Madagascar now lies close to Africa.

Rainbows in Madagascar

It's been called – with justification – the most beautiful amphibian on the planet. Joshua Ralph describes the Madagascan rainbow burrowing frog, which is restricted to the island of Madagascar, and reveals just why this stunning and fascinating species is facing an increasingly uncertain future today.

Around 88 million years ago, after the prehistoric supercontinent known as Gondwanaland had begun to separate into pieces, a small chunk of land measuring 592,848 sq km (228,900 sq ml) in area started to drift away from what is now India. This ultimately formed the island of Madagascar, which is positioned off the southwest coast of Africa.

Diversity

Today, it is regarded as one of the largest and oldest islands on earth, and has had more than enough time to create an amazing array of beautiful landscapes. The diversity that exists on the island today is partly the result of its massive spine, formed by a range of mountains that extend along the island's entire length, splitting it into two.

The result is that a diverse range of unique environments can be encountered on Madagascar today. Eastern and northern parts of the island consist mainly of lush rainforests and swamps, while the west and south is comprised of a mixture of arid woodlands and forests, contrasting with parched deserts.

➤ **The landscape and vegetation in Madagascar is very varied.**
Photo courtesy JialiangGao www.peace-on-earth.org

With this unique combination of extended isolation and a varied landscape, life on Madagascar has evolved in a truly unique fashion, unparalleled elsewhere on the planet. This is reflected by the island's wildlife, with nine out of every 10 species resident there being unique. Among them are more than 500 different types of endemic amphibians, occurring in a wide range of habitats and yet found nowhere else on earth.

From lush lowland rainforests to damp humid marshlands, you would think that these habitats would be the main hotspots for amphibian life on the island; however, this is not a true reflection of the situation. Remarkably, some species have even adapted to live successfully in the most hostile of environments occurring on the island. One such species is the Madagascan rainbow burrowing frog *(Scaphiophyrne gottlebei)* whose range is within the Isalo Massif National Park.

Natural history

First described just 23 years ago by German zoologists and herpetologists Professor Dr Wolfgang Böhme and Dr Klaus Busse, the Madagascan rainbow burrowing frog is one of nine members forming the *Scaphiophyrne* genus today. It is also known as the red rain frog or Gottlebe's rainbow burrowing frog.

➤ **The Madagascan rainbow burrowing frog was only became known to science in 1992.**
Photo courtesy of Franco Andreone/http://calphotos.berkeley.edu

The Madagascan rainbow burrowing frog is typically a very small species, with females generally being slightly larger in size than males, measuring between 26-34 mm (1.02-1.34in) while males are approximately 25-33mm (0.98-1.29in). Although this arrangement is not uncommon in other frogs, what makes the Madagascan rainbow burrowing frog different is that females are also believed to have brighter and more distinctive colouration, compared with their male counterparts that seem to be considerably paler.

The burrowing frogs

- Boribory burrowing frog *(Scaphiophryne boribory)*– Vences, Raxworthy, Nussbaum & Glaw, 2003
- Madagascan rainbow burrowing frog *(Scaphiophyrne gottlebei)*– Busse & Böhme, 1992
- Brown burrowing frog *(Scaphiophryne brevis)*- Boulenger, 1896
- Mocquard's burrowing frog *(Scaphiophryne calcarata)* – Mocquard, 1895
- Madagascan burrowing frog *(Scaphiophyrne madagascarensis)* – Boulenger, 1882
- Green marbled burrowing frog *(Scaphiophyrne marmorata)* – Boulenger, 1882
- Menabe burrowing frog *(Scaphiophyrne menabensis)*– Glos, Glaw and Vences, 2005
- Spiny burrowing frog *(Scaphiophyrne spinosa)*– Steindachner, 1882
- Matsoko burrowing frog *(Scaphiophryne matsoko)*– Raselimanana et al. 2014

What makes this species even more unique though, when compared with the others forming the *Scaphiophyrne* genus, is its truly dramatic and incredibly beautiful colouration. This comes in the form of bright to dark red areas, and bright green dorsal patterns, all separated by distinct jet black borders.

Belonging to the Microhylidae (or narrow-mouthed frog) family, members of the genus typically have a very short snout, with an incredibly small and narrow mouth as well. This is characteristically seen with other members of the family such as the African desert frogs *(Breviceps)*, another group that are sometimes represented in collections.

However, due to the nature of the habitat where the Madagascan rainbow burrowing frog is found, its forearms and digits have developed for climbing vertically on the stony walls of the canyons within the Isalo Massif where it is to be found. Meanwhile, the hind limbs are adapted for a completely different purpose: to allow the frog to burrow easily. They are very robust and are quite widely spaced for this purpose.

➤ **The brown burrowing frog displays the more subdued patterning and colouration that is more typical of the group.**
Photo courtesy of Franco Andreone/http://calphotos.berkeley.edu

➤ **The spiny burrowing frog was the first member of the group to be discovered, back in 1882.**
Photo courtesy Axel Strauss.

Distribution and natural habitats

Members of the genus *Scaphiophryne* are found only on Madagascar, being distributed all over the island in the different biotopes occurring there. As examples, the green marbled burrowing frog *(Scaphiophryne marmorata)* occurs in mid-elevation rainforests in a small area of east-central Madagascar, while the Madagascan burrowing frog *(S. madagascariensis)* is adapted to higher montane habitats in the central plateau, and Mocquard's burrowing frog *(S. calcarata)* inhabits the dryer forests and desert-like areas occurring in the west of the island.

However, the Madagascan rainbow burrowing frog *(S. gottlebei)* has a severely restricted and fragmented range, lying within the northern part of the Isalo Massif, in south-western Madagascar. Some good news, however, is that ➤

The habitat of the Madagascan rainbow burrowing frog is very distinctive.

Madagascar's dramatic landscape differs, thanks in part to the central mountain range, as seen here from space. Photo courtesy of the author.

following a large number of surveys, this species is now thought to occur over a slightly wider area than was initially believed.

Their natural environment

The Isalo National Park itself is home to approximately 340 different species of Fauna. Apart from its reptiles and amphibians, this area is home to several types of lemur, including the well-known ring-tailed lemur *(Lemur catta),* which are endemic to the region. This unique landscape provides various different biotopes, ranging from sandstone ruiniform rock stacks and deep canyons to vast grasslands and palm-lined oases.

Another striking species of amphibian can be found in the very same canyons, in and around the Isalo National Park. The blue-legged mantella *(Mantella expectata)* lives in the vicinity of the wet canyons and seasonal streams where, during the wet season, its spawn can be found, having been deposited on top of grassy tufts growing out of the limestone walls above small pools of water.

The Madagascan rainbow burrowing frog is partly rupicolous, meaning that it thrives amongst rocks, and specifically within rocky outcrops and narrow canyons. These canyons provide a cool and wet atmosphere, unlike the savannah plains surrounding the region that are subject to strong seasonal thermal extremes.

The rock walls of the canyons are often pockmarked with golf ball-sized holes, and these frogs may spend considerable time wedged here, rather than burrowing into the ground or inhabiting some other secluded position. The species actually displays fossorial behaviour too, with adults often remaining buried during times of drought. Here they wait for the respite provided by the wet season, when the rains return and they can not only take to water in temporary shallow pools but also start to spawn.

➤ **A pair of Madagascar rainbow burrowing frogs. Unusually, the male (top) is paler in colour than the female.** Photo courtesy of the author.

➤ **The patterning of the Madagascar rainbow burrowing frog, seen from above. The markings are highly individual.** Photo courtesy of the author.

Accommodation

The best type of accommodation for keeping any *Scaphiophyrne* species is an all-glass vivarium. A wooden enclosure with a glass front can be used, but unless the wood is fully waterproofed with a sealant and resin, then it is likely to become warped and misshapen quite rapidly, because of the humidity level required. The size of the enclosure will be influenced by the following factors:

1. How many individuals you have.
2. The ratio of the sexes.

A 40cm (16in) cube vivarium would house 3-4 individuals comfortably. A larger 80cm (32in) enclosure will be needed for more than four individuals. Other methods of housing these shy and secretive animals include storage containers known as Really Useful Boxes (RUBs), which have proved very useful for this purpose. They are opaque, and this seems to encourage the frogs to come out of hiding places more readily than they do when housed in enclosures incorporating clear glass in their design.

In spite of its name though, the Madagascan rainbow burrowing frog does not just spend time underground. This species occupies a wider range of microhabitats. After reading through many studies and researching into the natural habitats present within its range, it appears that what yet to be attempted is to replicate the biotope of this species in vivarium surroundings. Yet it would not be too difficult to create a canyon-style exhibit, enabling the species to behave in a more natural way, by using the following materials:

- **Expanding foam**.
- **Polystyrene**.
- **Fine wire mesh.**
- **Concrete.**
- **Liquid fibreglass (resin A, styrene and hydrogen peroxide).**

This is a subject that I will be returning to in more detail in a future article, covering the building of naturalistic terrariums.

Feeding

All *Scaphiophyrne* species are entirely insectivorous in their feeding habits, and require a similar diet to that given to poison dart frogs. They are fairly undemanding in terms of what they will eat, with as much variety as possible being recommended in any event. The main requirement is that their food needs to be small enough to be swallowed easily, although they will attempt to eat slightly bigger prey items.

A useful staple food is flightless fruit flies *(Drosophila),* which can be purchased easily by mail order, although if you want to reduce your feeding costs, you can culture your own fruit flies quite easily, with equipment and special food available for this purpose.

Among other suitable livefoods that can be provided to these amphibians are:

- **Tropical springtails** *(Folsomia candida)*
- **Tropical dwarf woodlice** *(Trichorina tomentosa)*
- **Pea aphids** *(Acyrthosiphon pisum)*
- **Lesser waxworms** *(Achroae grisella)*
- **Newly-hatched waxworms** *(Galleria mellonella)*
- **Hatchling black crickets** *(Gryllus assimilis)*
- **Hatchling banded crickets** *(Gryllodes sigillatus)*

Whenever possible, live foods should be dusted with a suitable vitamin and mineral supplement and gut-loaded prior to being given to the amphibians. Some of these invertebrates, such as the tropical dwarf woodlice can be included in the vivarium, helping to keep the substrate clean, often being referred to as 'custodians' for this reason. The frogs will snap up individuals that cross their path, just as would happen in the wild.

Particular care, though, should be taken with crickets, because they can bite the frogs and represent a hazard if they remain uneaten in the vivarium. Never be tempted to release a large number there – only provide crickets in very small numbers, so they should all be eaten quickly by the frogs.

Typical temperature range
➡ **May to September – 18-20°C (64-68°F)**
➡ **October to April – 22-27°C (71-81°F)**

➤ **Figure 3 The vivid markings actually help to break up the frog's outline.** Photo courtesy of the author.

Temperature and humidity

The temperature required depends on the time of year that you wish to replicate in the frogs' quarters, as this does vary seasonally. However, seasonal adjustments are not a necessity, unless you wish to condition them for breeding purposes. Relative humidity will also vary, depending on the season, but generally, these amphibians should be kept within a 40-50% humidity range, especially during the drier seasons of the year.

A small frog with big problems

Like a majority of the unique fauna and ➤

➤ **Other members of the genus are less colourful, like the green burrowing frog (Scaphiophryne marmorata) seen here.** Photo courtesy of the author.

flora found on the island, the Madagascan rainbow burrowing frog is threatened with the risk of extinction for a wide range of potential reasons. Some of these are specific, while others are more general. They include:

- Habitat loss thanks to logging.
- Habitat loss due to sapphire mining.
- Habitat loss as the result of fires and cattle grazing.
- Tourism and associated disturbance/habitat loss.
- Over-harvesting for the pet trade.
- Globally spread infectious diseases such as chytridiomycosis.

Care matters

The impact of collection for the pet trade is unclear. As a precautionary measure, it was decided that an annual export quota of 1000 specimens was established in 2006 by the government. The aim was to collect more data on wild populations.

However, it has since been noted that, instead of the highly secretive adults being caught for this purpose, it is the juvenile specimens that are being collected more frequently because they are much easier to find. They tend not to burrow away to the same extent. This may be better though, as it is the adult frogs that are significant for maintaining the overall population.

As with most of the genus, there is actually very little information on many aspects of the biology of the Madagascan rainbow burrowing frog, and in particular, their longevity. It has been thought that this would typically extend from around four to 15 years.

However, those kept in collections rarely appear to live for more than two years. They often reproduce successfully in their first year as adults, and then subsequently fade away, for reasons that are currently unclear. It is possible that this could be the result of an inadequate diet in some respects.

The species has also proved to be difficult to breed, with successes only reported from a couple of zoological institutions. Yet again, this is mainly attributed to the lack of knowledge about both the behaviour and also the reproductive cycle of the species. But this does not mean that it cannot be bred in collections; it should be entirely possible if further detailed studies emanating from the wild are carried out, to give a better understanding of the reproductive biology of these frogs.

▼ **The blue-legged mantella shares the arid Isalo Massif with the Madagascan rainbow burrowing frog.**
Photo courtesy of the author.

▼ **Suitable and basic exhibit for most of the Scaphiophryne genus, using a PUB as the housing container.**
Photo courtesy of the author.

Conclusion

Much work is still needed to help these simply amazing and beautiful amphibians. It is not just the hope of zoological collections but also conservation organisations working in Madagascar that private hobbyists will do everything they can to make sure that the species within this genus are not only kept and bred responsibly within vivarium surroundings, but also that awareness is raised about this particular species.

As hobbyists, we should make more of an effort to record our husbandry techniques and share this with the broader amphibian community, ensuring a future for the Madagascar rainbow burrowing frog in private collections that involves self-sustaining populations. The knowledge gained can then be used to assist its survival – and that of other species too – in its homeland. ✣

Share your experience

*** Have you kept and bred any *Scaphiophryne* species successfully? Share your experiences – contact prk.ed@kelsey.co.uk. Equally, if you've bred any other less common species of reptile and amphibian, do get in touch.**