

Digesting crocs' secrets – from the inside out

Crocodiles are ancient creatures that have survived environmental catastrophes over the millennia.

And many of the characteristics that have allowed them to survive into the 21st Century are only now beginning to be understood.



Most of the world's crocodylians are threatened or endangered, and although Australia's two species of crocodiles have enjoyed three decades of population growth since they were protected, these species too face new challenges to their survival, including the effects of climate change and invasive species such as cane toads.

Professor Keith Christian and Dr Chris Tracy, from CDU's School of Environmental and Life Sciences, have joined with Professor Grahame Webb and Charlie Manolis, of Wildlife Management International (WMI) and Crocodylus Park, in two projects to investigate the unique adaptations of crocodiles and their susceptibility to environmental disturbances.

The first project, funded by the Australian Research Council (ARC) in conjunction with the Innovation Board of the Northern Territory Government and WMI, is examining the digestive physiology of crocodiles with a long-term goal of improving growth rates of captive animals in the crocodile farming industry. To achieve that aim, however, the researchers are investigating the underlying physiology and behaviour of crocodiles related to their digestion.

Using recently developed techniques that measure the way nutrients pass through the intestines, the researchers have discovered that crocodiles have a surprising ability to absorb nutrients passively across the intestines. Passive absorption (as opposed to active transport) requires no energy, and thus has some advantages.

The extent of passive transport in crocodiles is comparable to that found in birds and bats – animals that have very high energy requirements. This unexpected result may be related to the fact that crocodiles and birds share a common ancestry, or, alternatively, it may be related to the fact that the preliminary measurements were all made from fast-growing juvenile animals.

Experiments planned for this year will involve larger and, therefore, slower-growing crocodiles in an attempt to further

text
Richie Hodgson





It is well established that crocodiles can die after eating a cane toad, and since both crocs and toads inhabit the edges of waterways, it seems a forgone conclusion that toads will decimate freshwater crocodile populations.

understand the pattern revealed by the initial experiments. Either way, the results will provide new insight into the inner workings of crocodiles, and ultimately these insights may be able to be exploited to produce an improved diet for captive animals.

A second project, which will begin mid-year, pending a successful ARC application, will examine the effects of cane toads on populations of freshwater crocodiles.

It is well established that crocodiles can die after eating a cane toad, and since both crocs and toads inhabit the edges of waterways, it seems a forgone conclusion that toads will decimate freshwater crocodile populations.

There are, however, several complicating factors. One factor relates to the main predators of freshwater crocodile eggs, goannas, being poisoned by toads. With fewer goannas around, many more hatchlings may be produced, even if larger crocodiles were to die as a result of eating toads. Determining the balance between these opposing forces is one of the aims of the new project.

Another complicating factor is related to apparent differences in the susceptibility of freshwater crocodile populations to cane toads – at least based on preliminary observations.

Drs Jonathan Webb (formerly of CDU) and Mike Letnic, of the University of Sydney, recently documented high mortality among freshwater crocodiles soon after the invasion of toads in the NT's Victoria River. Similar observations have been made in other rivers, including Katherine River. But preliminary observations in McKinlay River suggest much less mortality.

Although a thorough survey of McKinlay River has not been carried out since the arrival of toads (that will be the top priority if the ARC funding is successful), a survey of nests found no reduction after the arrival of the toads, suggesting that female numbers have not declined.

Variability among populations in various river systems may be caused by any number of factors, such as the ability of individual crocs to learn not to eat toads, the speed at which populations may evolve to learn to not eat toads, or pre-existing differences among populations in their propensity to eat frogs and toads. The latter possibility could relate to the fact that there are some native frogs in some river systems that are also toxic, raising the possibility that crocodiles in those areas may have a long-established aversion to eating frogs. These are among the various possibilities that researchers hope to investigate over the next few years.

The freshwater crocodiles in McKinlay River will be an important part of the study because of the long-term population data that have been collected since the 1970s by WMI staff.

Analyses of the population structure, size-dependant survivorship, and reproduction before and after the cane toad invasion will result in one of the most comprehensive population studies of any long-lived reptile. In a sense, the invasion of cane toads and their effect on crocodile populations is an evolutionary experiment on a grand scale – the sort that crocodiles have, so far, endured over the millennia.