# Racing cane toads reveals they get cold feet on Southern Australia invasion

26 August 2008

Cane toads weren't allowed to compete in the Olympics, but scientists have raced cane toads in the laboratory and calculated that they would not be able to invade Melbourne, Adelaide or Hobart and are unlikely to do well in Perth or Sydney, even with climate change.

According to research by Dr Michael Kearney, from the Department of Zoology at the University of Melbourne, and collaborators from Australia and the USA, the cane toad's march will grind to a halt once it is physically too cold for the toads to hop.

"The cane toads cannot survive in much of Southern Australia because they would be too cold to move about and forage or spawn" said Dr Kearney.

Their study is unique in that it is based on an understanding of the capabilities of the toad itself whereas many other studies – some predicting that Melbourne would be invaded by the toads – are based on correlations between climate and the places the toads are living at now, which can lead to errors.

Since their introduction to Australia in the 1930s, cane toads have been steadily advancing across Australia and have already invaded Brisbane and Darwin. Once used as pest control, the toads are now a devastating pest themselves so an accurate prediction of their final range and rate of movement is essential.

If there were a cane toad Olympics, all eyes would be on the weather: because they are cold-blooded, the toad's ability to move depends on its body temperature which fluctuates with its environment.

Dr Kearney and his colleagues, including Dr. Ben Phillips from the University of Sydney and Dr. Chris Tracy from Charles Darwin University, set up a 2m sprint event for toads at a range of different temperatures to see what temperatures would slow toads down the most.

The team used field-collected toads from four populations across the invasion front.

"We found that cane toads can barely hop once they get below about 15 degrees Celsius", said Dr. Tracy. "Their range would also be constrained by the limited availability of water for their tadpoles in some parts of Australia".

After racing their toads, Kearney and his colleagues used sophisticated computer models developed by Dr Warren Porter at the University of Wisconsin, Madison USA, to predict how cold toads would get at different times of the year across Australia.

They found that it is so warm and wet around Darwin that toads there can hop more than 50 kms per year. However, the cooler, drier conditions around Sydney or Perth mean that toads can barely manage 1 km per year. And they couldn't move at all under typical weather conditions in Adelaide, Melbourne and Hobart.

They found that toads have particular difficulties in parts of southern Australia with what are known as Mediterranean climates – places with cold wet winters and warm dry summers.

"These are perfect conditions for growing wine, but you are unlikely to meet a toad at a winery" said Dr Kearney. In many of these places the air temperature at night – the active period for toads - is often above 15 degrees Celsius, but this only happens during summer, and evaporation in the dry summer air cools them down too much.

"Our study is particularly helpful in predicting where cane toads could live under climate change because we have identified a cause-and-effect way that climate limits the toads". Dr. Kearney said.

"In one way it is obvious why dry conditions are bad

for frogs – they lose too much water" explained Dr. Kearney. "But having wet skin also provides frogs with a thermal challenge because the evaporating water takes heat away from their bodies and often makes them colder than the air."

They found that a moderate global warming could allow toads to move 100 km further south than their present limit by 2050. This would make conditions in Sydney slightly better for toads, and the only other city at risk of toad invasion under this scenario would be Perth.

The work is published in this month's *Ecography* journal.

Source: University of Melbourne