts tourism visitors to the region then what is to stop these visitors changing their destination requirements if the attraction has disappeared?
- Reduced visitation will directly impact across a wide range of services and employment and social directions could be directly affected.
- Toads will invade the southwest part of Western Australia. The climate in this region of the state is probably most suitable and comparable to parts of Queensland that have been ravaged by toads.(IAWG/CSIRO 2001) They will hitchhike in produce trucks from the Kimberley and around Carnarvon. They will be transported in pre-pack building materials from the Northern Territory and brought in by uncaring and non-vigilant travellers and they will devastate communities and biodiversity from the Kimberley to Esperance.
- Consider the impacts on National Parks across Western Australia, the impacts on wetland areas, private dams, recreation areas such as Kings Park, Perth Zoo and events such as Skyshow and the Leeuwin Concert, the wine tourism industry, the nature based tourism industry, the poultry industry and domestic

pets and the obvious threats to the safety of children and the potential illicit drug use and add on health costs.

- Each of these areas will have to adjust and be prepared to pay the cost poultry has been known to die from drinking water poisoned by toad spawn, domestic pets have been known to die from simply mouthing toads, toads will devastate plant pollinators, eat ground nesting birds and eggs, kill freshwater sport fish such as trout and barramundi and devastate threatened species (such as the western swamp tortoise), impact on wading birds and peoples enjoyment of recreational areas (imagine having to deal with thousands of toads defecating or ejecting toxins underfoot at an outdoor venue or event) and have been identified as causing human fatalities.
- Aboriginal people will suffer as there are effects on the resources that they have traditionally used for thousands of years fish, turtles, goanna, crocodiles, small mammals and the plant resources that rely on these animals to maintain genetic diversity could all be lost with downstream social, health and cultural impacts that are only now beginning to be identified.

Very little is known about effects on invertebrate fauna apart from evidence that many species are used as a food source – this unknown quantity causes all sorts of problems when considering impacts.

It raises questions of competition between native frog species and the cane toad and the long-term food chain impacts that can only be speculated upon (such as the impact on termite species and their relationship with grass and woodland ecologies, impacts on numbats (*Myrmecobius fasciatus*) and northern (*D.hallucatus*) and western (*D.geoffroii*) quolls) but speculation should not be used as an argument for doing nothing.

All of the offspring of these animals are also at risk – juveniles, eggs, hatchlings - all are food for cane toads.

What impacts may occur to our native fish species? Barramundi is a top predator and a sought after table and sportfish – does the potential exist for this species to be affected by cane toads by accumulating toxins and becoming unpalatable in the long term? Could the advance of cane toads influence the barramundi populations? Trout populations in southern rivers are likely to be impacted upon as toads move into the climatically perfect southern part of the state.

A Northern Territory Legislative Assembly (No.1 2003) report on the issues associated with the progressive entry into the Northern Territory of cane toads has also highlighted the devastation caused to other native fauna and identified that issues exist in respect of social, environmental, indigenous and cultural activities.

Several recommendations of value were proposed through this report

• Identification by the Federal Government that a threatening process was underway as described in the Environmental Protection and Biodiversity Conservation Act 1999.

- Reclassifying cane toads into the "menace" category under the Environmental Protection and Biodiversity Conservation Act 1999.
- The identification that the issue required government and industry cooperation and collaboration.
- Offshore islands should receive extra protection as storehouses of biological material.
- That construction of man-made barriers around man-made cane toad breeding sites (sewerage ponds, shire water features etc) should be undertaken.
- That the three tiers of government should be involved in control activities,
- That the NT Government approach the Western Australian Government to reach agreement for establishing a co-ordinated approach to research and control programs

Control and Research Directions

There is evidence that a significant amount of in field control of toad populations can occur whilst biological control measures (not genetically modified viruses) are researched.(Sawyer,G., and Morris, I. 2004/2005, pers.comm., Dec/Jan)

The CSIRO has now recognised the issues associated with putting all their genetic research "eggs in one basket" and, although belatedly, have also called for the fight to be taken to the toad frontline.(CSIRO 2004)

Most resources have been spent by CSIRO developing viruses that can kill toads – unfortunately these viruses have been mutated through genetic modification to potentially also have the capacity to kill most other creatures on the planet.(CSIRO 2004 and www.fdrproject.org)

The CSIRO has stated it needs to re-assess virus research and emphasised the need for strategic localised control methods to slow down the march of the toads.

Australia is also a signatory to a number of international treaties including the *Ramsar Convention*, *World Heritage Conventions* and the *CITES Convention* all of which outline responsibilities to protect and manage biodiversity and wildlife and the natural systems in which they occur. The United Nations is also attempting to encourage member states to cease genetic modification of viruses.

A number of management strategies and control tools have been identified including

- The efficiency of Frogwatch Northern Australia (www.frogwatch.org.au) designed traps as a tool for controlling localised outbreaks of this pest.(Sawyer,G.2005, pers.comm., January)
- $\circ~$ The obvious necessity to fight the fight in the NT thus keeping this pest out of WA.
- The need for co-operative strategies between WA and the NT to manage toad populations that include barrier fencing and trapping as management tools and an immediate trialling of these techniques in the Gregory National Park (NT).

- The desire that the sugar cane industry become involved (the very industry that imported this pest) in providing resources given the \$440 million "bail out" provided before the 2004 Federal election and the subsequent record breaking profits announced by Colonial Sugar Refineries (CSR) shortly after the election.
- An immediate need for more vigilant border protection activities including the provision of a chemical based wash down facility this will provide a twofold benefit control of toads and control of seed from exotic plants
- Immediate investigation of biological control methods including research on the efficacy and delivery of lavender beetle (*Cydnidae spp.*) toxins to juvenile toads and tadpoles.
- Possible strategies may also include use of traditional indigenous water deoxygenation plants (fish poisons) to place pressure on tadpoles during the dry season and investigation of 1080 style poisons.(Guého 2004)

Agencies that are charged with protecting and conserving Western Australia's natural heritage appear to have adopted a laissez-faire attitude to dealing with the problem.

Part of this attitude revolves around:

- a) An ecological assessment of the fecundity of female toads.
- b) A poorly considered and limited economic assessment of potential impacts

It is well documented that toads can produce significant numbers of eggs and ultimately any program developed to eradicate or control toads must recognise this issue.

Existing control methods that have been developed by Frogwatch in the Northern Territory such as the light traps and "super traps" catch cane toads during the wet season and will probably be very successful at localised control of toads, particularly during the extended dry season experienced in the NT and the Kimberley region. (Sawyer,G, 2004,pers.comm., 16 Dec.)(Seebacher and Alford 2002)

The traps are effective and their use could be extrapolated to cover broader scale areas such as the invasion front.

Instead of promoting a concessionary attitude to toad control, management agencies should adopt a proactive role and incorporate the use of large numbers of traps into a management strategy for toads.

Every toad disposed of via a trap is one less likely to breed, consume threatened wildlife or kill predatory wildlife such as the varanid lizards. John Weigel, Curator of the Australian Reptile Park, was recently collecting venomous snakes in the Kimberley (2004) ostensibly for the production of antivenom to save human lives. "That was my intention but I have come to realise that these specimens may well be the only surviving examples of their species after the cane toad arrives in the region." (Weigel, J. 2004, pers.comm., November)

Traps used in conjunction with barrier fencing will slow the invasion front of toads and buy much needed time to develop suitable biological controls.

And the results are community positive, media friendly and can be used to promote public interest in the issue in much the same fashion that cetacean stranding events are publicised and dealt with even though similar economic and ecological arguments could be used to reallocate the resources currently directed to this activity. There are other examples and consistency must be promoted.

Negative bureaucratic responses reflect on those making judgements based on outdated information. It can appear that this attitude is implying that attempts to raise the issue of cane toad management is not worthy of consideration whilst in reality the negative approach promoted by agencies such as CALM actually draws into public question their entire operational parameters.

Humans are particularly effective at changing environments to suit their desired outcomes – this same skill should be brought to bear on the cane toad issue. It is important that efforts should be directed to significant physical control of toads in the Northern Territory with the aim of reducing the likelihood of infestation in Western Australia.

Conclusion

Western Australia is worth saving – unlike other parts of Australia where cane toads have established, the obvious extent of their impact on wildlife and habitats *can be* separated from other destructive impacts due to increasing human population, clearing and degrading of native vegetation, pollution of waterways and the spread of other introduced plant and animal species. *The ecosystem services that underpin* society and help regulate these issues should be identified for the extent and value of their contributions to society and social welfare.

The Western Australian State Sustainability Strategy is a trailblazing blueprint for sustainability in the world today and it clearly sets out six goals for sustainability; **Goal 3: Value and protect our environment and ensure the sustainable management and use of natural resources** (Davidson 2004) clearly identifies a government mission to engage communities to protect biodiversity which appears to have been missed by management agencies.

A recent discussion paper (CALM 2004) promotes various concepts of biodiversity conservation strategies that are based on 10 principles of conservation (pp21) which could be read as providing solid operational parameters to commence serious management actions to protect Western Australia from the threat associated with toads (and other biodiversity threats).

Reality is somewhat different. This same discussion paper has a covenant that states "The views and opinions expressed in this publication do not necessarily reflect those of the WA Government, the Minister for the Environment or the Department of Conservation and Land Management." These types of statements are designed to allow for failure – a state of "achievement" that appears to becoming more acceptable within government.

One of the conundrums here is that Australia's wildlife has brought more foreign capital to our country, it has forged bonds between countries previously at war and its original quantity and diversity has produced such an array of superlatives that we are often astounded that this appreciation is rarely recognised by policy makers.

The suck and see attitude can only result in species loss and long term effects that will be a burden of legacy that we as a species should not find attractive. Research required to obtain solid data often takes far longer to achieve than the time that is available to produce physical results and engage community support.

Trevor Tough, a long term Kimberley tourism operator, believes that "*if 10% of the money given to the sugar industry (44 million dollars) in 2004 was put up as a reward for private enterprise to come up with an appropriate solution to remove cane toads from Australia, private research companies would be crawling over each other to have a go*".(Tough,T. 2004, pers.comm., August)

Prior to the Federal election, in August 2004 the Minister for the Environment Ian Campbell issued a press release that "condemned" the Labour dominated state governments for having "shown little enthusiasm to try to combat this menace ... cane toads are causing enormous damage. States and Territories have a clear responsibility to combat and eradicate invasive pests". (Campbell, I.. 2004, in press, August)

Aboriginal people are promoting the need for proactive responses to the toad threat and identified the necessity for wildlife to be protected to ensure the maintenance of culture and accessibility to traditional bush foods.

Citing their close links to the land and their traditional requirement to ensure that "country" and all the creatures within it were protected and managed, they have called on the broader community to work together for the common good and recognise that the threat posed by toads transcended politics, race and religion and that a unilateral approach to stopping this pest reaching Western Australia was a desired outcome. (McKenzie, N. 2004 pers.comm., 16 December)

Understanding toad behaviour and the impacts NT and Kimberley environments can have on them are areas where research dollars should be directed immediately.

Research undertaken at James Cook University in Queensland has indicated that toads require access to water every four days (Cohen & Alford 1996; Seebacher and Alford 2002). Given the extended "dry" seasons experienced in the Northern Territory and the Kimberley this is a weakness that can be exploited by incorporating physical control, trapping and barrier fencing into management strategies. (Guého 2004)

The strong community spirit that has been evident at recent public meetings in Broome and Kununurra (2004) is further evidence that the Kimberley region believes

that a real solution is in sight especially when it is recognised as an issue that will soon affect all Western Australians.

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