Amphibian conservation in Costa Rica and Manchester

A unique effort is being co-ordinated in Manchester, to save a rare amphibian in Costa Rica. John Courteney-Smith of Arcadia Reptile reports on this global scheme, which involves a range of key partner organisations and supporters.

The distinctive, isolated Costa Rican population is the most northerly.

Recently, I had the privilege of meeting Andrew Gray, the Curator of Herpetology at the Manchester Museum, and members of his team. This museum is one of the very few that boasts a comprehensive collection of live reptiles on display, and also specialises in the conservation of some of the world's most endangered amphibians.

Manchester Museum is part of a consortium of institutions that are carrying out essential work in Europe and also Costa Rica, in an effort to save one very rare amphibian - the lemur leaf frog *(Agalychnis lemur)*. This small frog is found only in one last remaining area of Costa Rica, although others from distinctly different populations are also known to exist in small numbers in Panama and Colombia.

When I had a few moments to chat with Andrew, (who is a real life Indiana Jones!), I thought it would be interesting to find out more about this amazing frog, and to gain an insight into Andrew's passion for amphibian conservation.

Q J. C-S: Thanks for taking the time to share the work that you are doing in terms of amphibian conservation around the world with us. Firstly, I must say that I have fallen totally in love with the lemur frog on appearance alone, but what first attracted you to this species?

A This particular frog is very close to my heart as it was thought to be almost extinct in Costa Rica after disappearing from many areas where it once existed, including the Monteverde Cloud Forest. It vanished from there about the same time that the stunning golden toad *(Bufo periglenes)* was last seen, in the 1980s. That species probably became extinct in only one year - no-one collected any tadpoles beforehand, and it has not been reported since then. The only evidence that we have of its behaviour was the footage shot for Sir David Attenborough's BBC series, *Life on Earth*, in the 1970s.

I spend a lot of my time in Costa Rica and the ➤

The golden toad is now feared to be extinct.

lemur leaf frogs we are working with come from the last remaining site for the species there. Many years ago, I was granted special permission by the Costa Rican authorities to collect a few tadpoles, with a view to helping to conserve the species. That was over 10 years ago, and I have been working to support these amazing little frogs ever since.

Q What first ignited the reptile and amphibian passion that you so clearly have, and how did it evolve from simply keeping them into proactive conservation?

A Rather than being interested in playing football as a young boy, I used to ask my Grandma to take me to a park called Ashton Gardens in St Annes, near Blackpool, where I grew up. I was the happiest kid ever just to be left all day long by the lake with my fishing net and trusty yellow plastic bucket. My days were filled with climbing trees and being surrounded by nature, and particularly collecting and examining newts, tadpoles, frogs and toads - basically anything alive!

When around nature, I was in my element. My interest in nature and wildlife has always been there, but was especially re-kindled when I first went to South America on a 575km (360ml) trip down the Amazon some 20 years ago. It broke my heart to witness at first hand the large scale deforestation that was taking place – it was after that that I knew I had to try my best in life to make a difference, in terms of conserving nature in any way that I could.

I changed jobs, and I now try to ignite that interest in nature in others, particularly in children, as they are the future. I also attempt to conserve species more directly through specific conservation programmes, like the model one we have initiated for the lemur leaf frog.

▲ Andrew Gray as a boy in park at St. Annes, near Blackpool, with his trusty yellow bucket.

Q More and more amphibians are becoming endangered, and in fact the IUCN rate the lemur frog as being critically endangered. What are the causes of their plight?

A Several factors connected with our changing climate feature as the main reasons, and they are all inter-linked. Cooling in the highlands, caused by a thicker cloud cover, is one cause for the demise of these frogs, as they rely on the heat from the sun. Another factor is the deadly chytrid fungus that thrives in the changed environmental conditions associated with this extra moisture and the cooler temperatures.

However, the direct impact of people on the environment is the main cause for the disappearance of these frogs; habitat loss, and the spraying of banned pesticides into the atmosphere from aeroplanes in countries such as Costa Rica doesn't help, as all amphibians absorb the moisture they require directly through their skin instead of drinking. It seems many highland species are in a "no win" situation as the chytrid fungus also prevents clean water being absorbed through their skin.

▼ Lemur leaf frog in profile. ©Chris Mattison.

Q You have been to Costa Rica to work extensively with the frogs alongside the Costa Rican Amphibian Research Centre (CRARC). Why is supporting and working with the CRARC so important to the future of this species?

A The Costa Rican Amphibian Research Centre is a very special place. Every time I go there, I am still amazed by all the different species that can be seen there, and the level of commitment toward amphibian conservation displayed by Brian Kubicki, who runs CRARC and has become a good friend of mine.

There are more amphibian species at the CRARC than anywhere else in Costa Rica, with some species only occurring there. The location of the site is most important, specifically its elevation and the associated weather conditions. The microclimate conditions have not changed there and are still perfect for the survival of many species.

Thanks to Brian's commitment to conservation, he bought the land and established the CRARC especially to protect the habitat from outside influences. The area is now protected from deforestation and pet trade

smugglers, and the habitat is being modified where necessary by re-planting to ensure a perfect environment for frogs remains. His organisation is key to Project Lemur Frog, as supporting the future of the wild population is paramount.

Q You believe that changes in the environment are responsible for the proliferation of the deadly chytrid fungus, but can anything be done in these wild environments to provide a safer habitat for the animals, or do we have to collect as many as we can now, treat and hopefully breed them until a better environment is found for re-introduction?

A Such pathogens are not new, and there are always such threats to wild animals in conjunction with ever changing environments. Under such circumstances, change may adversely affect one species, while creating conditions more suitable for another. The problem we face now is the speed of that change, and the fact that we are directly responsible for it. Some animals just cannot adapt fast enough and are disappearing rapidly because of us.

We can do little about recent changes in weather patterns and such like, but wherever suitable pockets of habitat remain, with the right environmental conditions for the species to survive, they will do so, if protection against other potentially harmful influences can be provided. The world will be a poorer place if we allow species such as the golden toad of Monteverde to disappear. No species should be allowed to become extinct if we can still do something about it.

It is most important we preserve and physically protect these remaining suitable habitats and the animals that still survive there - at all cost! Unfortunately, many of the frogs maintained in captivity can never go back or be re-introduced to the wild, for various reasons, but they can make exceptionally good educational tools to help deliver the right message.

We are impacting directly on these species' ability to survive, so we are fully responsible for their survival. Specimens kept in captivity as part of this project are maintained to provide a viable 'safety net', if ever the wild population should disappear, or wild habitats change back to being able to support re-introduction. Then, and only then, maybe we may actually be able re-introduce these species.

▲ Lemur leaf frog. ©Chris Mattison.

I believe wild animals really belong in the wild, so keeping any in captivity is not something I would consider lightly. The primary aim of the Project Lemur Frog is actively helping to support and protect the wild population, and any associated research carried out is totally non-invasive and aimed at helping care for the captive animals in the very best way we can.

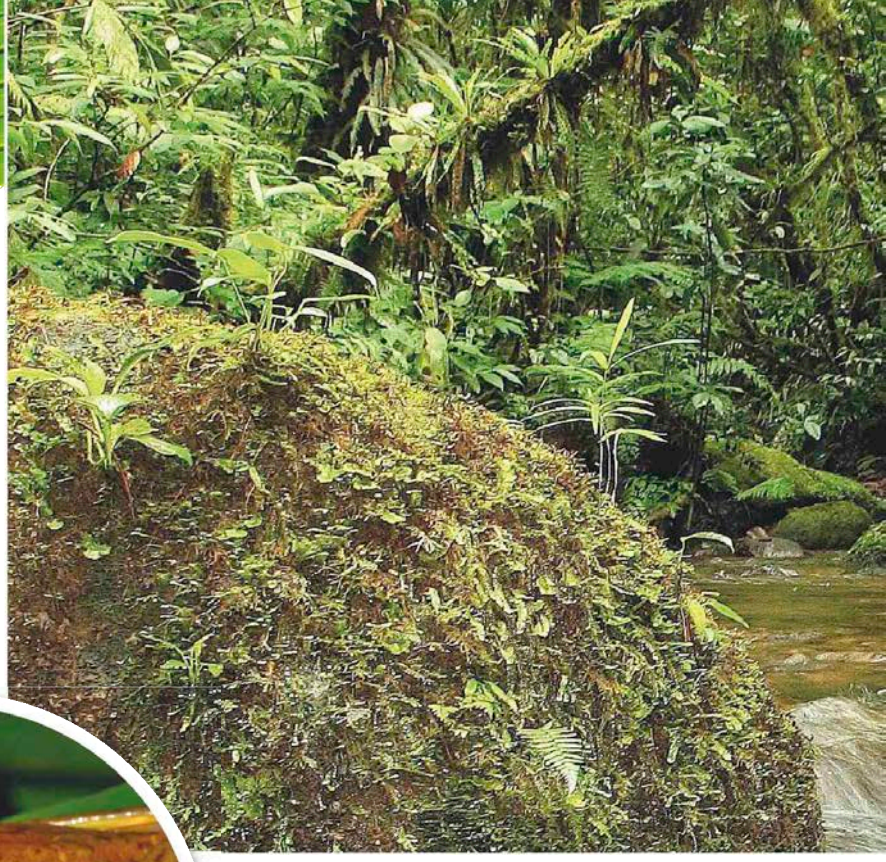
The conservation of these frogs is at a different level than most people realise. It is not about how many we collect, or how many we can breed, it is about maintaining a minimum captive population, that represents a genetically viable 'ark' for the future, whilst doing our utmost to highlight and protect the wild places where these animals naturally occur.

▼ Bristol Zoo's lemur frog room, known as an 'amphipod'.

Q Project Lemur Frog benefits from the inclusion of other parties. Who are the other partners supporting this cause and what are their responsibilities?

A Successful conservation necessitates collaboration and specialisation, and although Manchester Museum initiated the conservation programme, Project Lemur Frog is a team effort that has the support of some of the most dedicated amphibian conservationists in Europe and Costa Rica. Everyone involved is fully committed to working with the aim of helping to secure the future conservation of this critically endangered species.

Between the various complimentary Institutions and committed individuals, we cover all aspects of in-situ and ex-situ conservation work. The University of Salford is contributing heavily to the project by supporting important DNA investigations. Dr Robert Jehle, an amphibian genetics expert based at ➤



➤ Andrew Gray searching for lemur leaf frogs in Costa Rica.

Salford is a highly supportive collaborator in the project, as is Professor Claes Andren, the Scientific Director of Norden's Ark in Sweden.

Within the UK, Tim Skelton at Bristol Zoo has been highly instrumental in taking the captive breeding of the Costa Rican frogs forward, and apart from supporting necessary genetic work, Bristol Zoo has also invested in a special amphipod dedicated to the species. Efforts continue to develop detailed husbandry guidelines for maintaining the species in optimum captive conditions, and the Berkshire College of Agriculture (BCA) have just joined the project in support of developing best practice protocols for captive maintenance of the frogs. This includes non-invasive studies using UV lighting provided by Arcadia.

Q You have conducted in-depth and very expensive DNA research into this species and others. What has this research uncovered and of what benefit to captive stocks can DNA profiling be?

Lemur frog, displaying its night colouration. Courtesy Matt Wilson.

Andrew with a splendid leaf frog.

A Yes, one major aim of the project is to support research into the genetics of the species, which will help us professionally manage the ex-situ breeding population and also allows us to assess the viability of these frogs in the wild in Costa Rica. Non-invasive research has already highlighted significant differences between the Costa Rican and Panamanian populations.

In fact, the population of lemur frogs in Costa Rica is as different from that occurring in Panama as between two completely separate leaf frog species. The frogs might even be divided into different species in due course, which makes the conservation of the Costa Rican frogs from this one locality even more critical.

The pioneering DNA profiling work being conducted as part of Project Lemur Frog will even allow us to identify differences between individual specimens. This level of detail is new within the amphibian conservation community, and will allow us to determine the precise genetic relationships between animals involved in the breeding programme. This is something recognised as being of key importance in captive-breeding programmes with other animals, but not in frogs up until now.

Q As you know, we at Arcadia Reptile are very passionate about research and using the data from the wild environment in such a way as to allow captive animals to thrive. What three things have you taken from your Costa Rican visits and then implemented with your stock in Manchester?

A I believe that if you are going to keep any animal in captivity, you should do all you can to meet the animal's natural requirements. Providing the right care by meeting these requirements is necessary not only to support the animals' health and basic survival, but also to allow them to thrive if they are maintained in vivarium surroundings.

Providing the right environmental conditions is clearly the most important thing here, and all the information we gain through field research, measuring temperature and humidity, is most important. Also, light levels, and knowing the animal's normal exposure rate to UV is vital, when it comes to caring for them successfully. I'm so delighted to know that companies like Arcadia share an understanding of the importance of these studies and are committed to supporting them and providing the equipment necessary for helping reptile and amphibian keepers to meet the needs of their animals.

Q There is evidence of a few of these frogs being kept in captivity in private collections in Europe. In fact, it is easy to find care sheets for them online. Would you like private breeders to contact the project so that a studbook can be maintained?

A These frogs are certainly kept and bred in captivity throughout the world, although they are not as easy to maintain as many other leaf frog species, even the rare splendid leaf frog *(Cruziohyla calcarifer)*. Provided you have experience and can provide the optimum conditions though, including the correct temperature range, these frogs do well in captivity.

We very much support people's interest in keeping amphibians properly, and we even provided the original lemur frog stock for the private breeders in Europe many years ago from our surplus animals, which

were not included in the official breeding programme, to save any lemur frogs being wild caught for the trade.

A studbook for frogs is like any other studbook, so we closely monitor individual bloodlines from the original founder stock. Through DNA profiling, we will know the genetic makeup of each individual frog in the studbook. As it is most important that the official captive population of Costa Rican lemur frogs are professionally managed at this level, we cannot include any animals from outside the programme or potentially from other population sources, such as those that perhaps originate from Panama. If any reader would like any advice in keeping their leaf frogs properly though, they need only ask for our support and we will be very pleased to provide it.

Q Now that the project work is well underway and has support, what impact do you foresee it having over the next five years in helping to conserve this most wonderful frog?

A Funds raised through Project Lemur Frog will go to directly support the work of the CRARC, helping the protection of the habitat and wild population of Costa Rican lemur frogs, which we hope will increase within this period. Through this project, the genetic fingerprint for this species will also soon be made available to the scientific and amphibian conservation community, and more specifically, it will be used to establish a clear, genetically viable safety net population of these frogs for the future.

▼ Rainforest vivarium exhibit at the Manchester Museum.

Based on the research results, the genetics of the wild population can also be assessed. Through active involvement, the further education of several students, from both Europe and Costa Rica, is also being supported as part of the project. What we really hope to achieve with this highly collaborative, holistic initiative is to produce a model project for critically endangered amphibian species, which other workers may follow and species can benefit from.

The educational aspect of the work is an extremely important component. The wider message that we are trying to promote is not just focused on the leaf frogs, but the leaves they sit on, the trees that grow those leaves, and the rainforests that contain those trees. Save the rainforests and you save many species, that is the point.

We are causing the problems in the environment, and therefore we have a responsibility to the animals being affected – with frogs being one of the very first groups to be affected because they are so sensitive. Amphibians were the original animals with a backbone to walk the earth, and we owe it to them to make sure they are not the first to disappear.

Thank you for sharing your thoughts with us. Arcadia is so proud to be associated with Project Lemur Frog and we all look forward to exploring your blog and reading regular updates about this and your other projects as time progresses. ✣

Plan a visit

If you are in the north-west, why not visit the museum and see the collection? Admission is free.
WHERE: The Manchester Museum, The University of Manchester, Oxford Road, Manchester, M13 9PL.
WHEN: Tuesday–Saturday, 10am–5pm. Sunday, Monday & Bank Holidays 11am–4pm. 27–31 Dec: 11am–4pm Closed: 24–26 Dec, 1 Jan.
WEBPAGE: http://www.museum.manchester.ac.uk/collection/liveanimals/

Associated web links

www.projectlemurfrog.org
www.frogblogmanchester.com
www.arcadia-reptile.com