

FROG COUNT –

Study
confirms
rich bio-
diversity of
amphibians
in Kruger



Hyperolius marmoratus

They may not count among the traditional big five, but this does not make the conservation of frogs in the Kruger National Park (KNP) any less important. Lani van Vuuren reports on a current project to assess the biodiversity of frogs in the park.

Like many freshwater species, frog populations are declining globally. There are many factors that threaten their survival, among them habitat destruction and pollution. Even animals living within the confines of national parks are not safe from these influences, as the death of hundreds of crocodiles in the KNP a few years ago demonstrated.

However, while the increasing degradation of catchments feeding the KNP's rivers are well known the potential effect of this on the park's amphibian population has not been studied in depth – until now. A current study, funded by the Water Research Commission and led by independent researcher, Dr Wynand Vlok, is assessing the biodiversity of frogs associated with the major pans and rivers of the KNP as well as the physical and chemical factors affecting their distribution.

The study, which kicked off in 2009, has surveyed 45 wetlands (different types of pans) throughout the park as these are associated with the greatest biodiversity of frogs. In addition, the Luvuvhu, Shingwedzi, Letaba, Olifants, Sabie and Crocodile river systems have been sampled. Frogs are either physically identified and counted or identified through their calls.

SPECIES RICH

The study has confirmed the high biodiversity of frog species in the KNP. During the last survey, 33 frog species were recorded (the current record is 35 species). This included several new records and voucher specimens collected for several species, including the Sharp-nosed Grass Frog (*Ptychadena oxyrhynchus*), Southern Ornate Frog (*Hildebrandtia ornate*) and African Bullfrog (*Pyxicephalus edulis*).

A new record of a tadpole of the East African Puddle Frog (*Phrynobatrachus achruidoides*) was also recorded from Hapi East Pan. "This is the first confirmed record of the

species within the KNP," reports Dr Vlok. Another incidental observation was made of calling Tinker Reed Frogs (*Hyperolius tuberilinguis*) from the Lower Sabie rest camp – an area out of their normal range. "The species is possibly expanding its range northwards along the river and pan systems," notes Dr Vlok.

"Without adequate baseline data, such as species contribution within all regions of the park and population trends of species, it is impossible to determine a conservation strategy for the frogs of the Kruger."

It is no surprise that water is the main factor influencing amphibian biodiversity in the park. Rainfall is critical for the survival of the majority of frog species in the KNP as most frogs breed in shallow seasonal water bodies, such as temporary and seasonal pans, inundated grasslands and seasonal pools within rivers and streams.

Without adequate rainfall the majority of frog species cannot initiate or complete their reproductive events. This was experienced during the last field survey in December 2011. "Insufficient rains resulted in the majority of pans being completely dry resulting in little or no breeding activity," notes Dr Vlok. Thankfully, the rains arrived in late January and February, creating additional breeding habitats and inundation of the majority of larger and smaller pans within the park. "This would have resulted in the creation of additional breeding habitats and foraging areas for tadpoles."

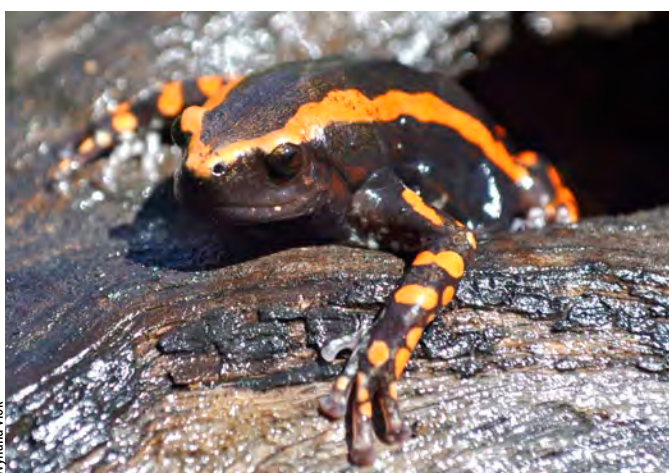
So, while causing significant damage to roads and bridges in the KNP and inconvenience for the humans that use them, the frogs would have welcomed the floods experienced earlier this year. "The frogs certainly benefited from the good rains. The

heavy rainfall would have resulted in the emergence and breeding of the majority of frog species, and especially the explosive breeders such as the African Bullfrog, Toads, Grass Frogs, and Sand Frogs," Dr Vlok tells the *Water Wheel*.

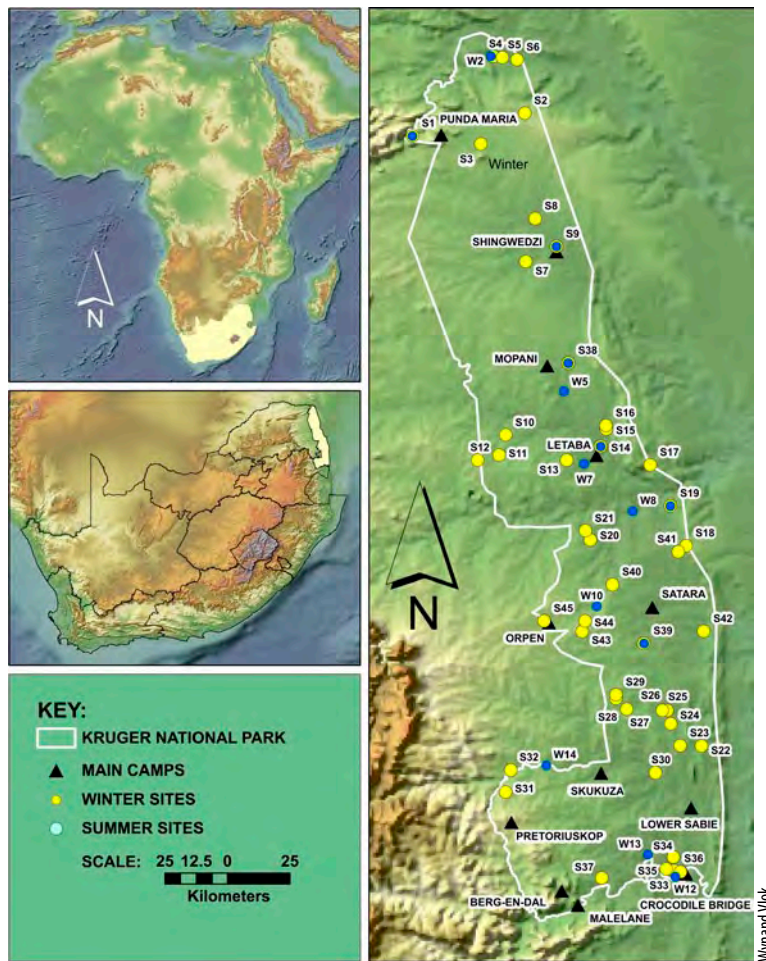
Right: The foam nest of the Southern Foam Nest Frog (*Chiromantis xerampelina*).

Below: The African Bullfrog (*Pyxicephalus edulis*), which has now been recorded in the Kruger National Park.

Bottom: The Red-Banded Rubber Frog (*Phrynomantis bifasciatus*).



Right: The main frog surveying sites.



Another important factor for frog biodiversity is temperature. Some frogs are known as more mesic temperature species, e.g. Raucous Toad (*Amietophrynus rangeri*) while others keep to the tropical savanna, e.g. Tropical Platanna (*Xenopus muelleri*), and Golden Leaf Folding Frog (*Afraxalus aureus*). “Together,

temperature and rainfall influence vegetation, another important factor for frog species distribution and diversity,” notes Dr Vlok. “Certain species such as the Brown Backed Tree Frog (*Leptopelis mossambicus*) and Southern Foam Nest Frog (*Chiromantis xerampelina*) are arboreal so trees are an important

habitat requirement. Other frog species, such as Sand Frogs (*Tomopterna* spp.) prefer sandy soils to burrow in.”

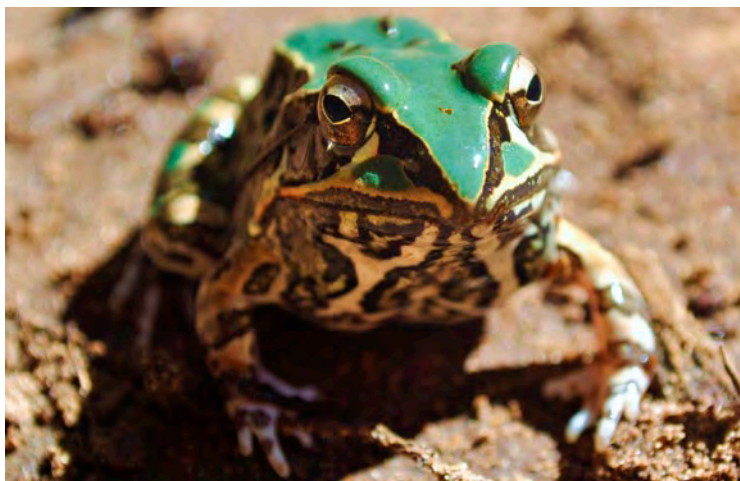
ACID RAIN

Since water pollution and acid rain are already being experienced by the KNP, another study is being undertaken as part of the larger amphibian biodiversity project to determine factors that may influence amphibian biology, distribution and population sizes. This study is focusing specifically on the possible effect of decreasing pH levels (as a result of acid rain) on frog biology and ecology. It is also determining how the presence of metals and organic pollutants can influence these amphibians. The latter is being determined through histopathological, bioaccumulation and biomarker studies.

Acid tolerance bioassays have been conducted with eggs as well as tadpoles of four frog species occurring in the KNP, namely the Flat-Tacked toad (*Amietophrynus maculatus*), Southern Foam Nest Frog (*Chiromantis xerampelina*), African Bullfrog (*Pyxicephalus edulis*) and Ornate Frog (*Hildebrandtia ornata*), using survival and development as endpoints.

No eggs have developed below a pH of 4 (acid rain with an average pH value of 4.72 has been recorded in the park), with most species requiring a higher pH concentration (value 5 to 6) to develop. Preliminary results regarding chronic exposure of tadpoles to water with low pH have found that tadpoles exposed to pH 4 to 4.5 take much longer to develop; they are also smaller than other tadpoles and differ in colour or pigmentation. Some of the tadpoles have also found to have axial deformities, where the tails are crooked.

“While the overall quality of the water at frog breeding sites is generally good, dry periods do result in a concentration of salts and nutrients. We have noted previous studies on acid rain in the KNP with concern, as



Right: A juvenile Ornate Frog (*Hildebrandtia ornata*).

we do not know how long the capacity of the soils to buffer this acidity will continue,” says Dr Vlok. “In the long run, this can have a detrimental impact on the frogs in the park, and even biodiversity in general, as evidence from Europe has shown.”

LONG-TERM MONITORING

This project has highlighted the need for an ongoing frog monitoring project in the KNP to ensure the future of these amphibians in the Kruger. “Without adequate baseline data, such as species contribution within all regions of the park and population trends of species, it is impossible to determine a conservation strategy for the frogs of the Kruger,” Dr Vlok points out. “Monitoring of the complete frog assemblages at pans will provide more pertinent information than surveys on selected flagship species or frog species of conservation concern.”

The research team has noted that several of the sites selected during the current project fulfil the criteria for long-term monitoring sites. They are accessible by vehicle, have a wide diversity of habitats as well as frog species, and have been monitored in the past. It is also important that water quality within selected pans in different regions is monitored through the wet seasons.

“More intensive studies need to focus on the current status of the Raucous Toad (*Amietophrynus rangeri*) within the park as well as the presence of the East African Puddle Frog (*Phrynobatrachus achridoides*) at other pans around Hapi East Pan (Pafuri area). Tadpole specimens of the Russet-backed Sand Frog (*Tomopterna marmorata*) and Knocking Sand Frog (*Tomopterna krugerensis*) need to be collected as they are currently unknown,” adds Dr Vlok.

In the end it is all about ensuring that southern Africa’s most famous national park continues providing a sanctuary for all creatures no matter how great or small. 

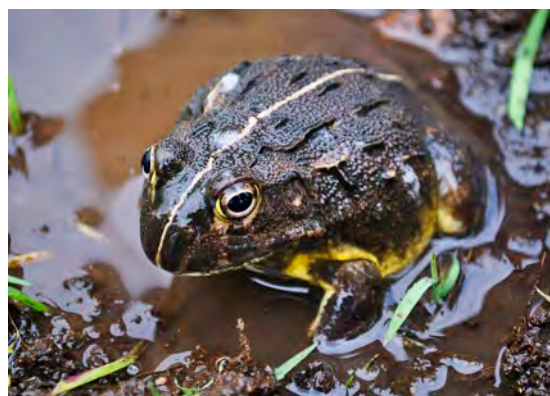


Wynand Vlok

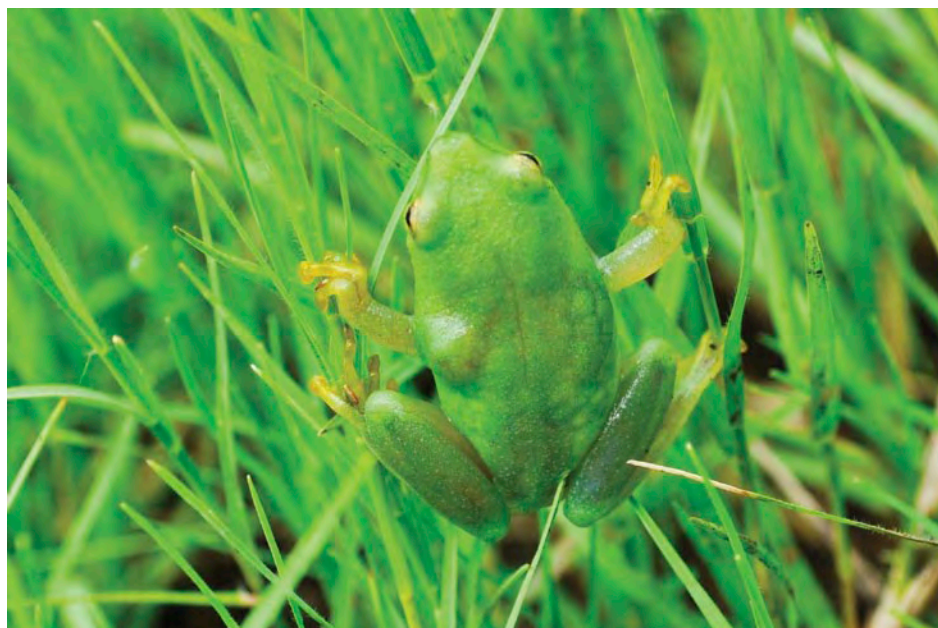
Above: The field laboratory where eggs and tadpoles exposed to waters of differing pH.

Right: Juvenile African Bullfrog (*Pyxicephalus edulis*).

Below: The Water Lilly Frog (*Hyperolius pusilus*).



Wynand Vlok



Wynand Vlok