KwaZulu-Natal: IT'S MAN VERSUS CROC

Xander Combrink

The massive die off of Nile crocodiles in the Olifants River system since 2008 brought home the fight for survival of this sentinel species in an increasingly threatened environment. Now alarming population declines have turned the spotlight on the wild crocodiles of KwaZulu-Natal. The Zululand Crocodile Research Programme is hoping to find answers. Lani van Vuuren reports.

Historically, crocodiles were abundant throughout the lower lying and coastal areas of KwaZulu-Natal, but today the last remaining wild crocodiles are restricted to the north-eastern corner of the province, from the Tukhela River northwards in an area known as Zululand. Within Zululand, viable crocodile populations are found north of the Mfolozi River with Lake St Lucia and Ndumo Game Reserve hosting two of the three largest populations in South Africa. The diversity of crocodile habitat found here, which include rivers, streams, large natural lakes and estuaries, swamp forests, pans and wetlands, is unrivalled in southern Africa.

Lake St Lucia, which is part of the iSimangaliso Wetland Park World Heritage Site, is a particularly important conservation area for crocodiles, as it hosts the largest number in a single water body in South Africa. It is also the largest viable estuarine crocodile population in Africa. Around 900 crocodiles (greater than 1,2 m) call the lake home.

RESEARCH PROGRAMME

Crocodiles are recognised as a top predator and iconic flagship species of these aquatic habitats. Increasingly, these animals are also viewed as an environmental sentinel and important indicator of aquatic

Captured crocodiles on the banks of Lake St Lucia waiting to be marked, measured and weighed. Blood and urine samples are collected and each crocodile is fitted with coloured tail tags.

Roger de la Harpe/Africa Media Online

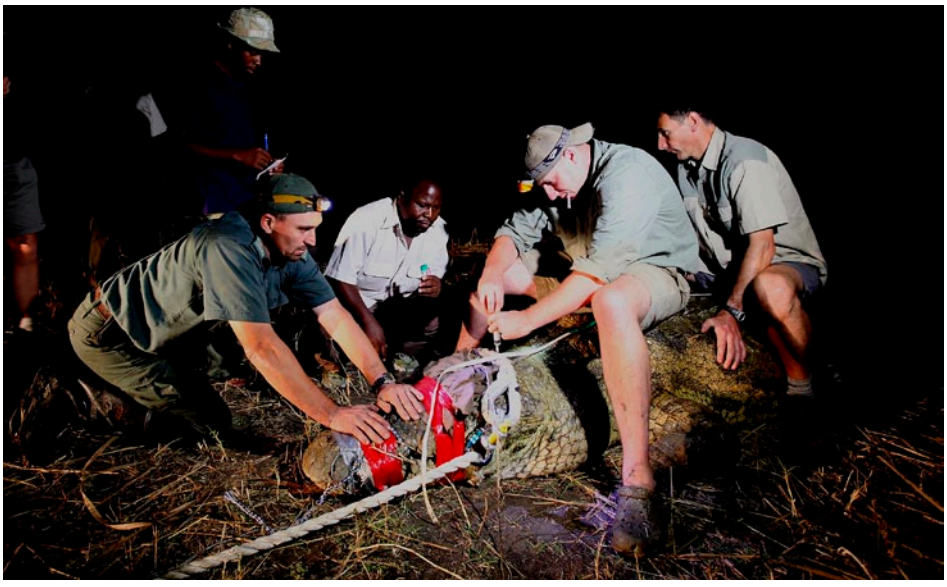
ecosystem health. If crocodile populations are sick it is a serious reflection on the health of associated water bodies and other sub-apex organisms in the food web – as has been illustrated by the death of hundreds of crocodiles from Pansteatitis (a disease which results in the hardening of the crocodile's fat reserves) in the Olifants River gorge in 2008.

Concern about the conservation status of crocodile populations in KwaZulu-Natal prompted the University of KwaZulu-Natal (UKZN), together with Ezemvelo KZN Wildlife (EKZNW), to initiate the Zululand Crocodile Research Programme in 2009. The programme is focusing on Lake St Lucia, Ndumo Game Reserve and Pongolapoort (Jozini) Dam.

The programme, which will run until 2012, is multi-faceted. It aims to improve understanding of the reproductive and feeding ecology, movements, genetics, population dynamics and toxicology for the three mentioned focal areas. For ecotoxicology analyses, tissue samples have also been collected from Moçambique and Malawi.

Above: *A baby crocodile hatches at Lake St Lucia. Destruction of nesting habitats are increasingly putting the park's crocodile population at risk.*

Below: *For every captured crocodile, blood samples are collected from the post-occipital sinus at the dorsal base of the skill and sent to a lab for analysis.*



Dale Hancock

The programme is led by Prof Colleen Downs of the School of Biological and Conservation Sciences of the University of UKZN. Three PhD students are involved in the leg work (Xander Combrink, Jonathan Warner and Peter Calverley) as well as a MSc student, Gareth Champion. Dr Ricky Taylor of EKZNW and Prof Jan Myburgh of the University of Pretoria are acting as co-supervisors. Additional funding has been received from the Hans Hoheisen Charitable Trust and the Mazda Wildlife Fund has sponsored a vehicle. The project team is also collaborating with the crocodile research project at the Kruger National Park running in parallel.

According to Prof Downs, working at several sites concurrently offers a better understanding of the different pressures present at each site as well as how the ecology varies with habitat type. "The connectivity between systems is also important, especially at Ndumo." Here female crocodiles are suspected to move across the border into Moçambique during breeding season.

PEOPLE VS CROCODILES

As in the Kruger National Park, Zululand crocodiles are increasingly under pressure. However, here the problem is not large-scale pollution of water sources per se, but rather the large-scale interaction between people and crocodiles.

Numerous waterbodies in Zululand remain unfenced with unrestricted access by people. When people and crocodiles share the same resource conflict is bound to occur. At least one person is caught by crocodiles here every year, although many more crocodiles are killed in the same period.

In addition, crocodile body parts and blood are considered to be powerful "muthi" used in traditional rituals, adding to the demise of this majestic creature as a result of illegal killings. "In a number of areas, crocodile populations have

been reduced considerably and, as a result of disturbance and destruction of nesting sites, crocodile numbers will not recover naturally," Combrink tells *the Water Wheel*.

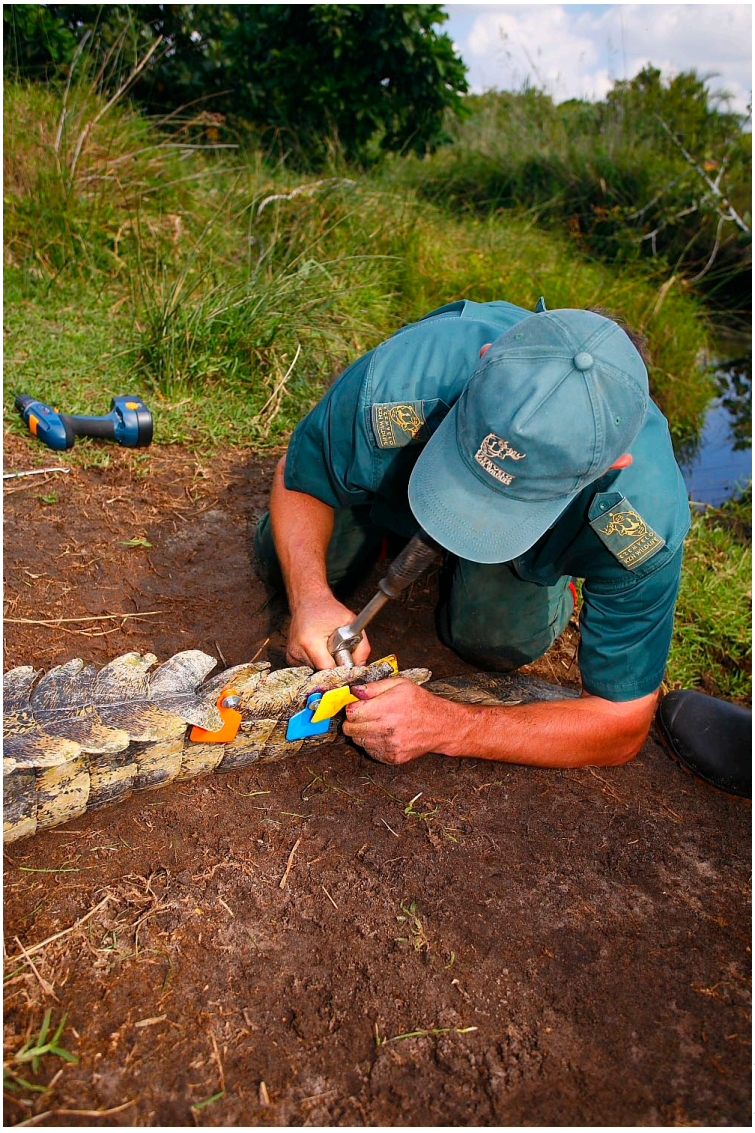
People have to start realising the importance of crocodiles as part of freshwater and estuarine ecosystems. "Possibly the only way to secure their survival is to attach some kind of value to crocodiles and linking that value directly back to the users," says Combrink. Other possible management options include creating fenced drinking areas for livestock, boreholes around waterbodies for water collection and fishing jetties.

ECOLOGY AND POPULATION DYNAMICS

Despite previous studies on certain ecological aspects of crocodiles in Zululand, this is the first time a number of populations are being investigated simultaneously in terms of movements, breeding, habitat use and population dynamics. At Lake St Lucia, GPS-GSM transmitters are being used to reveal detailed movement data for male and female adults and sub-adults throughout the different seasons. In turn, crocodiles in Ndumo Game Reserve and Pongolapoort Dam have been fitted with VHF (radio transmitters). Calverley plans to extend the Ndumo study to southern Moçambique, also using GPS-GSM technology.

To date, 20 crocodiles have been fitted with transmitters at Lake St Lucia to monitor detailed movement and habitat use. These data are retrieved via the cellphone network. For a larger sample, less detailed information on movements are recorded when captured crocodiles (marked with plastic tail-tags) are re-sighted on subsequent occasions.

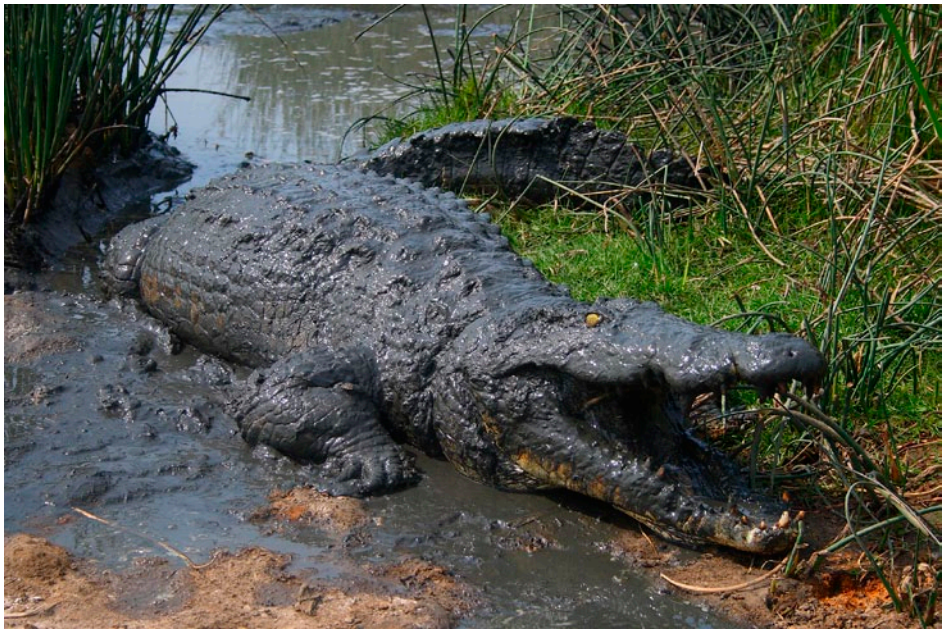
The crocodiles are also being counted as part of the study. At Lake St Lucia, EKZNW employs aerial surveys using fixed-wing aircraft at least once a year as part of its crocodile



Jelger Herder

Right: *Subsequent to capture, a unique sequence of coloured tags are fitted to the tail of each crocodile for future identification during subsequent sightings.*

Below: *A crocodile captured from a wetland on the eastern shores of Lake St Lucia.*



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monitoring programme which started in 1972. The results of these surveys are now incorporated into the Zululand Crocodile Research Programme.

In winter three to four surveys are also conducted in the course of one week as part of the research programme using Microlight aircraft. Microlights fly slower and are more manoeuvrable than fixed-wing aircraft, making it easier to spot crocodiles. However, they can only be used during winter when flight conditions are more stable. Winter is also considered the best time of the year to count crocodiles as they leave the cool water to bask on sandbanks.

In addition, the project team is counting crocodiles at night from boats. "Spotlight counts are often a more accurate method for counting crocodiles, with the added advantage of better information on sizes, especially smaller animals," notes Combrink. Because of the large number of animals that are being caught and released as part of the programme the fieldwork component is extremely time consuming.

In addition to tracking the movement of the adults, nesting surveys are done during breeding season. Information such as the number and position of each nest, as well as a suit of other habitat characteristics are recorded. During the 2011/12 breeding season it is planned to extend the nesting surveys into Mozambique. Many of the challenges experienced by breeding crocodiles have already been exposed by these surveys, such as the destruction of nesting areas by people and their cattle and increasing infestation by invasive alien plants, which make nesting difficult. On the positive side, Pongolapoort Dam, although man-made, has been identified as an important breeding population. However, nests here are vulnerable to flooding.

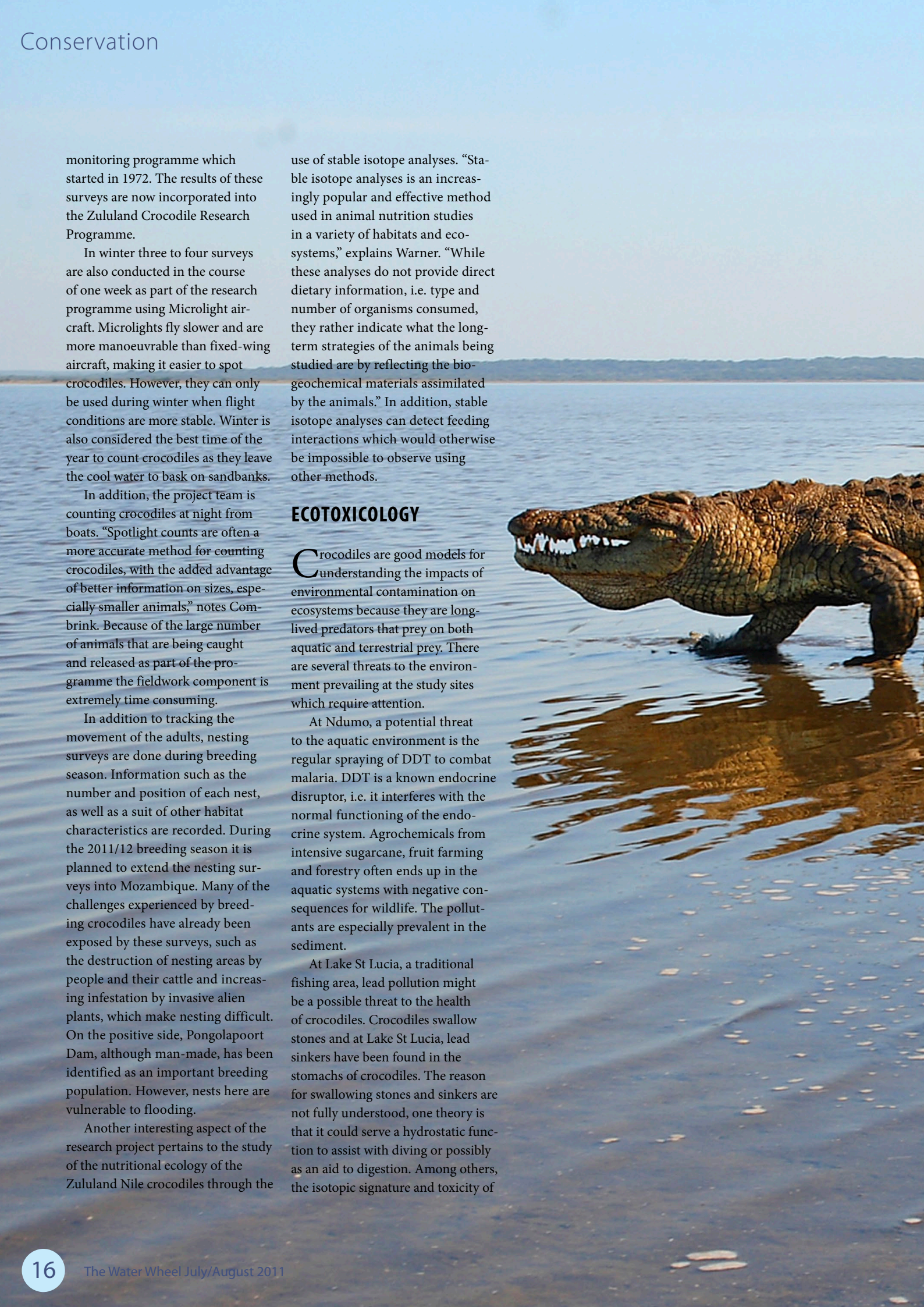
Another interesting aspect of the research project pertains to the study of the nutritional ecology of the Zululand Nile crocodiles through the use of stable isotope analyses. "Stable isotope analyses is an increasingly popular and effective method used in animal nutrition studies in a variety of habitats and ecosystems," explains Warner. "While these analyses do not provide direct dietary information, i.e. type and number of organisms consumed, they rather indicate what the long-term strategies of the animals being studied are by reflecting the biogeochemical materials assimilated by the animals." In addition, stable isotope analyses can detect feeding interactions which would otherwise be impossible to observe using other methods.

ECOTOXICOLOGY

Crocodiles are good models for understanding the impacts of environmental contamination on ecosystems because they are long-lived predators that prey on both aquatic and terrestrial prey. There are several threats to the environment prevailing at the study sites which require attention.

At Ndumo, a potential threat to the aquatic environment is the regular spraying of DDT to combat malaria. DDT is a known endocrine disruptor, i.e. it interferes with the normal functioning of the endocrine system. Agrochemicals from intensive sugarcane, fruit farming and forestry often ends up in the aquatic systems with negative consequences for wildlife. The pollutants are especially prevalent in the sediment.

At Lake St Lucia, a traditional fishing area, lead pollution might be a possible threat to the health of crocodiles. Crocodiles swallow stones and at Lake St Lucia, lead sinkers have been found in the stomachs of crocodiles. The reason for swallowing stones and sinkers are not fully understood, one theory is that it could serve a hydrostatic function to assist with diving or possibly as an aid to digestion. Among others, the isotopic signature and toxicity of



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Microlights are used to count St Lucia's crocodiles during winter months.

A marked crocodile makes his way back into St Lucia after being captured and released.

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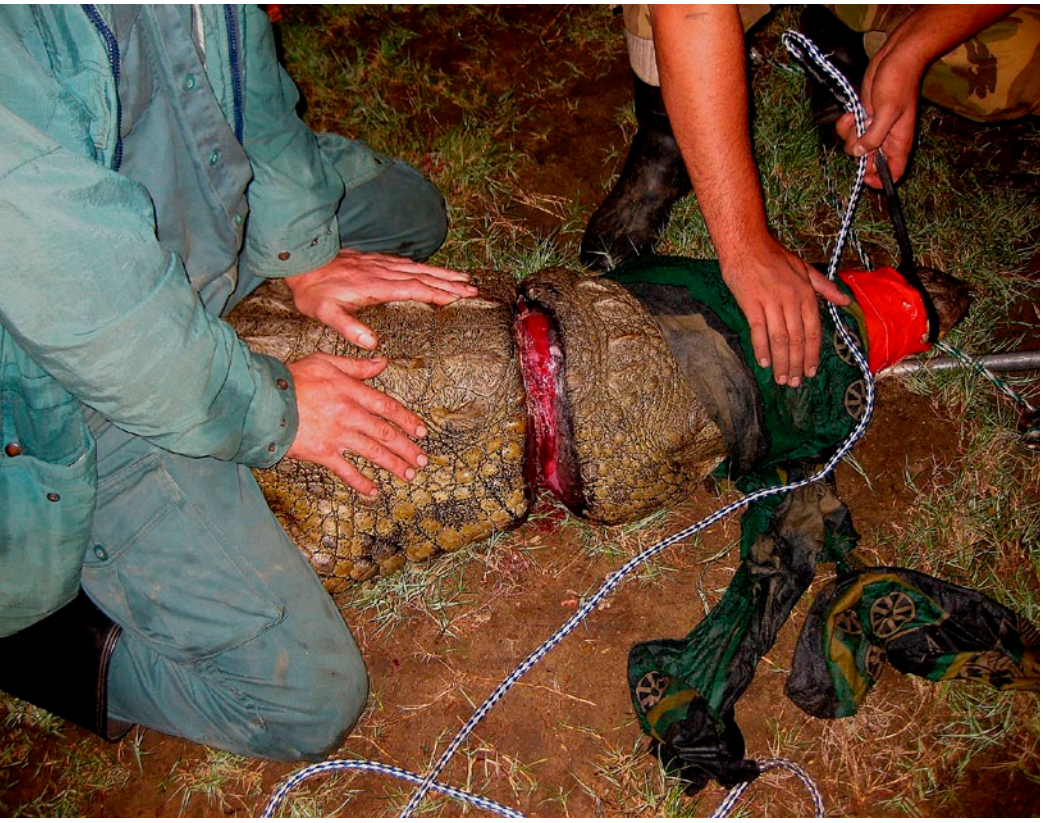
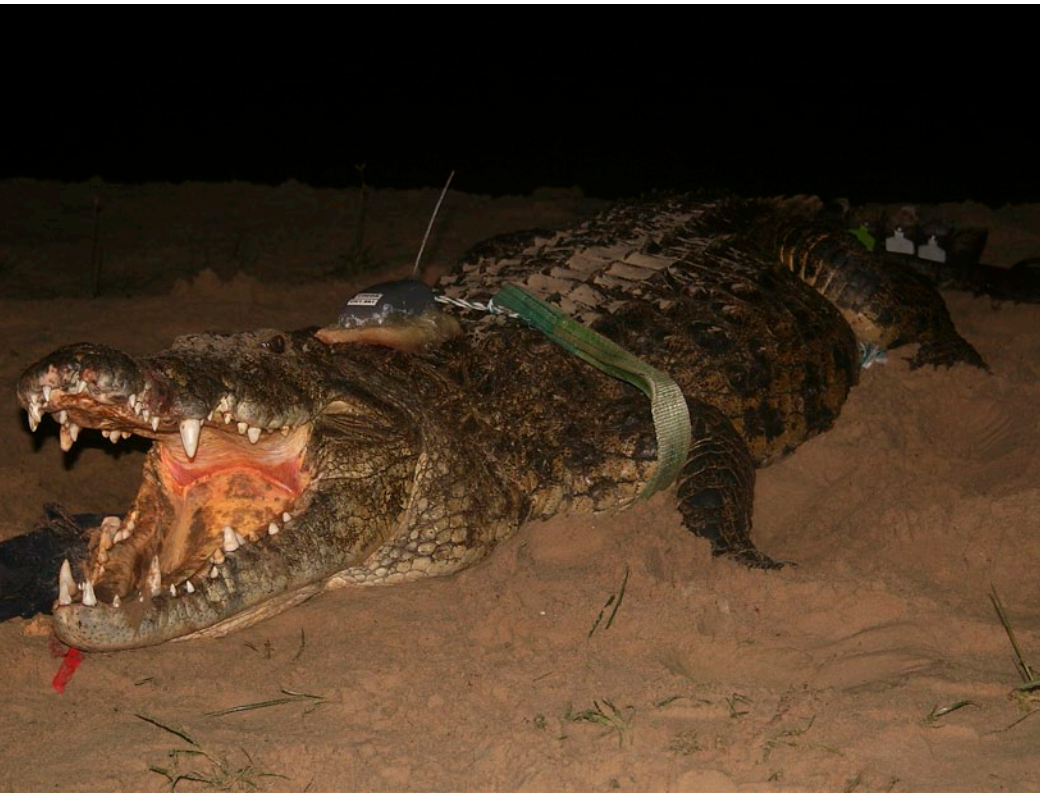
Habitat transformation in the Mkhuze swamps of Lake St Lucia.



Jon Warner

Above: *Researchers remove a steel cable from the neck of a captured crocodile. Numerous crocodiles are killed in KwaZulu-Natal for their organs which are used in traditional rituals.*

Below: *A captured crocodile is fitted with a GPS transmitter to track detailed long-term movements.*



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lead in crocodile body tissue at Lake St Lucia is to be assessed to provide answers in this regard.

GENETICS

Warner explains that the wild crocodiles of Zululand are not expected to show a high level of genetic diversity. "Although some subpopulations are probably genetically isolated, this has not been the case historically."

Still, establishing the genotype of wild Nile crocodiles will be useful in comparison with the many farm-raised (and often inbred) animals in the province that are expected to show little or no genetic variation. "If genetic diversity among a subpopulation does exist, concurrent morphometric analyses during this study may help better identify unique phenotypes," notes Warner. Unfortunately, historical relocation of crocodiles among populations as well as 'dumping' of farmed animals into wild ecosystems seriously hamper crocodile genetic studies in the province.

Although there is an inevitable delay in getting back some of the laboratory results, other findings and recommendations are made available to managers for immediate implementation. There is no doubt that the outcomes are playing an important role in the way crocodiles are managed going forward. "I believe that the programme will certainly provide a knowledge base that will enable us to apply more effective management for the conservation of crocodiles in KwaZulu-Natal," says Dr Taylor, EKZNW Regional Ecologist: North Coast, one of the initiators of the programme.

"The continuing decline of a number of crocodile populations in South Africa is alarming," notes Combrink. "Conservation of this top predator in KwaZulu-Natal is not only beneficial to the protection of other species in the food web, it is also critical to conserving the rich natural heritage of this province."