# *Ex situ* conservation program for the Andean Marsupial Tree Frog

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The Andean Marsupial Tree Frog (*Gastrotheca riobambae*) is endemic to Ecuador, and it was recently named by the mayor of the Metropolitan District of Quito as a kind of city emblem, but unfortunately, the decrease in population is increasingly evident. The Andean Marsupial Tree Frog is listed in the IUCN Red List as an Endangered species, with the main reasons for its decline being urban development, the advance of the agricultural frontier, the use of pesticides, expansion of exotic tree plantations such as pine and eucalyptus and the presence of chytrid fungus or *Bd* (*Batrachochytrium dendrobatidis*) at various locations where the species is present (Frenkel et al. 2010).

Juvenile Andean Marsupial Tree Frogs (*Gastrotheca riobambae*) bred at the Quito Zoo in Guayllabamba, Ecuador. Photo: María Teresa Alvear.

The Quito Zoo in Guayllabamba began an *ex situ* conservation program for the Andean Marsupial Tree Frog in November 2014 with specimens collected from populations in the north east of Pichincha. These animals were rescued from the area where the new Quito airport is being built, on the slopes of the Guayllabamba River. These adults are currently on display, although the first tadpoles to be bred at the Zoo have been transferred to a separate management area at the Zoo.

In the first phase of the program we had 333 juveniles, of a total of 382 first generation tadpoles. The tadpoles were kept in 12-gallon plastic containers, with each container holding an average of fifty individuals. All were fed three times per week with a balanced pellet diet with a protein level of 30-50% and maintained at an ambient temperature of 21°C, with access to natural light with access to parts of UVB rays. All water used was chlorine and pesticide-free. The time to metamorphosis varied, with 67% of the tadpoles finishing their metamorphosis in thirty days, while the remaining individuals were delayed up to ninety days to complete their development.

Juveniles are kept in glass containers 120cm long x 40cm wide and 50cm high. These terrariums are fitted with bromeliads, stems, leaves and have a mesh top cover that allows penetration of UVB rays from the sun. They also have a water recirculation system that keeps the humidity level inside the terrarium above 90%, creating ideal conditions for normal development of the frogs.

From the beginning, the frogs were fed three times a week with a varied diet based on insects and invertebrates, and consisting of two species of crickets, mealworm larvae, adults and larvae of the wax moth of abaja, sow bugs and two earthworm species. Once a week the food items were supplemented with calcium. This diet has allowed us to maintain completely healthy frogs.

In the juvenile phase we tested for the presence of chytrid fungus in 5.3% of the population, using polymerase chain reaction in real time (q-PCR). The tests were negative which leads us to conclude that the populations of *Gastrotheca riobambae* held at Quito Zoo in Guayllabamba are free of chytridiomycosis.

María Teresa Alvear taking care of Andean Marsupial Tree Frogs in the frog room at Quito Zoo. Photo: María Teresa Alvear.

As part of the conservation program that we are developing, we have established the first controlled reintroduction in one of the adjacent creeks to Guayllabamba River, which is within the immediate vicinity of the zoo trial. At just six months into the program we have the first 256 adults from six unrelated genetic lines to be reintroduced into their natural environment. The area designated for the reintroduction has been enriched with bromeliads, and artificial water pools which are 60cm in diameter and have a permanent irrigation system. Monthly monitoring consisting of an auditory and visual record of the reintroduced animals will be established.

We have also developed a head-starting program in which we will catch wild tadpoles and raise them in artificial ponds, capturing approximately 10% of the animals found in each natural pool. They will be raised until adulthood and then reintroduced back into the wild in other locations where populations of this species occur, helping

to diversify the genetics in these areas. The intended release sites will be examined in advance to ensure they are suitable. For this we plan to test for chytridiomycosis, check for sufficient pools with uncontaminated water, enrich the habitat with native plants such as bromeliads, sigses and other similar plants that will provide shelter, food and sufficient moisture for the development of the frogs.

The Andean Marsupial Tree Frog program at Quito Zoo is helping to repopulate all the slopes of the Guayllabamba River basin, with the reintroduction of genetically viable individuals. In the future, we intend to also repopulate the parks and gardens of the Metropolitan District of Quito along with an educational campaign for children and youth in local schools district and villagers living in areas close to the reintroduction sites.

### References

Frenkel, C., Vallejo, A. Felix-Novoa, C. and Ron, SR 2010. Gastrotheca riobambae in. Ron, SR, Guayasamin, JM, Yanez-Muñoz, MH, Merino-Viteri, A., Ortiz , and Nicolalde DA, DA 2014. AmphibiaWebEcuador. Version 2014.0. Zoology Museum, Pontifical Catholic University of Ecuador. <http://zoologia.puce.edu.ec/vertebrados/anfibios/FichaEspecie.aspx?Id=1136> accessed May 26, 2015.

One of the outdoor containers for juvenile Andean Marsupial Tree Frogs. These terrariums are fitted with bromeliads, stems, leaves and have a mesh top cover that allows penetration of UVB rays from the sun. Photo: María Teresa Alvear.

## Amphibian trade workshop: Identifying the threats, species most at risk and next steps

The Singapore Zoo, the Animal Welfare Institute, Defenders of Wildlife and the Amphibian Survival Alliance joined forces in March 2015 to host two international amphibian trade workshops. On March 12th and 13th two teams of amphibian and trade specialists from academia, government, and non-governmental organizations gathered at parallel workshops in Singapore and Washington, DC.

Starting with a list of amphibian species prepared for the workshops, the specialists identified the species most at risk from trade (domestic and international), habitat loss, or due to disease. The species requiring the highest priority actions were selected and needed conservation actions were assigned to each species. The original species list was created using data from the IUCN Red List, CITES trade database, and input from the IUCN SSC Amphibian Specialist Group regional chairs.

Predictably, a number of “priority species” are traded locally, regionally and internationally for consumption as bushmeat or in the frog leg trade. Other species of priority concern including a wide range of salamanders, frogs, and toads are traded internationally for the pet trade. Amphibian exploitation for both the bushmeat and the pet trade involves offtake that is depleting wild populations.

The specialists identified conservation actions for priority species or entire taxa. These included stronger national laws and regulations, improved law enforcement efforts, listing or up-listing in CITES Appendices, improved compliance with international trade standards for CITES-listed species, and ongoing monitoring of trade trends and impacts.

Another threat posed by widely traded amphibian species is disease. Such threats include both *Batrachochytrium dendrobatidis* (*Bd*) and *Batrachochytrium salamandrivorans* (*Bsal*) fungal infections, Ranavirus, and other viral diseases. Such diseases affect not just amphibians but also some fish and reptiles. While vector amphibian species (including bullfrogs, *Xenopus* frogs, Korean Fire-bellied Toads and African Dwarf Clawed Frogs) may not be threatened by trade, their trade exposes other animal populations to potentially devastating emerging infectious diseases. To reduce such risks, actions must be taken to improve implementation of existing veterinary health protocols to identify diseased animals prior to export and stricter measures such as quarantine and disease monitoring of imported amphibians must be implemented.

Workshop organizers and participants have initiated efforts to implement some of the recommended conservation actions and intend to collaborate with additional experts from across the amphibian conservation community to achieve meaningful progress for amphibian conservation.


Some of the participants at one of the international amphibian trade workshops which included amphibian and trade specialists from academia, government, and non-governmental organizations. Photo: Alejandra Goyenechea.