Island **battlefront**: Toads versus native fauna

Kimberley islands are providing our native species with havens from the advancing and insidious cane toads. Or are they?

by David Pearson, Corrin Everitt, Jasper Kruse and Andrew Rethus

Introduced cane toads have spread across northern Australia since their release in Queensland in 1935. In 2009, they entered Western Australia's east Kimberley, marching westwards at a rate of about 50 kilometres per year. As part of the State Government's Cane Toad Strategy for Western Australia significant scientific research has been undertaken to understand and control this insidious pest. Cane toads are toxic to many Australian native species courtesy of the large parotid glands located on either side of their necks which exude white bufotoxin, a strong and complex poison that can kill very quickly. The most affected native species are larger predators such as northern quolls, goannas and venomous snakes, but also some smaller species such as northern bluetongue lizards. Toads at the front of the invasion tend to be large, efficient dispersers and are the first toads that naïve wildlife encounter. Their large size translates to large bufotoxin loads and so these pioneer toads have a devastating impact on the populations of species that attempt to eat them.

ALL DOOM AND GLOOM?

As cane toads have invaded various areas, there have been reports of the deaths of many species including frogs and predators, suggesting toads were having catastrophic effects. However, a laboratory study conducted by the University of Sydney with assistance from Parks and Wildlife found there was actually a range of responses to toads among mammals and reptiles. Many species ignored toads and did not try to eat them; others tentatively bit toads and received a non-lethal dose of bufotoxin

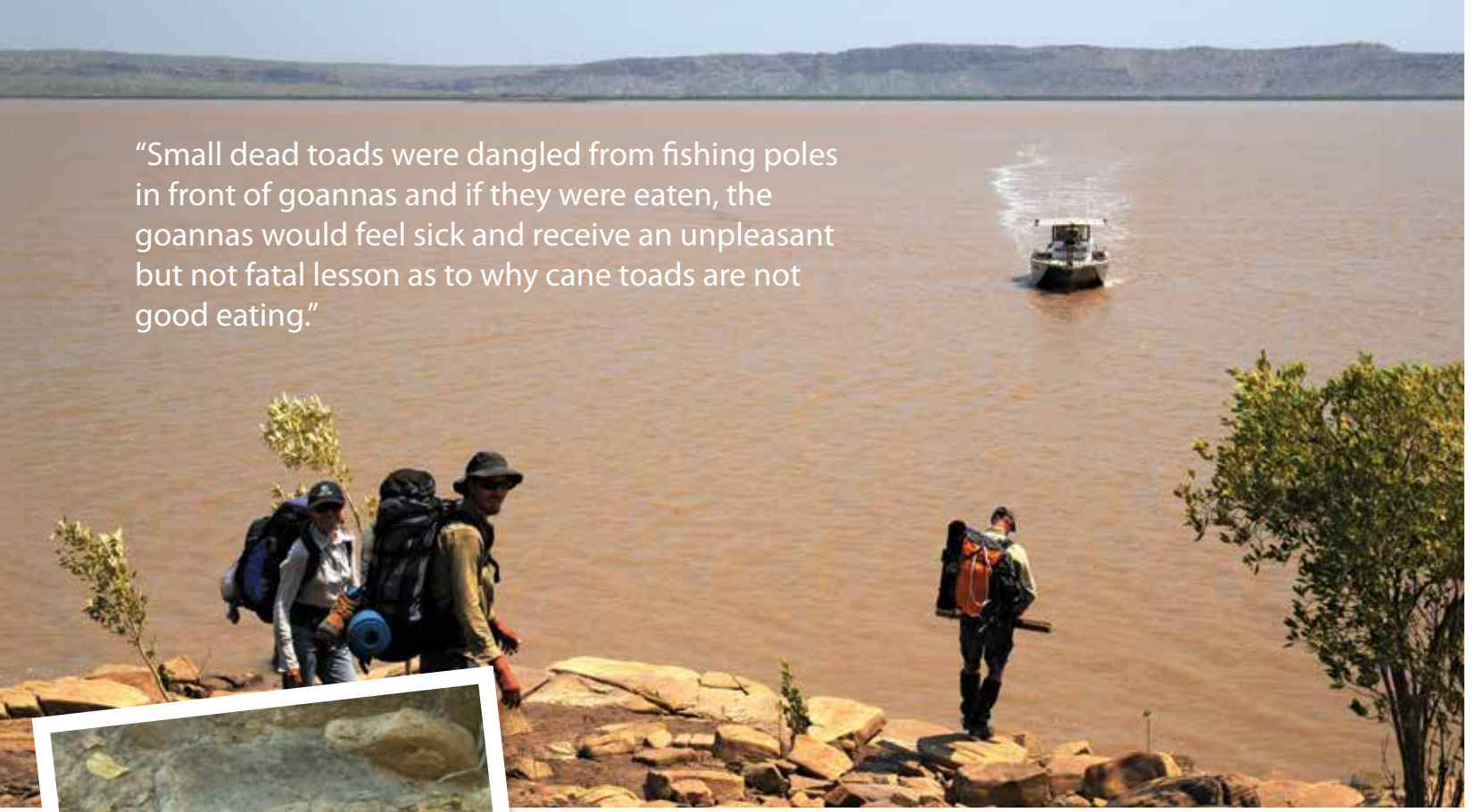
and were subsequently not tempted to try another; while in others a proportion of individuals were killed by toads. In some species, such as larger venomous snakes and several species of goannas, the majority of individuals found their first experience with a toad lethal – a great concern for the likely impacts on wild populations of these most susceptible species.

Recent work by a number of research groups has focused on developing ways to train quolls, bluetongue lizards and goannas not to eat toads. 'Taste aversion' sausages made from non-toxic parts of toads mixed with a strong salt have been used to train quolls to avoid toads. The idea developed by University of Sydney researchers Jonno Webb and Rick Shine, is that by eating one of these taste-aversion sausages, a quoll is immediately nauseous and as a result will not be tempted to eat a toad in the future, associating the ill feeling with the taste and smell of toads. Similarly, in a project between the University of Sydney, Parks and Wildlife and Kimberley Balanggarra Corporation, goannas have been successfully trained to avoid large toads. Small dead toads

Opposite page
Main The stunning Adolphus Island.
Photo – David Pearson/Parks and Wildlife
Inset left Cane toad.
Photo – Parks and Wildlife
Inset right Brown tree snakes have learnt to avoid cane toads.
Photo – David Pearson/Parks and Wildlife

Above right Juvenile toads look different to adults, but they still have poison glands, which are visible here as the light brown lump behind the eye.
Photo – Jiri Lochman

"Small dead toads were dangled from fishing poles in front of goannas and if they were eaten, the goannas would feel sick and receive an unpleasant but not fatal lesson as to why cane toads are not good eating."



Top The survey team scoured the island.
Photo – David Pearson/Parks and Wildlife

Above Camera traps captured images of quolls on the island.
Photo – Parks and Wildlife

were dangled from fishing poles in front of goannas and if they were eaten, the goannas would feel sick and receive an unpleasant but not fatal lesson as to why cane toads are not good eating.

ISLAND ARKS – SAFE FROM TOADS?

As toads continue their relentless occupation of the Kimberley, it was thought that islands along the coastline might provide refuges for native fauna at risk from toad poisoning. More than 3500 islands are dotted along the Kimberley coast, but only the larger ones and those closer to the mainland tend to have large toad-sensitive predators such as quolls and goannas. Toads have already shown that they can reach offshore islands in the Northern Territory, presumably by rafting on vegetation or perhaps on plumes of freshwater that flow on top of the heavier saltwater when large tidal rivers flood.

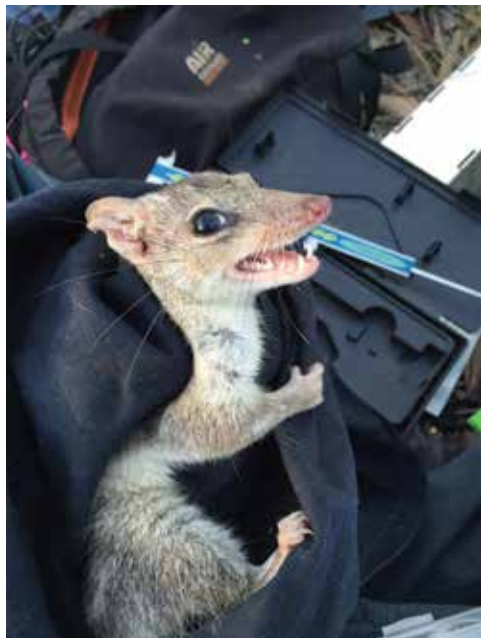
The first major island in WA that the toad front reached was Adolphus Island, which lies in the channel of the Ord River, 40 kilometres from its mouth where it empties into the vast Joseph Bonaparte Gulf. Parks and Wildlife visited the island in 2008 during the Kimberley Island Survey and detected quolls and the large floodplain goanna (*Varanus panoptes*) – species particularly at risk from toads. A team from Parks and Wildlife, the Unversity of Sydney and the Balanggarra Corporation returned to the island in 2013 to study the quolls with the intention of trialling taste-aversion sausages. However, the quoll population proved to be too small and scattered at study sites, prompting the need for further exploration of the island to see if other, and potentially larger, quoll populations could be located.

A SURPRISE ENCOUNTER CHANGES PLANS

In June 2014, Parks and Wildlife staff worked in two teams, walked around the entire island and explored suitable-looking quoll habitat identified from satellite imagery. Adolphus is steep and rocky with a 50-kilometre perimeter and encircled by saline mudflats and mangroves. There are no known water sources in the dry season, so a helicopter was used to drop water containers to use at each campsite. We searched rocky and creekline habitat looking for tracks and the distinctive droppings of quolls.

Unfortunately, and unexpectedly, on the first night a toad was found while we were putting up our mosquito nets. Toads were thought to have only recently reached the mainland adjacent to the island. Over subsequent days several more toads were located in a small seepage area and then along a seasonally dry creekline.

The lack of surface water on Adolphus Island during the dry season makes the island an unlikely habitat for cane toads. However, during our search around the



Above Corrin Everitt checking a cage trap.
Photo – David Pearson/Parks and Wildlife

Above right A northern quoll being measured.
Photo – Jasper Kruse/Parks and Wildlife

RIght A poisoned goanna lies near its burrow with a cane toad close by.
Photo – David Pearson/Parks and Wildlife

banks of the small creeklines some dead toads were discovered as well as live ones concealed under logs and, worryingly, in the burrows of the floodplain goannas. We also began to find dead goannas and snakes. It is difficult to ascertain whether these deaths were due to toads, but the position of their uneaten bodies in creeklines and in the open suggested that death was quick, not the result of a predator, but from rapid poisoning, typical of toads. Eventually during the search a fresh dead floodplain goanna was found with a dead toad alongside it. Clearly the fauna of Adolphus Island was already under assault from cane toads.

LEARNING FROM ADVERSITY

Even though it is a tragedy that cane toads have reached Adolphus Island, it is important to make the most of this unfortunate occurrence and learn as much as we can about how toads use the island, where they shelter, if it is possible to remove them and how native fauna are surviving – are they learning to avoid toads without our intervention?

At a number of sites where we knew or suspected quolls might persist, automatic motion-sensitive cameras were set up to detect them. The batteries on these units last many weeks so it was possible to get detailed surveillance of sites long after researchers returned home. Quolls were caught with Elliott traps with the intention of feeding captured individuals taste-aversion sausages to train them to avoid toads. We continued to explore the island both day and night with head torches to find out what native fauna persisted and to gauge the areas that toads were present. In some areas, tethered taste-aversion sausages were placed in front of cameras to see if wild quolls consumed them and what other animals may eat them.

EARLY BUT ENCOURAGING DAYS

After observing many dead goannas in the first few months of our work on Adolphus Island, we were encouraged by still finding active burrows and tracks of goannas. It seems some goannas must have learnt to avoid toads. Presumably they were fortunate enough to encounter

Above The northern bluetongue lizard is one species affected by cane toads.

Above right Water and supplies were delivered to the island by helicopter.

Below Ongoing monitoring of the island will determine if native populations survive and recover.
Photos – David Pearson/Parks and Wildlife

a small toad rather than a lethal large one and had learnt themselves. Trapping indicated that quolls were still present although at reduced numbers compared to the pre-toad situation. In addition, the cameras detected quolls at other sites. Olive pythons, recorded anecdotally to be killed by toads, are still encountered at night often in close proximity to toads, so they too seem to have learnt to avoid toads.

Cameras are left on the island to provide longer-term surveillance. One unusual outcome of having cameras on the island was the detection of a rare bird, the Eurasian hoopoe (*Upupa epops*) that decided to inspect one of our cameras. This was only the fourth recording of the species in Australia.

Our hope is that the fauna of Adolphus Island is resilient and able to survive the arrival of cane toads. Eradication of toads from islands, even arid ones like Adolphus, is very difficult because toads are able to survive under logs, in rockpiles and goanna burrows, and they have the ability to build populations from small numbers. Taste aversion training of quolls provides a technique to preserve small pockets of quolls. However, the logistics of producing the taste-aversion sausages, dispersing them in remote places and their short longevity in the field means they have a limited though potentially significant role in ensuring quolls persist in the landscape and can recolonise habitat after the main front of toads has passed through.

Even though cane toads have severely impacted a few reptile species and quolls, Adolphus Island remains an important sanctuary for a range of birds, small reptiles and several frogs, away from some of the threats prevalent on the mainland such as feral cats, habitat change due to grazing by cattle and frequent wildfires. Early indications are that toad-susceptible species on Adolphus have survived the initial invasion of cane toads and ongoing monitoring will determine if populations are able to remain viable and recover. This will provide valuable information to guide the management of wildlife on other islands likely to be invaded by cane toads.

David Pearson is a Parks and Wildlife principal research scientist. He can be contacted on (08) 9405 5112 or by email (david.pearson@dpaw.wa.gov.au).

Corrin Everitt is Parks and Wildlife's State Cane Toad Initiative program coordinator. She can be contacted on (08) 9168 4200 or by email (corrin.everitt@dpaw.wa.gov.au).

Jasper Kruse is a Parks and Wildlife technical officer based in the Kimberley Region. He can be contacted on (08) 9168 4223 or by email (jasper.kruse@dpaw.wa.gov.au).

Andrew Rethus is a State Cane Toad Initiative school-based trainee. He can be contacted on (08) 9168 4200 or by email (andrew.rethus@dpaw.wa.gov.au).

The authors would like to acknowledge the work and support of their Parks and Wildlife colleagues in the East Kimberley District. The Balanggarra Aboriginal Corporation kindly provided permission to work on the island and provided great assistance with the logistics of this study.