FRESHWATER AND ECOSYSTEMS

Embracing biodiversity stewardship to help protect SA's unique frogs

Efforts are underway to target research and conservation action for South Africa's most threatened frogs, and using biodiversity stewardship agreements as one of the tools to help ensure their survival. Article by Jorisna Bonthuys.

Jeanne Tarrant

South Africa is home to almost a tenth of all known species of birds, fish and plants in the world, as well as 6% of mammal and reptile species. It is a mega diverse country, hosting some of the most unique biodiversity on the planet.

The country's extraordinary diversity of fauna and flora is also one of the most threatened. Many of South Africa's frog species are in dire straits. As part of a new area of focus for its threatened amphibian work, the Endangered Wildlife Trust (EWT) recently launched a research project in the Western Cape. The organisation is zooming in on some of the most threatened frogs in the province.

The need to conserve threatened frogs remains critical, according to Dr Jeanne Tarrant. She heads up the EWT's threatened amphibian programme. "Many of our frogs and their habitats are in trouble, and urgent interventions are needed to turn the tide," she says.

Globally, around half of all amphibian species are declining.

More than 40% are threatened, making amphibians the most threatened vertebrate group in the world. Habitat loss and degradation, climate crisis, trade and a deadly fungal disease all play a role in their demise.

Since 2012, the EWT's amphibian programme has aimed to build resilience for amphibian populations in a changing landscape. It currently implements five projects across the Eastern Cape, Western Cape and KwaZulu-Natal. These three provinces are home to the country's most threatened frogs.

"We look at threatened species as flagships for improved protection and management of important freshwater habitats," Tarrant says. "Our team then prioritise species based on threat status, existing conservation work and level of endemicity."

Looking in new spots for frogs

Although still in its infancy, the EWT's frog research in the Western Cape has already yielded promising results. The work is done in partnership with Bionerds, supported by the Whitley Fund for Nature and the Amphibian Survival Alliance.

The researchers focus on priority species that occur from the Agulhas Plain, through the Overberg and on the Cape Peninsula. These include the rough moss frog (***Arthroleptella rugosa***), the micro frog (***Microbatrachella capensis***), and the newly described moonlight mountain toadlet (***Capensibufo selenophos***) – all critically endangered.

"We also included the Cape platanna and the western leopard toad into our survey work. These two endangered species are often found in the same area as the micro frog," Tarrant says.

Using distribution prediction modelling and survey techniques, the researchers have already confirmed at least two new localities for the endangered Cape platanna (***Xenopus gilli***). Fieldwork only started in July on the Agulhas Plain and within the Nuwejaars wetland special management area near Botrivier in the Overberg. This knowledge expands the known range for this acidic, black-water habitat-specialist, according to a recent press release.

The rough moss frog has a tiny range of 0.9 km^2, making it extremely vulnerable to threats such as alien and invasive plants and fire.

The distribution of the micro frog, found in just four localities across 7 km^2, is highly fragmented and affected by urbanisation, agricultural expansion, the spread of alien invasive plants, and drainage of breeding habitats.

At this stage, the distribution of the newly described moonlight mountain toadlet is not well understood. "Given the vulnerability of these species and their limited range, targeted efforts and effective management of key conservation sites will benefit

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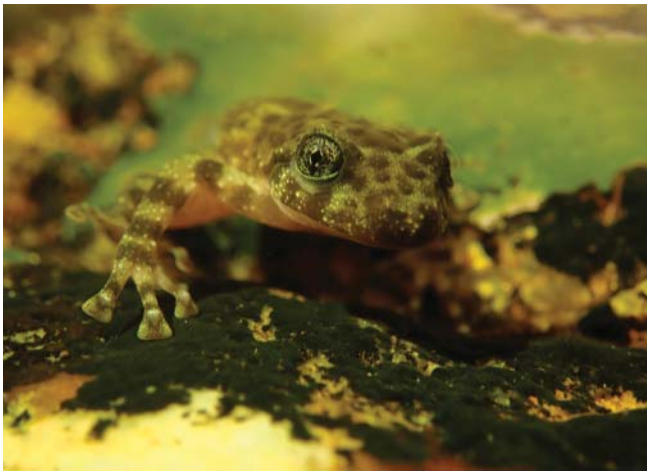
Almost 30% of South Africa's 135 frogs are considered threatened.

Jeanne Tarrant



A Table Mountain Ghost Frog tadpole (left) and an adult (right). This rare and elusive frog species is endemic to Table Mountain in the Western Cape

all three species," Tarrant says. "Frogs are generally sensitive creatures. Some are generalists and can tolerate a wide range of environmental variables, including temperature changes."

But will they be able to survive pressures to their habitat amid climate change? Scientists already predict conditions getting hotter and drier in the Western Cape over the next few decades. "This could edge many amphibian species closer to the edge of extinction," Tarrant warns.

More research is needed to improve scientific understanding of the threshold of many of these species to inform conservation efforts. Tarrant says: "We need to collect baseline data for the future."

The EWT is compiling a 10-year research and conservation strategy for South Africa's frogs.

Unlocking biodiversity stewardship for frogs

South Africa's legislation allows for the protection of habitat through mechanisms including biodiversity stewardship sites and servitudes.

Over the past two decades, there has been a shift from land purchase towards stewardship projects to secure threatened ecosystems. Between 2008 and 2016, 68% of the country's protected areas were established through biodiversity stewardship programmes. Several organisations now work both inside and outside reserves and parks to expand the protected area network.

This mechanism of habitat protection relies on agreements with landowners that remain in place in the long term – at least 30 years, and 99 years for the highest level of protection status (a nature reserve).

Landowners can enter into one of several types of voluntary stewardship agreements. Under the highest level of stewardship, a property is declared as a privately-owned nature reserve. At the other end of the scale is a non-binding, voluntary agreement to conserve the biodiversity on a property.

The EWT promotes biodiversity stewardship agreements for important freshwater environments, with threatened frogs as their flagship. "These agreements offer cost-effective solutions to achieve targets for protected area expansion in key areas, and improving the environmental management of the broader landscape," Tarrant says.

But using stewardship sites as a tool to protect threatened amphibians is a complicated and long-term process. "Landowners must be supported on their stewardship journey. Management of these sites must be adequate to ensure long-term benefits for both nature and people," Tarrant says. "It takes time to build relationships. There are all sorts of variables at play. It is an intricate process."

In the Eastern Cape, the organisation is working with the Eastern Cape Parks and Tourism Agency. Together they aim to secure up to 30 000 ha of privately-owned grasslands in the Amathole region, including through stewardship agreements. This mountainous region, considered one of the Eastern Cape's most crucial strategic water source areas, is also home to the critically endangered Amathole toad (***Vandijkophrynus amatolicus***).

In Kwazulu-Natal, the EWT works in partnership with the provincial conservation authority Ezemvelo KZN Wildlife to ensure amphibians survive outside existing protected areas. Here Tarrant and her team focus on the endangered Pickersgill's reed frog (***Hyperolius pickersgilli***), found on communal land in a semi-urban area within the eThekwini municipality. Much of its former habitat has been drained for agriculture (sugarcane and tree plantations) or completely lost due to urban development (housing) and industrial activity (mining).

Together with traditional leaders of the Sobonakhona Traditional Authority in Adams Mission south of Durban, they are exploring a communal stewardship agreement to protect this species. The land belongs to the Ingonyama Trust Board, who recently gave its support to this approach. The 500 ha wetland system, the largest intact wetland site in the greater Durban area, is under pressure from unregulated development in the area, especially in its buffer zone.

"It is an exciting project that we could replicate elsewhere on

communal land in the province," Tarrant says.

Ghosts of the mountain

In the Western Cape, the EWT partners with South African National Parks (SANParks) to ensure the survival of the Table Mountain ghost frog (***Heleophryne rosei)***. This species is found within the Table Mountain National Park, in an area of only 9 km^2. Its habitat is affected by streamflow changes, alien vegetation, siltation and path erosion.

Despite occurring almost entirely within a protected area, the species is considered to be "poorly protected". As a result, the species remains under serious threat.

Tarrant says: "Although its habitat is already under formal protection, it is not necessarily managed specifically for the species and the freshwater systems that support them."

The EWT launched a project in 2019 in collaboration with the South African National Biodiversity Institute (SANBI) and SANParks, supported by the Table Mountain Fund, to understand more about this species and its requirements. This cryptic, secretive species typically occurs in inaccessible ravine habitats. Information on its habitat requirements, breeding activity, life history and population size remains limited.

"Without a specific focus on threatened amphibians, it is possible that the frogs' habitat could be affected by invasive plants or inadequate fire management. The management of a stewardship site remains key, whatever the conservation status," Tarrant says.

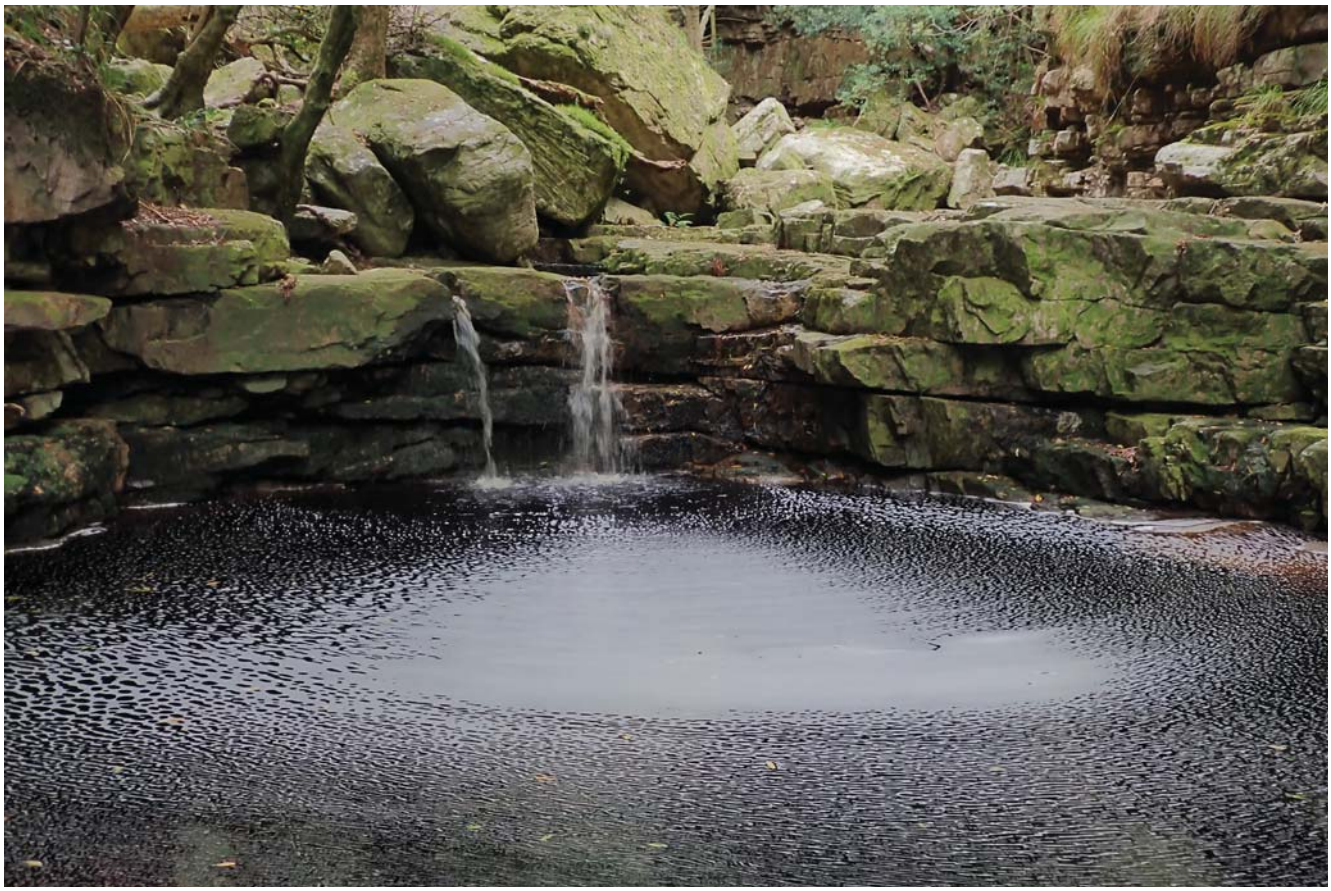
The EWT is carrying out research to support the necessary management interventions. "Our role is focusing on the frog, which relies on the functional freshwater stream environment. We help provide the research evidence and recommendations for their survival. But this information must become part of the management plans for this nature reserve."

Keeping the chorus alive

Over the years, the EWT has collected many hours (over 700) of frog call data, including through the use of passive acoustic monitoring. "Each species of frog has its own unique call," Tarrant explains. "A frog's call is an excellent aid in frog identification, and enables us to tell which species are present in an area."

Three postgraduate students at the University of KwaZulu-Natal will now analyse these recordings. "They will search for acoustic signals to use in machine learning and help inform our management efforts, thus feeding into stewardship sites," Tarrant says.

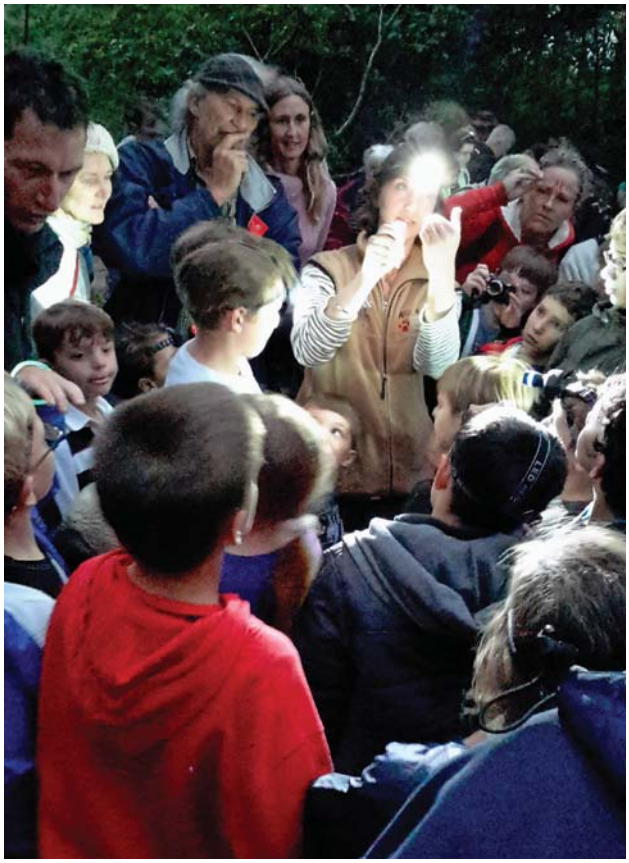
If frogs are disappearing, we need to ask ourselves what does that mean about the state of our natural resources, especially freshwater? "Frogs represent the aquatic system and are great indicators of the ecological health of freshwater systems. If you look at the value of our freshwater resources – it is pretty much a free or very cheap service that is provided to us by nature.



Jeanne Tarrant

The Table Mountain Ghost Frog is found within the Table Mountain National Park, in an area of only 9 km^2

Photo supplied



Education plays an important role in the conservation of South Africa's frog species

Globally, this resource is literally trillions of dollar worth, and we get it for free," notes Tarrant.

"Frogs also play an important role in pest control; they eat things like mosquitos and flies. They are also important in the food chain – lots of things are eating them. "If we lose our frogs that would also disrupt our food chain. Yet many people undervalue their value in nature.

She adds that in South Africa, we also have lots of superstitions about frogs – most of them are negative. "Many people are genuinely afraid of frogs, and we know public perceptions of frogs affect our conservation efforts. "There are also myths associated with frogs in some cultures. Some people associate frogs with curses and witchcraft. Others believe they shoot lightning out of their mouths. A key part of our work is to get people to understand and appreciate that these little creatures have huge value."

The race is on to prevent amphibian losses, and secure their freshwater habitats.

Scientists are now also exploring rehoming some endangered species, including the Pickersgill's reed frog**.** "We are working with wetland specialists and the Johannesburg Zoo that breed these frogs in captivity.

"We can already reintroduce captive-bred frogs back into the wild, which may allow a species to return to a healthy population. But it makes no sense to re-establish populations in systems that are degraded or not well-managed.
"In the meantime, our primary aim remains to protect the remaining populations in the wild," Tarrant concludes. "We need to know where they are and secure the wetlands and streams they depend upon."

Wetland, streams and frogs

- South African wetlands and river systems are in a critical state, with over 65% reported to be damaged and 50% estimated to have been destroyed.
- Of all ecosystems, wetlands are considered to be one of the richest in terms of ecosystem services provided. These 'services' are defined as the benefits that humans derive from nature. Wetlands and streams offer crucial habitat for many of South Africa's threatened amphibian species. Yet, the complexity of wetland ecology has resulted in them being studied the least.
- Almost 30% of South Africa's 135 frogs are considered threatened.
- Two-thirds of South Africa's frogs are endemic, meaning they are found nowhere else on Earth. Of these, the highest proportion of endemic frog species can be found in the Western Cape (with at least 40 species found only in this province).
- Amphibians are reliant on freshwater for their survival. Without water to moisten their highly permeable skin, most frog species would be unable to survive. It is also crucial for them to complete their lifecycle – most species' larval stage develops in or close to water.

Source: www.wrc.org.za; www.sanbi.org.za.

Did you know?

- There are 8 221 known amphibian species of which 7 252 are frogs and toads, 755 are newts and salamanders, and 214 are caecilians.
- New species are discovered every year. The most recently described species in South Africa include two new rain frog species (the Ndumo and Phinda rain frogs), three new mountain toadlets, and several dainty frogs.
- South Africa's smallest frog is the northern moss frog (Arthroleptella subvoce). It is 14 mm in length. This species is known only from the Groot Winterhoek Mountains in the Western Cape. It is also one of our most threatened species.
- South Africa's largest frog is the giant bullfrog (Pyxicephalus adspersus), which gets up to 25 cm and 1.4 kg. They are found throughout central southern Africa but occur predominantly in Gauteng.
- Amphibians are the oldest land vertebrates. Ichthyostega was an amphibian species that lived in Greenland 362 million years ago.
- Frogs can leap, on average 30 times their body length.
- A South African Cape river frog called "Santjie" holds the world record for frog jumping. This frog (5 mm in length), covered the longest distance covered in three consecutive jumps at 10.3 m. This jump, made in 1977, is listed in Guinness World Records.

Source: www.ewt.org.za; www.amphibiaweb.org