1. Project Title:
Aromobates meridensis, an endangered Venezuelan frog in need of conservation efforts.

2. Names, institutional affiliation, and email address of project leader:
Osmary Leal, Laboratory of Biogeography of the University of Los Andes at Merida, Venezuela. E-mail: osmaryleal991@hotmail.com

3. Total funding amount requested from Amphibian Ark in USD$:
US$ 5.000,oo

4. **Executive summary**

About a dozen species of *Aromobates*, a genus of dendrobatid frogs, inhabit Venezuelan mountains. Most of them are poorly known, and have a long history of poor taxonomic understanding of relationships as well as per a huge lack of bio geographical and ecological information about them. Most of the species are known to have population declines, and to have been affected by habitat fragmentation and alteration. *Aromobates meridensis*, the Merida rocket frog, is perhaps the single most well known species in the genus, making it an excellent candidate to conservation projects. Taken advantage of a recent discovered population not yet publicly reported (La Marca, com. pers.), and that the problems facing the species still persist, we propose to undertake an ex situ project for a rescue conservation program on this Andean frog.

Objectives:

(1) Set an ex-situ conservation program for *Aromobates meridensis* with a parental stock taken from the wild.
(2) Generate information to write the husbandry guidelines for the species.
(3) Re-introduction of captive-raised F1 descendants into natural conditions.
(4) To spread the knowledge on this species, and the natural forests it inhabits, in regional communities and education centers.

Given the high risk of extinction in the wild due to massive deforestation and water pollution, along other human-activities' related problems, there is an urge to set a conservation program for the Merida rocket frog. Accordingly, we plan to find out which are the right conditions to keep the frogs in captivity, to obtain the parental stock from the wild, and to set the required strict quarantine and biosecurity standards for husbandry purposes. Specimens will be kept in captivity in the *ex situ* facilities, with the final goal to establish a long-term program involving liberations of the offspring into the wild.

Aromobates meridensis. Photo by Aldemar Acevedo, used only for reference purposes.

5. Introduction

The genus *Aromobates* possesses a high species' diversity in the Venezuelan Andes (Rojas-Runjaic *et al*. 2011). Most species in the genus have received little attention, and some have complex taxonomic histories. *Aromobates meridensis* was originally described under the genus *Colostethus* by Dole and Durant (1972), then it was transferred to the genus *Nephelobates* by La Marca (1994), and finally allocated in the genus *Aromobates* by Grant *et al*. (2006), where it still remains (La Marca and Otero Lopez 2012).

The Merida rocket frog is a relatively large member of the genus, being only smaller to Aromobates *nocturnus* and *A. leopardalis*. It is unique among *Aromobates* frogs by having yellow ventral surfaces. *Aromobates meridensis* is a high cloud forest species endemic to the Sierra de La Culata mountain range, in the central Venezuelan Andes. In Holdridge's Life Zone system (Ewel *et al*. 1976) the known localities fall either within the very humid Lower Montane forest or within the very humid Montane forest life zones. The Merida rocket frog is sympatric with *Aromobates mayorgai*, and *Mannophryne* cf. *collaris* in some parts of their distribution area.

In the Venezuelan Andes, amphibian populations in general have experienced severe declines (La Marca 2004, 2007, 2009). A conservation study on frogs of the family Dendrobatidae in these highlands revealed (La Marca 2007) that 56% of the species of the family living in the

Venezuelan Andes have experienced declines (La Marca and Otero Lopez 2012). La Marca and Garcia-Pérez (2004a) indicated that the primary threats to the species are habitat loss due to agriculture and livestock and agricultural pollution, and regarded as threat the invasive bullfrog (*Lithobates catesbeianus*). La Marca (2007) in a study carried out to ascertain the conservation status of populations of dendrobatid frogs in the Venezuelan Andes pointed out that the type locality of *A. meridensis* was in a highly degraded environment, experiencing habitat fragmentation and presence, from moderate to high, of solid and liquid pollutants.

La Marca and Otero Lopez (2012) also concluded that, in general, the area occupied by *Aromobates meridensis* is suffering from agrochemical water pollution. Climate change, as a possible output from massive deforestation in the formerly dense forests South of Lake Maracaibo, may pose an additional problem (La Marca and Esqueda 2005). La Marca and Otero Lopez (2012) reiterated that the type locality and all other known localities may be experiencing climate alterations (mainly decrease in the amount of rainfall), since clouds carrying condensed water from the plains in the South of Lake Maracaibo may have diminished after the massive deforestation that is taking place in the later area since the decade of the 1950´s. The introduced bullfrog (*Lithobates catesbeianus*), a potential predator known to carry a pathogenous chytrid fungus (Batrachochytrium dendrobatidis), poses an additional threat. In fact, the species seems to be affected by the chytrid fungus *Batrachochytrium dendrobatidis* (BD) as first detected by Lampo *et al*. (2008).

La Marca and Otero Lopez (2012) reconsidered the conservation status of the species. This new study challenged the statuses previously advanced by La Marca and Garcia Pérez (2004) and Barrio *et al*. (2010), the later largely overlooking the first evaluation. La Marca and Otero Lopez (2012) considered that the area of occupancy of *Aromobates meridensis* has experienced decline and that was likely that this trend will extend onto the future. At the same time, the number of localities or subpopulations also had been in decline. Accordingly, La Marca and Otero Lopez (2012) suggested the category of CR/A2ace; B1ab(ii,iii,iv) to reflect the current understanding of this critically endangered endemic species.

Aromobates meridensis, along with a few other species, was considered by Barrio and Torres (2010) to be actually in need of an urgent response by scientists; they also recommended that these frog species must be actively searched, and monitored if extant, in order to proceed with the international initiatives that try to find solutions to several problems that these frogs face, and they highly recommended to international and national financing organizations to invest in the aforementioned species as a high priority agenda of their activities.

This project focuses to breed the species in captivity, and to preserve the species in its native range, through liberations (re-introductions) of captive-raised descendants into the wild. To minimize the risks of inbreeding in captivity, we will try to get reproductive parents from as many different places as possible. All founder specimens will come from the few remaining known populations, although prospection is needed to detect other. Captive management and breeding program will eventually benefit the species to maintain viable populations. We will also perform field research to know better the biology of the species in the wild. In managing the captive frogs we are adhering to recommended biosecurity standards (e.g. Amphibian Ark, 2008 and others).

The *ex situ* program for *Aromobates meridensis* frog will be held in the Laboratory of Biogeography of the University of the Andes, and steps have already been taken to initiate or move the project to the Merida's Botanical Garden which have facilities that will be requested and conditioned for. This project counts with the partnership of the VARAC Center in Merida's Chorros de Milla Zoo, the Botanical Garden of Mérida, and veterinary support from Biocontacto.

6. Methodology

This project already counts with the advice and guidance of Dr. Enrique La Marca, as well as the support of trained keepers to supervise the frogs and care for the *ex-situ* facilities. Also, the VARAC center makes available founder stocks to constitute the invertebrate food-supply' colonies that will provide reliable and varied live-food items for the captive specimens. BIOGEOS Foundation is offering financial support towards completion of the project.

Special care has been taken to undertake the necessary measures for good health (quarantine, medicines, and veterinary protocols), and general maintenance (environmentally controlled spaces, food resources, and enclosures) for the captive Merida rocket frogs. Climatic conditions will be mimicked with artificial illumination and automated photoperiod, controlled temperatures, artificial rainfall and fogging, as well as an automated water-flow with filtering system. Previous gathered experience is helpful to set the right standards to avoid potential escapees. The quarantine treatments we have set as protocols will prevent transfer of diseases between and among specimens taken from the wild, kept in captivity and liberated into the wild. We will follow standard record-keeping protocols to avoid risks of interbreeding and minimize the risks of loss of genetic diversity. The species will be kept isolated from other species.

7. Budget

Budget category	**Item/amount**	**Requested from AArk**	**Other sources/ status**
Field work	Field vehicle rental, fuel, $60/day, 20 days	$1,200	0
	Stipends local participants $50/day, 10 days	$500	0
	Lodging, 2 people, $20/day, 4 days	$160	0
	Vehicle maintenance	$150	0
***Ex situ* facility**	1st year keeper salary	0	$2,600 BIOGEOS Foundation
	Disposable gloves ($100 x4)	$100	0
	Air conditioner	$ 500	0
	Refrigerator (to cool water)	$700	0
	Food and culture media for invertebrates	0	$600 BIOGEOS Foundation
	Plumbing (valves, couplings, PVC pipe)	$390	0
	Glass (cut and drilled)	$300	$1,200 BIOGEOS Foundation 0
	Pumps ($60 x5)	$100	0
	Thermometer ($20 x5)	$200	0
	Plastic enclosures, hand nets	$700	$920 BIOGEOS Foundation
	Shelves	0	$600 BIOGEOS Foundation
	Light bulbs, timers	0	$980 BIOGEOS Foundation
	Overalls, boots, facial masks	0	$450
Education	Presentations at local schools and conservation organizations	0	$800 BIOGEOS Foundation
Threat mitigation	Water analyses	0	$800 BIOGEOS Foundation
	Campaign against pollution	0	$600 BIOGEOS Foundation
Total		**$5,000**	**$10.000**
Percentage		**50%**	**50%**

8. Scientific citations

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La Marca, E. and J.E. García-Pérez. 2004a. *Aromobates meridensis*. In IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2. <www.iucnredlist.org>.

Rojas-Runjaic, F.J.M., E.E. Infante-Rivero, C .L. Barrio-Amorós. 2011. A new frog of the genus *Aromobates* (Anura, Dendrobatidae) from Sierra de Perijá, Venezuela. Zootaxa 2919:37-50.

9. Timeline of work

Activity	Jul-Sep 2016	Oct-Dec 2016	Jan-Mar 2017	Apr-May 2017
Field study and collection	X	X		
ex situ facility	X	X	X	X
Threat mitigation			X	
Presentation of results				X

10. Supporting letters.

A **letter of endorsement** from an unrelated international organization endorsed by a recognized leader in the field of conservation (Dr. Carlos Rivero-Blanco).

A **letter of institutional support** from BIOGEOS Foundation (Dr. Enrique La Marca), employer of Principal Investigator.

Proposal submitted to: Kevin Johnson, Taxon Officer. AArk Seed Grant (KevinJ@amphibianark.org).