

A Harlequin frog (Atelopus) with black and yellow spots, sitting on a mossy rock in a forest. The frog is positioned in the lower-left corner of the frame, facing right. The background is a lush, green forest with moss-covered rocks and dense foliage.

***Atelopus Project:***  
**Monitoring Harlequin Frogs in Sierra Nevada,  
Colombia.**

## Conservation Leadership Programme: Project Reporting

Final Report

Due: On completion of all project activities planned under CLP funding.

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4. Permanent contact address, email and website: Universidad del Magdalena, Carrera 32 No 22 – 08 Apartado Postal 2-1-21630, Santa Marta D.T.C.H. – Colombia, [biologoluisrueda@gmail.com](mailto:biologoluisrueda@gmail.com); <http://www.luisruedasolano.com/proyectos/proyecto-atelopus/>
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#### ***Atelopus Project:***

#### **Monitoring Harlequin Frogs in Sierra Nevada, Colombia**

The decline of Harlequin frog populations (*Atelopus spp.*) have been documented as the most alarming case of species loss in recent history. The main threats to their populations are the fungal disease chytridiomycosis and climate change. Sierra Nevada de Santa Marta in north Colombia is an important sanctuary for harlequin frogs due to the presence of several species with healthy populations. This project will create the base-line for a monitoring and conservation programme of *Atelopus laetissimus* and *A. nahumae* which are both found in this region. Long-term population monitoring will be implemented through capture-mark-recapture methods as an in-situ conservation action. Biosecurity and detection protocols of *Batrachochytrium dendrobatidis* will be implemented. We will engage key stakeholders in strategic activities such as environmental education, monitoring and implementation of biosecurity protocols to safeguarding these highly threatened amphibians. Our results will contribute to understanding the long-term population dynamics of these species and how climate change, ecological and ecophysiological factors affect the survival of the harlequin frog in Sierra Nevada de Santa Marta.

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Thanks for all.



*Profe Beto and his Atelopus team.*

## Section 1:

### SUMMARY

**Atelopus Project Colombia** had the purpose of creating a baseline for monitoring of population and ecological dynamics of Harlequin frogs, *Atelopus laetissimus* and *Atelopus nahumae* in the sector of San Lorenzo, Sierra Nevada de Santa Marta. This baseline goal to follow up 10 years of natural populations dynamic, and what influence have environmental and human factors in the *Atelopus* population. Although our results focus on *Atelopus laetissimus*, this report has the populations monitoring, ecological monitoring and epidemiological surveillance protocols for those two species. Through these protocols, we obtain important natural history data, such as population number, mating data, height, weight, activity and operational temperatures of those species. Especially, the most important outcome is to know within the project time, the conservation status of *Atelopus laetissimus* and *A. nahumae*; we have documented abundant and stable populations, which contrasts with other *Atelopus* species of mid-mountain in Neotropic. It is expected that governmental and non-governmental authorities continue with these protocols and maintain interest in the conservation of *Atelopus* species in the Sierra Nevada de Santa Marta, which is a sanctuary for harlequin frogs in Colombia.

#### ***Atelopus* Project: Monitoring Harlequin Frogs in Sierra Nevada, Colombia**



*Atelopus nahumae*

*Atelopus laetissimus*

## INTRODUCTION

Amphibian population declines have been worldwide (Stuart et al. 2008, Mendelson et al. 2006 Pounds et al. 2006, Young et al. 2001). About 32.2% of the 7044 existing Amphibian species are in endangered categories of IUCN (2012). Several causes are associated with the decline of amphibians (habitat destruction, invasive species, illegal wildlife trafficking, among others) (Baillie et al. 2010; Rueda-Almonacid et al. 2004). However, Global warming and the Chytridiomycosis (disease caused by a pathogenic fungus *Batrachochytrium dendrobatidis* (Bd) which is transmitted by water, seem to be the most plausible reasons to explain this phenomenon (Pounds et al. 2006). These two factors could be acting synergistically, because global warming changes weather patterns (increasing or decreasing the temperature and decreasing rainfall) which would promote optimal growth of the fungus Bd (Pounds et al. 2006).

Amphibian species that have suffered population declines share similar ecological characteristics, such as aquatic habitats, large body size and restricted altitudinal ranges in the highlands (Lips et al. 2003). Most Harlequins Frogs of the genus *Atelopus* (Family Bufonidae) have all these ecological characteristics, which makes these species highly susceptible to the decline of their populations, including those ones, which are present in protected areas. In fact, the decline of populations of *Atelopus* have been documented as the most alarming case of species loss in recent history (Lötters 2007, La Marca et al. 2005).

The Harlequins frogs that inhabit the Sierra Nevada de Santa Marta, Colombia, are categorized critically endangered (CE), (*Atelopus carrikeri*, *A. walkeri*, *A. arsyecue*, *A. laetissimus* and *A. nahumae*) (Acosta -Galvis 2013, Ruthven 1916; Rivero, 1963; Rueda-Almonacid 1994, Ruiz-Carranza et al. 1994). These are endemic to this massif and its distribution is replaced altitudinally (Rueda-Almonacid 1994). *Atelopus laetissimus* and *A. nahumae* are in the northeastern part of the Sierra Nevada de Santa Marta in the departments of La Guajira, Cesar and Magdalena, with altitudinal distribution (1900 - 2880) and (1500 - 2800) m respectively (Acosta-Galvis 2013, Ruiz-Carranza et al. 1994). These species live around the montane rainforest streams (Lötters 1996) and unlike the general pattern of diurnal habit other *Atelopus* species, *A. laetissimus* and *A. nahumae* have also nocturnal activity (Granda-Rodriguez et al. 2008 Carvajalino-Fernandez et al. 2008; Obs. Pers).

The project purpose is to make the baseline for a sustainable long-term monitoring programme for harlequin frogs *Atelopus laetissimus* and *Atelopus nahumae* in the Serrania de San Lorenzo, Sierra Nevada de Santa Marta. Taking various population, ecological and ecophysiological parameters that will help to understand how these influence the survival and conservation status of these two endemics and critically endangered species in the next 10 years.

*Sierra Nevada de Santa Marta, sanctuary for harlequin frogs in Colombia.*

## PROJECT MEMBERS (*Atelopus* Team Members)

### Luis Alberto Rueda Solano (*Atelopus* Team leader)



Young Biologist with emphasis on Herpetology. My interests include ecology, ecophysiology, behaviour and conservation of Amphibians and Reptiles. I was graduated from Magdalena University (Santa Marta, Colombia), and I did Masters in Biological Sciences at the Andes University (Bogotá, Colombia). Currently I work as professor at the Magdalena University, where develop herpetological projects that promote knowledge and conservation of Colombian Caribbean herpetofauna.

### Andrés A. Rocha Usuga



Young biology student at the University of Magdalena (Santa Marta, Colombia) with emphasis on herpetology. His research interests includes the behavioral ecology of frogs, focused on the reproductive biology of frogs and conservation of these. He has participated in several research projects that have served as a hub for the conservation of endangered species. He is a student internship and his undergraduate thesis will be in Reproductive Biology *Atelopus* species. A future claim to be a comprehensive Biologist to ensure the conservation of endangered species.

### María Alejandra Galvis Aparicio



Biology student of the University of Magdalena, belonging to the Herpetological group of the University. I coordinate the epidemiological monitoring of *Batrachochytrium dendrobatidis* (Bd) on endemic amphibians of San Lorenzo, I want to document the fungus presence, also I had collaborated in the use of bio-security protocols to prevent the transmission of Bd, provide assistance and support in fieldwork of *Atelopus* Project.

### Lilia Mejía Quintero



I am biology student in a comprehensive training process. Active member of the research herpetological group, with expertise in monitoring amphibians and reptiles. Moreover, I was *Atelopus* project's assistant though of all work-areas, field monitoring, educational campaigns, logistics processes, administrative management. My research interests span the ecology and behavior of amphibians and reptiles. Currently I am developing my undergraduate work based on foraging of *Atelopus laetissimus* in the Serranía de San Lorenzo.

### Jose Luis Perez Gonzalez



I am a student of Biology, University of Magdalena, my research interests focus on behavioural and reproductive ecology of frogs. Mainly, my activities in the *Atelopus* Project were based on the support in the fieldwork in the Serranía de San Lorenzo for data collection, such as the size and weight body of individuals, markings and placement datalogger, and participating in social activities with children and University's students of Santa Marta city.

### Lizeth Carolina Jiménez López



An active member of the Herpetological group of Magdalena University, my research interests are focus on behaviour and ecology of high mountain frogs. My particular study is about the microhabitat use of *Atelopus laetissimus*; joining behavioural foraging and structural aspects of microhabitat used by these species. My main contribution to the *Atelopus* project was attending different exploratory field trips and monitoring of Harlequins frogs in the Sierra Nevada de Santa Marta. I was responsible for the project advertising disseminated in various media, as well as an important accompaniment in administrative activities that allowed the execution of the project.

### **Tomás Mejía Moreno**



Biologist in training, active member of the "froglets" team (Herpetological Group of the University of Magdalena). Field and laboratory assistant in "Atelopus Project" made me got a practical experience in research and conservation of amphibians and reptiles. My research interests include trophic ecology of lizards.

### **Tatiana Hernández Palma**



Undergraduate student in biology, member of the Herpetology group since I was a first- year student in the university, interested in chemistry ecology, toxicology and in the conservation of reptiles and amphibians. She is passionate about research, with skills in work group and laboratory and field assistance. My participation was very important in the educational and social activities of the Atelopus Project.

### **Jorge Eguis**



Undergraduate student in biology and active member of the team "froglets" (Research Herpetological Group of the University of Magdalena), with experience in taxonomy research and monitoring of reptiles and amphibians. Field and laboratory assistant in the "Atelopus Project Colombia".

## Section 2:

### AIM AND OBJECTIVES

#### OVERALL GOAL

- To determine the effect of climate change on population dynamics of harlequin frogs in Sierra Nevada de Santa Marta, Colombia.

#### PROJECT PURPOSE

- To establish the baseline for a sustainable long-term monitoring programme for harlequin frogs in the San Lorenzo Serrania, Sierra Nevada de Santa Marta.

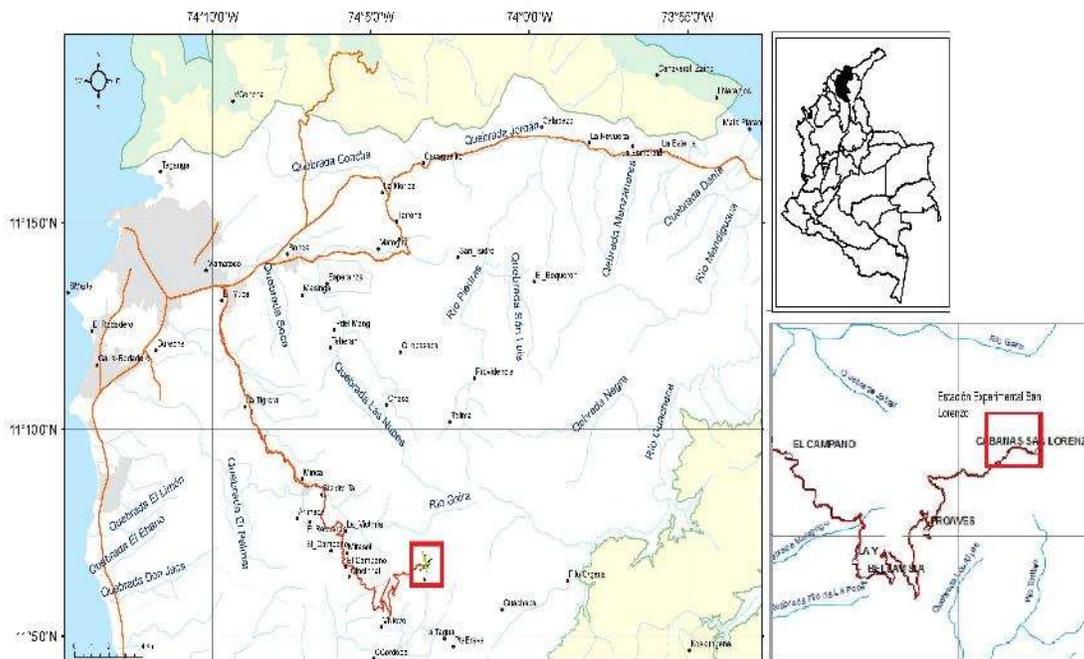
#### OBJECTIVES

- **Objective 1** The status of the fungal infection in these amphibian communities has been established.
- **Objective 2** Baseline information as to the population, distribution and habitat preferences of *Atelopus* frogs in the Serranía de San Lorenzo is established.
- **Objective 3** Information for Limiting factors and physiological aspects of the ecology of *Atelopus* frogs are better understood.
- **Objective 4** Awareness about the *Atelopus* frogs and their conservation needs has been significantly increased amongst local communities, student communities and visiting ecotourists.

## METHODOLOGY

### Study Area

This study was conducted in the upper basin of the Gaira river, Serrania de San Lorenzo, northwestern slope of the Sierra Nevada de Santa Marta, Magdalena Department, Colombia. In this area, *Atelopus laetissimus* and *Atelopus nahumae* live sympatrically. These harlequin frogs are well studied in "La Quebrada San Lorenzo" into the San Lorenzo Forest Station (11 ° 06 '54.96" N 74 ° 03' 03.46 "W) to ~ 2100 meters of elevation, however we chose others streams for sampling. This area has steep slopes and primary and secondary forest vegetation in good conservation status.



Serrania de San Lorenzo, Sierra Nevada de Santa Marta, Colombia

### Field Sampling

We used a robust sampling, which were five primary sampling events to the study area (two months between them). Each sample was at least four days, which used as secondary events sampling in each of these, one selected random streams, which were inspected three times a day, in diurnal periods (9:00 and 14: 00 hours) and night (19:00 hours). Thus, it carried out the specific methodologies for each of the objectives of this study.

**Estimation of population size and survival probabilities:** We used the method CMR to capture, mark and recapture individuals during sampling events, for each species of interest in the streams sampled. Individuals were captured manually and were marked by the method VIE Tags (Visible Implant Elastomer) (Phillott et al. 2007) and photoID. It was assigned a different VIE color or body patron code for each individual captured by species. We obtained the population size (by closed population model) and monthly survival probabilities (by open population model) for *Atelopus laetissimus* during the sampling period. These analyzes were carried out using the software MARK.

**Body mass and reproductive periods:** we used a fixed transect (suggested by Rueda-Almonacid et al. 2006) of 50 m long and 10 m wide (500 m<sup>2</sup>) in each of the selected streams. These transects were positioned on the stream section with the greatest abundance of *Atelopus* individuals (Obs. Pers). Transect had five meters of wide on each side of stream, taking as reference of central point of the stream, within transect were counted all individuals of *Atelopus*. We got body mass of each of the individuals recorded, weighed and measured (LRC) through a digital caliper and pesola, respectively.

**Climate Registry, Body and Operational Temperatures:** At the beginning and ending of each sampling event, we took air temperature and relative humidity (micro-climatic variables) with a thermohygrometer. We registered body temperature (BT) and operating temperature (OT) of each individual localized. BT was register by an infrared thermometer and OT by plaster models (similar to the species of interest) connected to data loggers (HOBO® Data Logger Outdoor). OT was recorded throughout the sampling months. These models with their respective Data Loggers were randomly switch on each sampling event within the monitored streams.

**Determination of *Batrachochytrium dendrobatidis* (Bd):** Individual swab smears were carried out to the skin of amphibian's community, each swab was stored in individual containers. These samples were taken to the laboratory of Biology of the University of Magdalena and by PCR techniques establish the presence/absence of the fungus Bd.

**Awareness of Student Community:** Lectures and conservation activities were conducted, to inform and sensitize participants about global amphibians' declines and their implications on biodiversity. These activities were made with student of Magdalena University and local people of Santa Marta city.

**Workshops:** We carried out several workshop with stakeholders. One these was the workshop responsible for the conservation of Amphibians of St. Lorenzo, Sierra Nevada de Santa Marta, Colombia with Parques Nacionales and local communities.

**Workshops Target Audience:** Local guides and ecotourists, biology students, government agencies, NGOs or local people interested in the conservation of amphibians.

**Key message:** It was a prior contact with local communities, government (Parques Nacionales and Corpamag) and non-governmental (Proaves) agencies. Parallel to this, the Atelopus Project team prepared material required to perform the workshop. Which involved information on amphibian diversity of the place, how to identify each amphibians species as harlequin frog and how to recognize a local, regional, national and global problems of the amphibian fauna. Moreover, as to implement securely biosecurity protocols, plus some guidelines sampling methods used in the project and other topics that can help to improve conditions becoming more responsible ecotourism to conservation of amphibians in the mountains of San Lorenzo. Besides, we used poster and video for tourists and local people about harlequin frogs information with the key message will be that "the Sierra Nevada de Santa Marta is the Sanctuary of harlequin frogs in Colombia."

## OUTPUTS AND RESULTS

### OBJECTIVE 1 THE STATUS OF THE FUNGAL INFECTION IN THESE AMPHIBIAN COMMUNITIES HAS BEEN CLEARLY ESTABLISHED

Activity 1: Training team in field collection techniques and detection of Bd in laboratory.

Activity 2: Contents protocols for field and laboratory arrest Bd amphibian community

Activity 3: Identification of all amphibian species.

#### **Outputs from objective 1**

Training team member (especially Maria Galvis) in field collection and laboratory detection techniques of Bd fungus (*Batrachochytrium dendrobatidis*) and field Biosecurity protocols. These training were made in April and August 2015. They received the training of team leader (Luis Rueda Solano) with specification of one Advisor's project (Sandra Flechas). Besides, Maria Galvis received training in laboratory techniques in Andes University (Bogota, Colombia) under Sandra Flechas mentoring.

The training of field collection techniques of Bd fungus was in April 2014 in the Serrania de San Lorenzo (SNSM) during three (3) days. The output of this training was one database with information about *Atelopus species* and other species which team members practiced swabs field technique. Since then, the database has been updated with new species and more than 100 individual swabbed, and we are still working swabbed the individuals. This information include the most of amphibians of the sector (Table 1). Bd detection laboratory analyses were realized for all amphibian community of San Lorenzo.



The training of field collection techniques of Bd fungus and Biosecurity protocols.



Field collection of samples for Bd fungus in amphibian's community, Serranía de San Lorenzo, Sierra Nevada de Santa Marta.

**Table 1.** Amphibians community and species swabbed in the sector of the experimental station of San Lorenzo, 2200 m altitude, Sierra Nevada of Santa Marta, Northern Colombia.

| Species                           | Habit             | Microhabitat        | No. Of individuals swabbed | Positive Bd* | Negative Bd* |
|-----------------------------------|-------------------|---------------------|----------------------------|--------------|--------------|
| <i>Atelopus laetissimus</i>       | Nocturnal         | Terrestrial/Shrubs  | 49                         | -            | 19           |
| <i>Atelopus nahumae</i>           | Diurnal/Nocturnal | Terrestrial/Shrubs  | 49                         | -            | 2            |
| <i>Geobatrachus walkeri</i>       | Diurnal/Nocturnal | Terrestrial         | 7                          | -            | -            |
| <i>Ikakogi tayrona</i>            | Nocturnal         | Shrubs              | 7                          | -            | -            |
| <i>Pristimantis delicatus</i>     | Nocturnal         | Shrubs              | 6                          | -            | 4            |
| <i>Pristimantis carmelitae</i>    | Nocturnal         | Terrestrial         | 46                         | -            | 11           |
| <i>Pristimantis cristinae</i>     | Nocturnal         | Shrubs              | 6                          | -            | 2            |
| <i>Pristimantis insignitus</i>    | Nocturnal         | Terrestrial         | 11                         | -            | -            |
| <i>Pristimantis megalops</i>      | Diurnal/Nocturnal | Terrestrial         | 55                         | -            | 25           |
| <i>Pristimantis sanctaemartae</i> | Nocturnal         | Shrubs              | 38                         | -            | 9            |
| <i>Pristimantis tayrona</i>       | Nocturnal         | Phytotelmata        | 14                         | -            | -            |
| <i>Pristimantis sp. nov. 1</i>    | Nocturnal         | Shrubs              | 15                         | -            | -            |
| <i>Pristimantis sp. nov. 2</i>    | Nocturnal         | Terrestrial/Shrubs  | 3                          | -            | 1            |
| <i>Bolitoglossa savagei</i>       | Nocturnal         | Shrubs/Phytotelmata | 14                         | -            | -            |

\*Analysis in processing.

#### BIOSECURITY PROTOCOLS FOR AMPHIBIANS IN SERRANÍA OF SAN LORENZO, SIERRA NEVADA DE SANTA MARTA.

To prevent and reduce the risk of transmission of Bd in the Sierra Nevada de Santa Marta, park administrators have been implementing, a biosecurity protocol for all foreign and national personnel that enters the Estación Experimental de San Lorenzo, which consists of disinfection of field equipment (boots, nets, measuring devices) used as much by researchers as by tourists who visit the protected area. Prior to making a visit to the sector of San Lorenzo it is required that all students, researchers and tourists disinfect their field equipment. Nevertheless, as a preventive measure in-situ, field boots are washed with a commercial sodium hypochlorite solution diluted in water, similarly measuring tools are washed in 70% isopropyl alcohol. These field biosecurity protocols in the Serrania of San Lorenzo are the results of agreement with Governmental Institution "Parques Nacionales de Colombia". These protocols are at the time present implemented in the Estación Experimental San Lorenzo. For more details, it will be published in the Amphibians and Reptiles Conservation Journal in few months.

Rueda-Solano, L. A., S. V. Flechas, M. Galvis-Aparicio, A.A. Rocha-Usuga, B. Cuadrado-Peña & R. Franke-Ante. 2016. Epidemiological Surveillance and Amphibian Assemblage Status at the Estación Experimental de San Lorenzo, Sierra Nevada de Santa Marta, Colombia. Amphibians and Reptiles Conservation. (in press).

## OBJECTIVE 2 BASELINE INFORMATION AS TO THE POPULATION, DISTRIBUTION AND HABITAT PREFERENCES OF ATELOPUS FROGS IN THE SERRANIA DE SAN LORENZO IS ESTABLISHED

Activity 1 Training methods of mark-recapture methods and demographic

Activity 2 Explore different points of San Lorenzo

Activity 3 Contents Population monitoring protocols, Ecological, and Epidemiological Surveillance

Activity 4 The mark-recapture methodology species of *Atelopus* is performed

Activity 5 Microhabitats associated *Atelopus* species identified

Activity 6 Body measurements and weight of individuals of *Atelopus* spp are taken

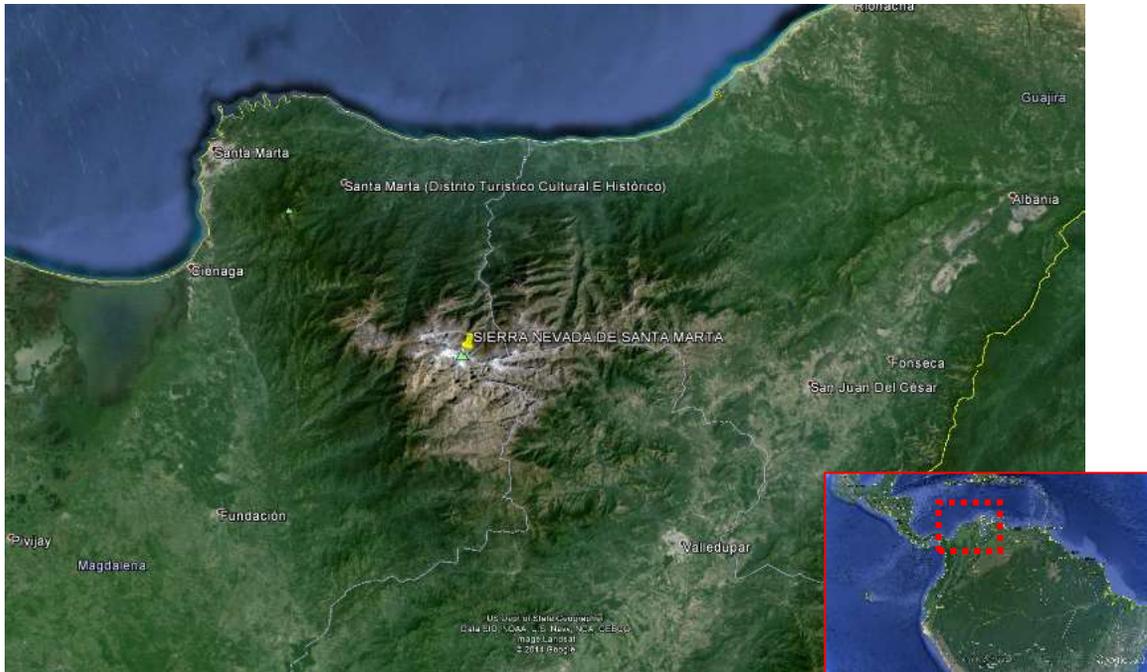
Activity 7 Surf two areas in Sierra Nevada de Santa Marta (1) the Serrania de Bañaderos (Guajira, Colombia); (2) Cuenca media Rio Ancho (Guajira, Colombia)

- **Outputs from objective 2**

**Training team member** (especially Andres Rocha) in capture - mark-recapture techniques in field and Software MARK for analyse Harlequin frog's population dynamics. We are implemented photo-identification and VIE for marking individuals of *Atelopus laetissimus* and *A. nahumae*.

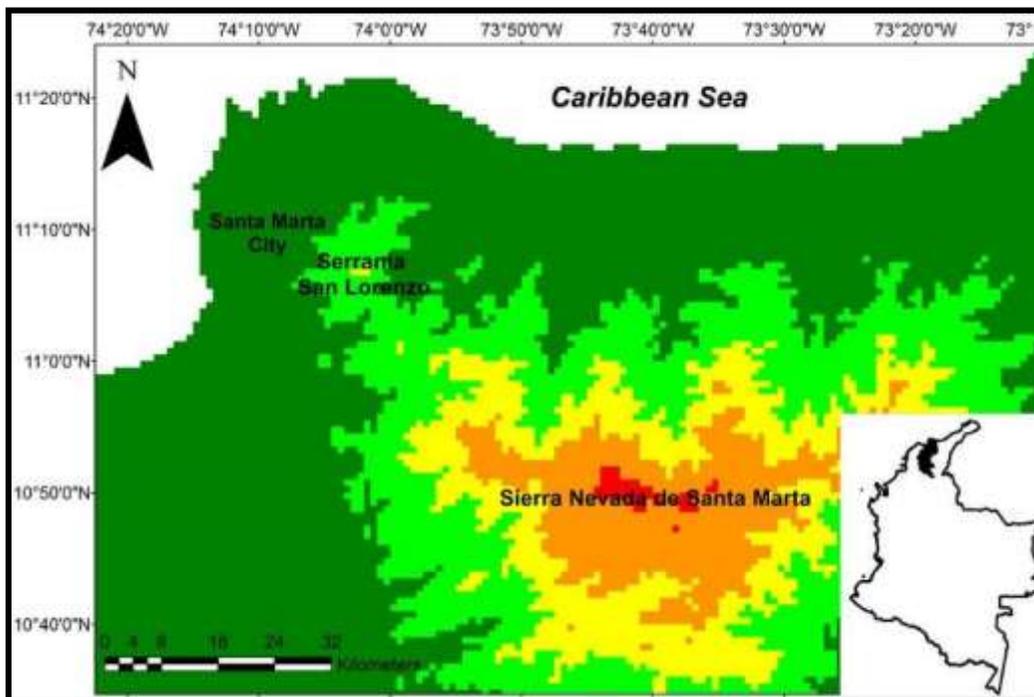


Training in capture – mark –recapture techniques for analyse the population of *Atelopus laetissimus* and *A. nahumae*



Sierra Nevada de Santa Marta, North of Colombia.

In the first days of October of 2014, we were exploring the Serranía of San Lorenzo. We could get all streams for monitoring of *Atelopus laetissimus* and *Atelopus nahumae* in this Serranía. We explored 1,27 Km<sup>2</sup> of this Serranía and we took four (4) streams with more than 300 meters of separation between them. These streams were selected for the abundance of harlequin frogs.



Serranía de San Lorenzo, Sierra Nevada de Santa Marta, North of Colombia.

**Monitoring streams in the Serranía de San Lorenzo:**



Stream 1 San Lorenzo: latitude: 11.115611° longitude: -74.050278°; Altitude: 2151 m

Stream 2 Proaves: latitude: 11.108500° longitude: -74.063389°; Altitude: 2169 m

Stream 3 Betoma: latitude: 11.111000° longitude: -74.062000°; Altitude: 2104 m

Stream 4 Cascada: latitude: 11.111833° longitude: -74.060889°; Altitude: 1622 m



Monitoring Stream for *Atelopus laetissimus* and *A. nahumae*

**Population monitoring, Ecological monitoring, and Epidemiological Surveillance protocols for *Atelopus laetissimus* and *Atelopus nahumae* in Serranía de San Lorenzo, Sierra Nevada de Santa Marta.**



*Atelopus laetissimus*

*Atelopus nahumae*

***Population Monitoring Sampling Protocol***

Population monitoring of *Atelopus laetissimus* and *Atelopus nahumae* must be conducted in the upper basin of the river Gaira Serrania de San Lorenzo, northwestern slope of the Sierra Nevada de Santa Marta, Magdalena Department, northern Colombia. In this area, these are sympatric species; therefore, it is achievable monitoring both populations.

The monitoring will be through of a robust sampling with primary and secondary sampling events to the study area. Primary sampling events could be monthly or yearly and each sampling event will have minimum three or four days. These days will be used as secondary events sampling. The monitoring streams will choose randomly, which will be inspected two times per day, in diurnal periods (9:00 or 14: 00 hours) and night (19:00 hours). It will be used a fixed transect of 50 m long and 10 m wide (500 m<sup>2</sup>) in each monitoring streams.

Capture, mark and recapture of individuals during sampling events for each *Atelopus* species in the monitoring streams will be used. Individuals will be captured manually (see Biosecurity protocols), it will be marked by the method VIE (Visible Implant Elastomer) Tags (Phillott *et al.* 2007) for *Atelopus nahumae* and Ventral PhotoID for *Atelopus laetissimus* (FIG 7). Each individual captured must be assigned a different and unique code by species.

The estimate of population size and survival probabilities for both *Atelopus* species in Serranía de San Lorenzo will be obtained using closed and open population models respectively (McCaffery *et al.* 2015).

### ***Ecological Monitoring Sampling Protocol***

For ecological monitoring, must be used a fixed transect of 50 m long and 10 m wide (500 m<sup>2</sup>), in each monitoring streams. It will be gotten the body mass registered weighed and measured (LRC) of each of the individuals. Besides, it will be registered all microhabitat used for *Atelopus* species and will be implemented stomach wash to know about population diet throughout the years.

### ***Epidemiological Surveillance Protocol***

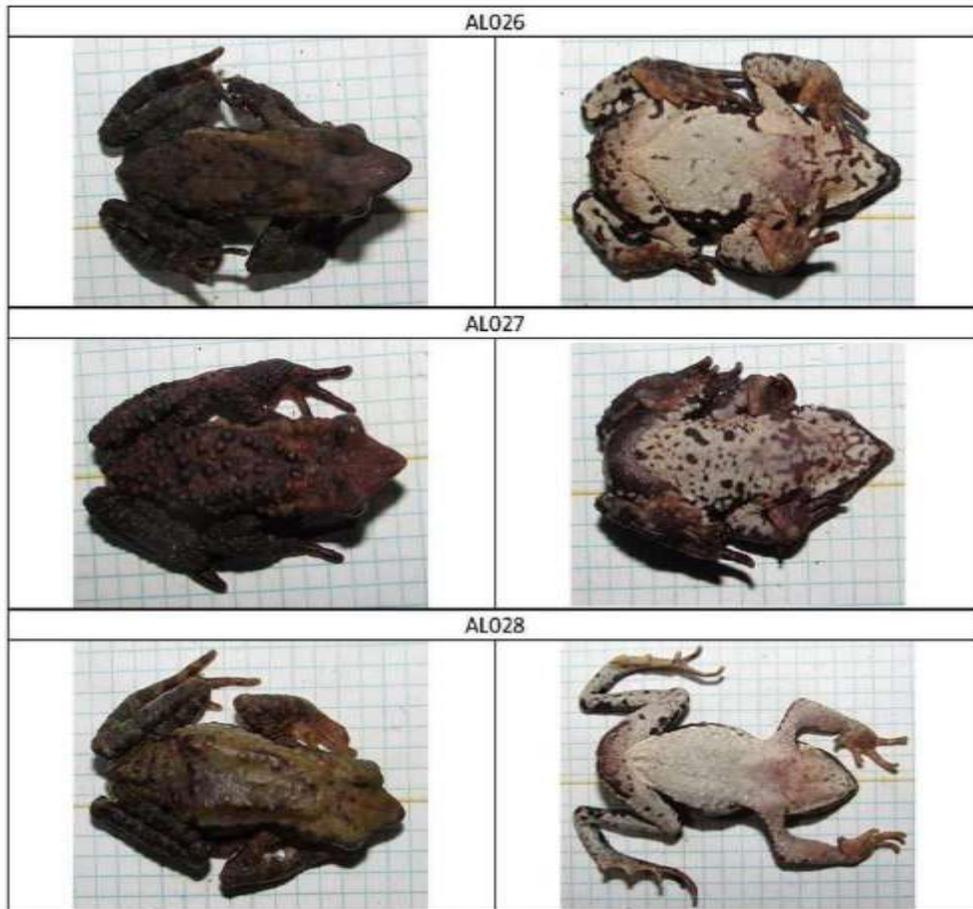
Epidemiological surveillance will consist in observations of anurans with clinical signs that will be visually detectable, such as lethargic individuals with macroscopic lesions or ulcers and the presence of fungi or other corporal anomaly, such as deformities. For every case, data will be recorded for individuals if they manifested any clinical sign that may be related to Bd infections. Signs of the disease include lethargy, abnormal postures, hyperemia (Berger et al. 2000; Daszak et al. 1999). Swabs from individuals will be obtained in the field following the protocol of Hyatt et al. (2007) for Bd laboratory analysis.

For more details, it will be published in the Journal Amphibians and Reptiles Conservation in few months.

Rueda–Solano, L. A., S. V. Flechas, M. Galvis–Aparicio, A.A. Rocha–Usuga, B. Cuadrado–Peña & R. Franke–Ante. 2015. Epidemiological Surveillance and Amphibian Assemblage Status at the Estación Experimental de San Lorenzo, Sierra Nevada de Santa Marta, Colombia. *Amphibians and Reptiles Conservation*. (in press).

## THE MARK-RECAPTURE METHODOLOGY SPECIES OF *ATELOPUS*

Until now, we have been working with individuals of *Atelopus laetissimus*, the ventral PhotoID was a powerful tool in this propose. We have made five (5) sampling events (two in April; one in May; two in June-2015) with 99 individual have been marked through PhotoID (FIG 7). We have had an important new caught and re-caught number per each sampling event (Table 3), this has helped to our analysis in population dynamics of *Atelopus laetissimus*. The population estimate for *A. laetissimus* in the Quebrada San Lorenzo was **123 individuals** (standard error= 7.5945), with confidence interval (95%) **between 113 to 142 individuals**. This population estimate was made with **constant probability of recapture of 0.6747065** (CI95%= lower 0.5110725 upper 0.8045223). Due to that, the best model (lower AICc) was with survival probabilities varied in time and constant probability of recapture (Table 4). The survival probabilities varied in time for individuals of *A. laetissimus* in the Quebrada San Lorenzo, with a lower survival in the first mouths of the year after dry season of December to March and upper survival probabilities in rainy seasons of April and May, in this time is early reproductive period for this specie (FIG. 1). However, we need more sampling for improve of population estimates.



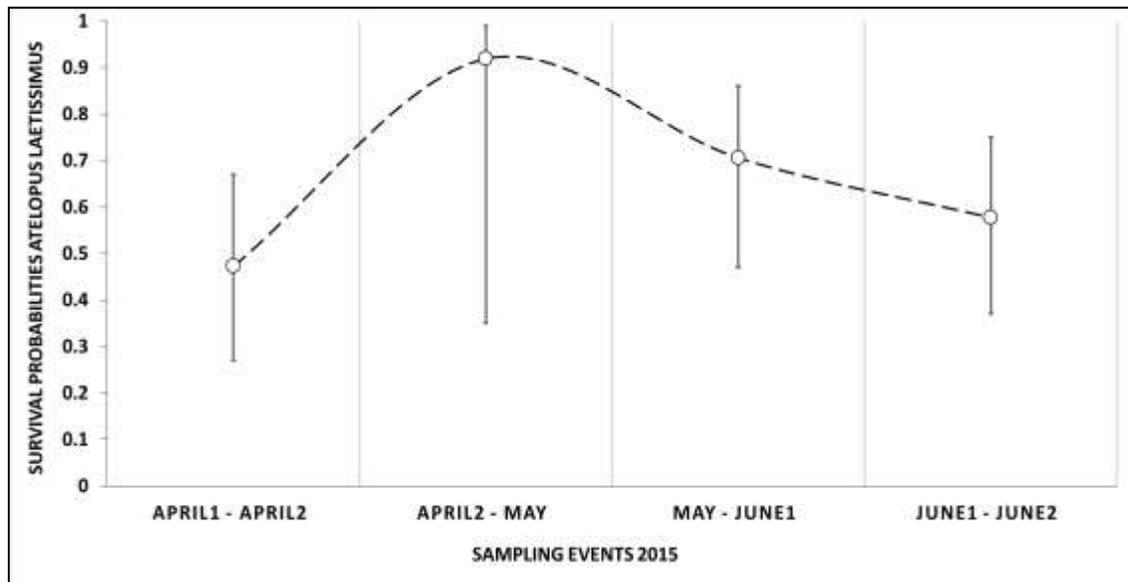
Individual ventral PhotoID for *Atelopus laetissimus*

**Table 3.** Summary of capture effort at the five sampling events for individuals of *Atelopus laetissimus* in the Quebrada San Lorenzo, Serrania de San Lorenzo, Sierra Nevada de Santa Marta.

| EVENTS 2015            | SAMPLING EVENTS 2015 |          |          |          |          | Total    |
|------------------------|----------------------|----------|----------|----------|----------|----------|
|                        | April1               | April2   | May      | June1    | June2    |          |
|                        | <b>1</b>             | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>5</b> |
| Individuals registered | 24                   | 18       | 35       | 56       | 37       | 170      |
| Newly caught           | 24                   | 10       | 23       | 33       | 9        | 99       |
| Re-caught              | 0                    | 8        | 12       | 23       | 28       | 71       |
| Total caught           | 24                   | 34       | 57       | 90       | 99       |          |

**Table 4.** Models from MARK used to estimate survival probabilities and recapture rates for individuals of *Atelopus laetissimus* in the Quebrada San Lorenzo, Serrania de San Lorenzo, Sierra Nevada de Santa Marta. Phi(t) = survival probability estimated varied in time; Phi(.)= survival probability estimated constant in time; p(t)= caught probabilities estimated varied in time; p(.)=caught probabilities estimated constant in time. (\*) selected model.

| Model       | AICc     | Delta AICc | AICc Weight | Model Likelihood | No. Par. | Deviance |
|-------------|----------|------------|-------------|------------------|----------|----------|
| Phi(t)p(.)* | 257,6336 | 0          | 0,49304     | 1,0000           | 5        | 40,7288  |
| Phi(.)p(.)  | 258,2059 | 0,5723     | 0,37035     | 0,7511           | 2        | 47,6434  |
| Phi(t)p(t)  | 261,1658 | 3,5322     | 0,08431     | 0,171            | 7        | 39,8809  |
| Phi(.)p(t)  | 262,1210 | 4,4874     | 0,05229     | 0,1061           | 5        | 45,2162  |



**Figure 1.** Estimated survival probability for individual males of *Atelopus laetissimus* in the Quebrada San Lorenzo, Serrania de San Lorenzo, Sierra Nevada de Santa Marta.

## MICROHABITATS ASSOCIATED ATELOPUS SPECIES IDENTIFIED

*Atelopus laetissimus* is associated mainly to plants of medium height or shrub along the streams and it has nocturnal activities. Preliminary dataset shows that Cyclanthaceae plants seem be where can be observed more often between 1.7 – 1.5 meters of distance from the ground. The relativity humidity is very high in their microhabitats.

**Table 5.** Microhabitat associated to *Atelopus laetissimus*

| <i>Atelopus laetissimus</i><br>(sex/Perch type) | No<br>Ind. | Max.<br>Perch (m) | Mean<br>Perch (m) | Max.<br>Distance<br>from<br>stream (m) | Min.<br>Humidity<br>(%) | Max.<br>Humidity<br>(%) |
|---|------------|-------------------|-------------------|--|-------------------------|-------------------------|
|---|------------|-------------------|-------------------|--|-------------------------|-------------------------|

| <b>FEMALES</b>        |   |     |      |   |      |      |
|-----------------------|---|-----|------|---|------|------|
| Plant (Cyclanthaceae) | 2 | 1.7 | 1.35 | 0 | 84.4 | 91.3 |
| Leaf Litter           | 1 | 0   | 0    | 0 | 86   | 86   |
| Plant (Shrub)         | 1 | 0.5 | 0.5  | 0 | 91.3 | 91.3 |

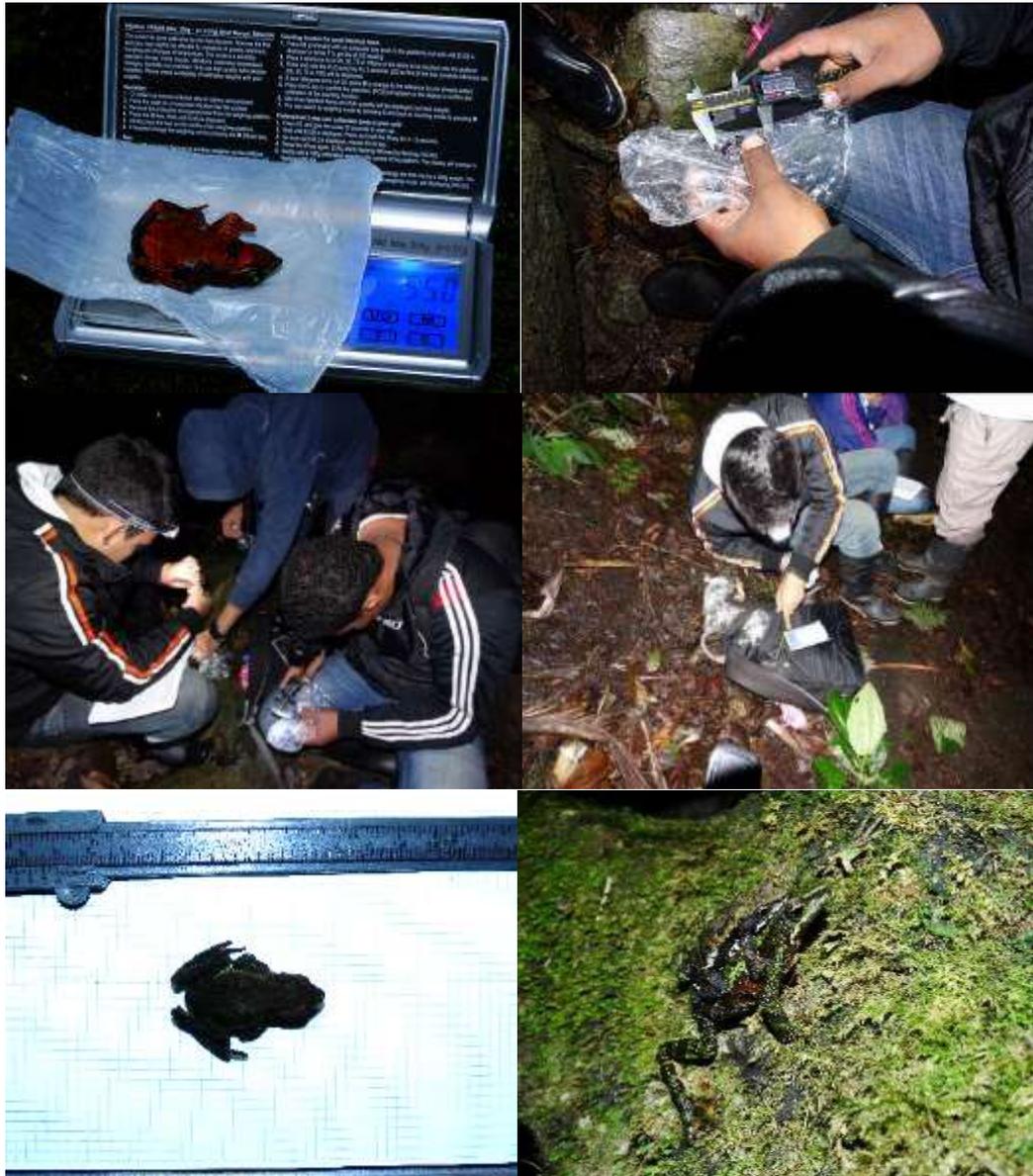
| <b>MALES</b>               |    |      |       |    |      |      |
|----------------------------|----|------|-------|----|------|------|
| Plant (Cyclanthaceae)      | 22 | 1.51 | 0.77  | 20 | 67.5 | 94.7 |
| Plant<br>(Melastomataceae) | 4  | 1    | 0.72  | 0  | 74   | 86.2 |
| Plant (Poaceae)            | 1  | 1.03 | 1.03  | 0  | 75.7 | 75.7 |
| Plant (Arecaceae)          | 13 | 2.5  | 1.06  | 0  | 78.5 | 92.2 |
| Plant<br>(Melastomataceae) | 2  | 0.98 | 0.87  | 0  | 93.4 | 93.9 |
| Plant (Shrub)              | 4  | 1.44 | 0.765 | 0  | 91.4 | 93.1 |
| Fern                       | 10 | 1.46 | 0.625 | 0  | 79.4 | 94.3 |
| Plant (?)                  | 3  | 0.92 | 0.65  | 0  | 80.2 | 84.7 |
| Leaf Litter                | 5  | 0    | 0     | 0  | 80.1 | 93.2 |
| Rocks                      | 4  | 0    | 0     | 0  | 79.2 | 91.8 |



Microhabitat associated to *Atelopus laetissimus*

## BODY MEASUREMENTS AND WEIGHT OF INDIVIDUALS OF ATELOPUS SPP ARE TAKEN

The mean weight of female individuals of *Atelopus laetissimus* was **14.24 g** (N=22 SD= 2.08) and for males individuals was **4.2 g** (N=182 SD= 0.78). The average height for females was **58.22 mm** (N=22 SD= 2.64) and for males was **39.9 mm** (N=128 SD=1.88)



Height and weight of individuals *Atelopus laetissimus*

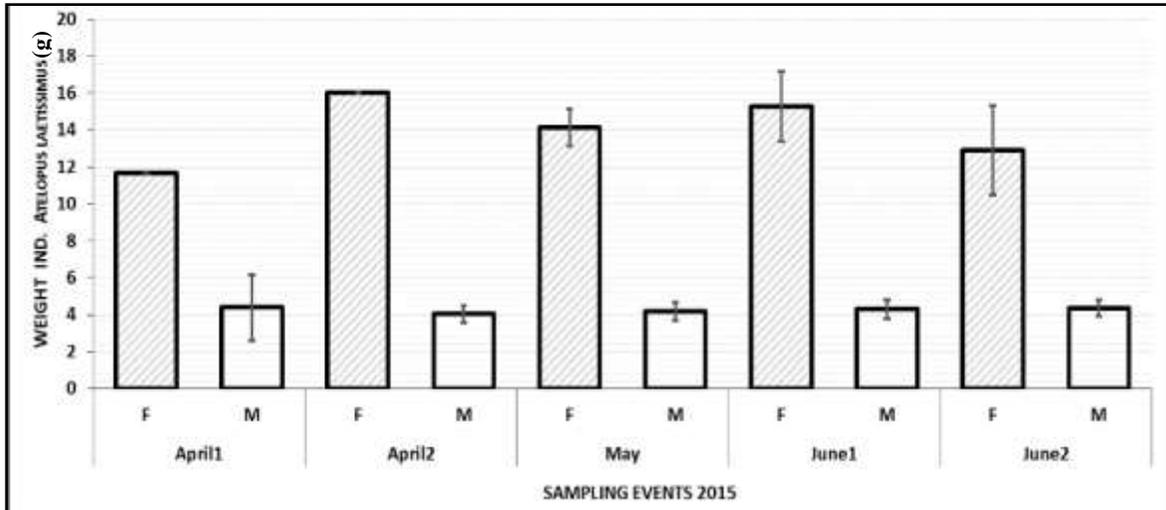


Figure 2. Mean weight of individuals *Atelopus laetissimus* through sampling. Error bars=SD

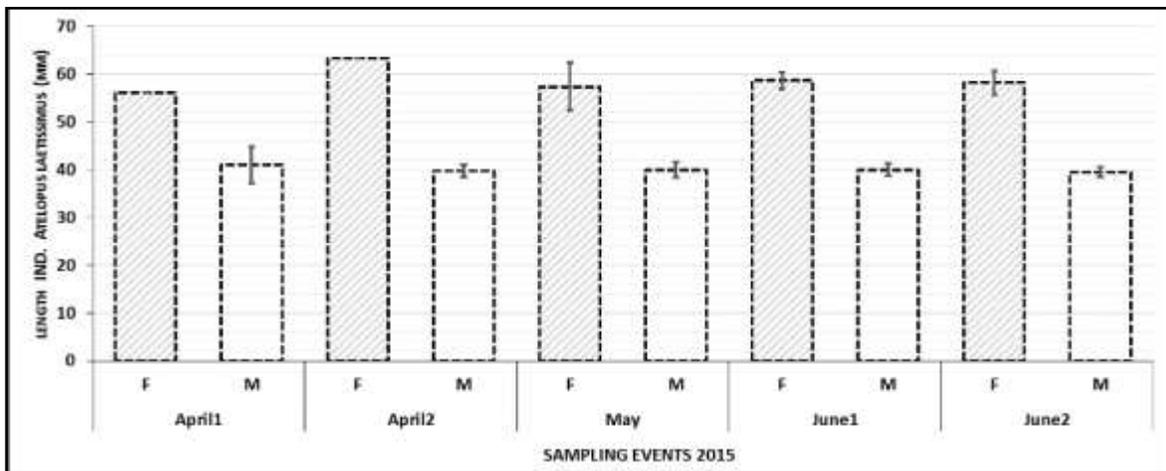
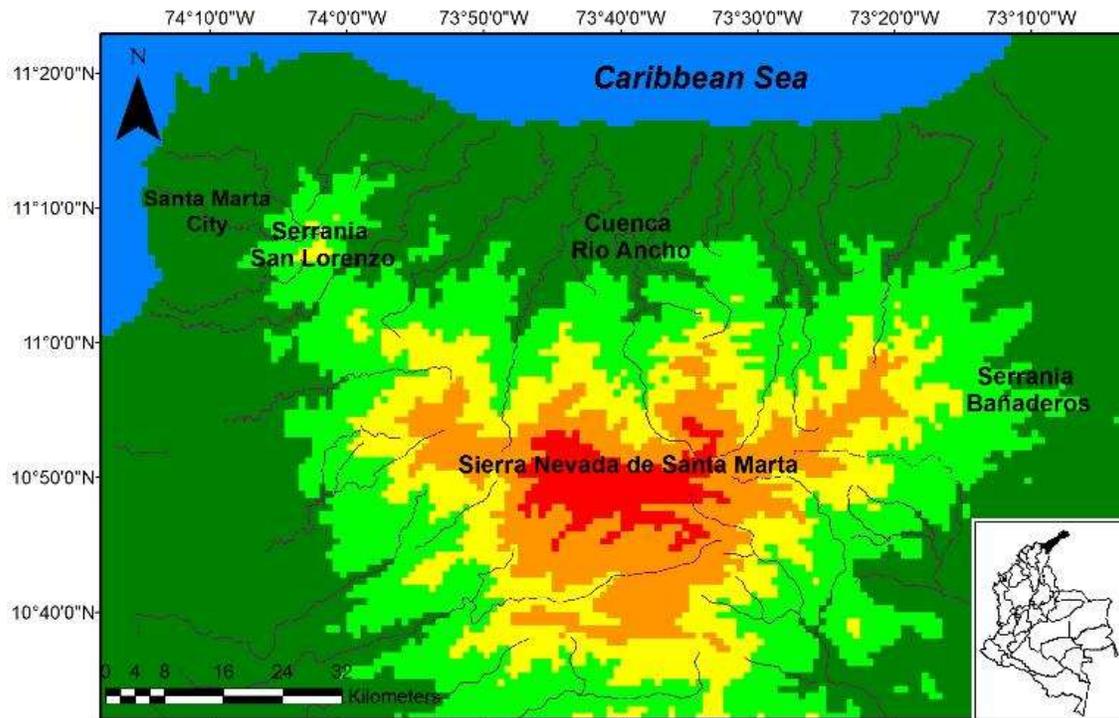


Figure 3. Mean length of individuals *Atelopus laetissimus* through sampling. Error bars=SD

EXPLORATIONS LOOKING FOR *ATELOPUS* POPULATIONS:



Until now, we have made two explorations to remote localities in the Sierra Nevada de Santa Marta. These have resulted with new species of herps for science. Besides, finding new populations and morphotypes of harlequin frogs previously unknown. However, we need the exploration of more localities, like Serranía de Cebolletas in the northwest of the Sierra Nevada de Santa Marta. These explorations are an important tool to know distribution, habitats and threats of harlequin frogs in this mountain.



Team members in the explorations to Rio Ancho and Bañaderos (Guajira), Sierra Nevada de Santa Marta.

## Exploration Serranía of Bañaderos

In October of 2014, we explored a new areas in Sierra Nevada de Santa Marta, we were looking for *Atelopus* populations, this time we went to the Serrania de Bañaderos, near to Hatonuevo municipality of La Guajira Department (11.134472° -72.789472°), to 155 kilometers of Santa Marta City (Magdalena). In this time, we could not find Harlequins frogs in this expedition, but we found a **new lizard specie**, It is a diurnal gecko specie (SAURIA: Sphaerodactylidae) with a beautiful blue-grey color (*Gonatodes sp.nov.*). We are studying more morphological and genetic analysis to confirm. However, the preliminary analysis showed a new species of *Gonatodes*, related to *Gonatodes albogularis*.



*Gonatodes albogularis*



*Gonatodes sp. nov.* (Confirmed with morphology and genetic analysis)

## Exploration Cuenca Media Río Ancho

In march of 2015, we explored a areas in Sierra Nevada de Santa Marta, we were looking for *Atelopus* populations, this time we went to the Cuenca Media Río Ancho, near to Palomino municipality of La Guajira ( $11.124472^{\circ}$  -  $73.556194^{\circ}$ ), to 80 kilometres of Santa Marta City (Magdalena). In this time, we could find a healthy population of harlequin frogs. Genetic analysis showed this populations was *Atelopus laetissimus* but we found **several morphotypes unknown before**. We are making more morphological and genetic analysis.



## Outcome objective 2

One of the most important outcome of the Atelopus Project Colombia has been the re-categorization to lower threat level of *Atelopus laetissimus* and *Atelopus nahumae*. Due to the populations' stability (monitoring from 2008 to 2015) and discovery of new populations in other localities in the Sierra Nevada.

*Atelopus laetissimus*: <http://www.iucnredlist.org/details/54519/0>

*Atelopus nahumae*: <http://www.iucnredlist.org/details/54531/0>

The image displays two screenshots of the IUCN Red List website for the species *Atelopus laetissimus*, illustrating a change in its conservation status. The top screenshot, labeled 'BEFORE', shows the species listed as 'CRITICALLY ENDANGERED' (CR) on the IUCN Red List scale. The bottom screenshot, labeled 'AFTER', shows the species listed as 'ENDANGERED' (EN). Both screenshots include the IUCN Red List logo, navigation menus, a search bar, and detailed taxonomic and assessment information for the species.

**BEFORE**

**AFTER**

**Taxonomy [top]**

| Kingdom  | Phylum   | Class    | Order | Family    |
|----------|----------|----------|-------|-----------|
| ANIMALIA | CHORDATA | AMPHIBIA | ANURA | BUFONIDAE |

Scientific Name: *Atelopus laetissimus*

**Assessment Information [top]**

### OBJECTIVE 3 LIMITING FACTORS AND PHYSIOLOGICAL ASPECTS OF THE ECOLOGY OF ATELOPUS FROGS ARE BETTER UNDERSTOOD

Activity 1 Field sampling for relative humidity and temperature ranges of *Atelopus laetissimus* and *A. nahumae* habitat

Activity 2 Field sampling for the operating temperature of the *Atelopus laetissimus* and *A. nahumae*

Activity 3 Field sampling for the body temperature of the species of *Atelopus laetissimus* and *A. nahumae*

#### Outputs from objective 3

FIELD SAMPLING FOR RELATIVE HUMIDITY AND TEMPERATURE RANGES OF *ATELOPUS LAETISSIMUS* AND *A. NAHUMAE* HABITAT.

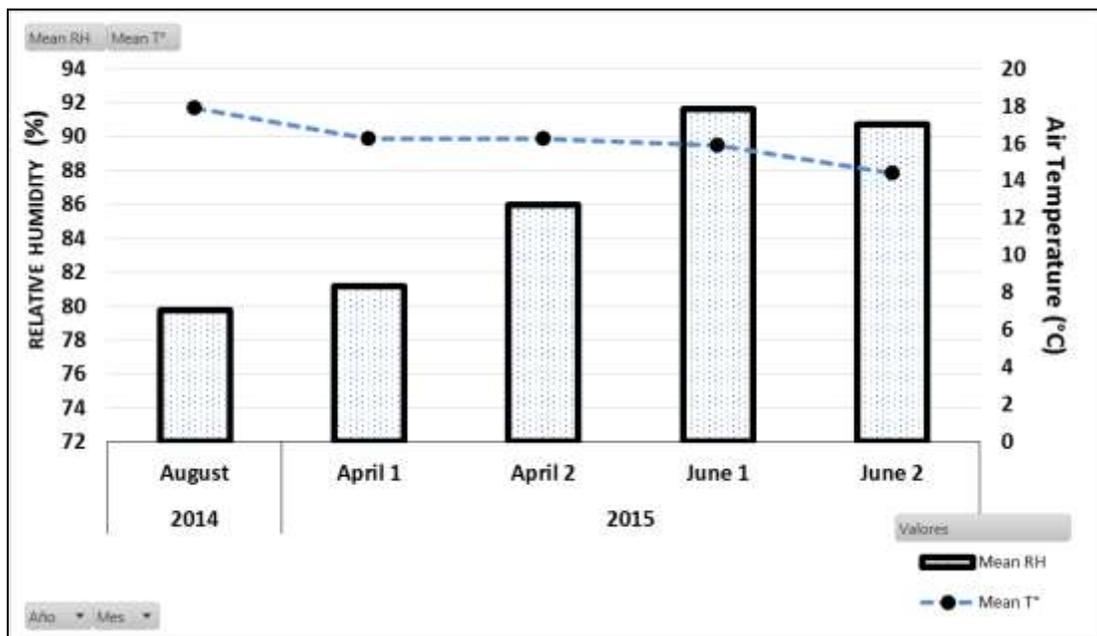


Figure 4. Mean relative humidity and air temperature *Atelopus laetissimus*' habitat through sampling.

Field sampling for the operating temperature of the *Atelopus laetissimus* and *A. nahumae*

Our field dataloggers still are registering operative temperature of plaster frog models in different microhabitat associate to *Atelopus laetissimus*.

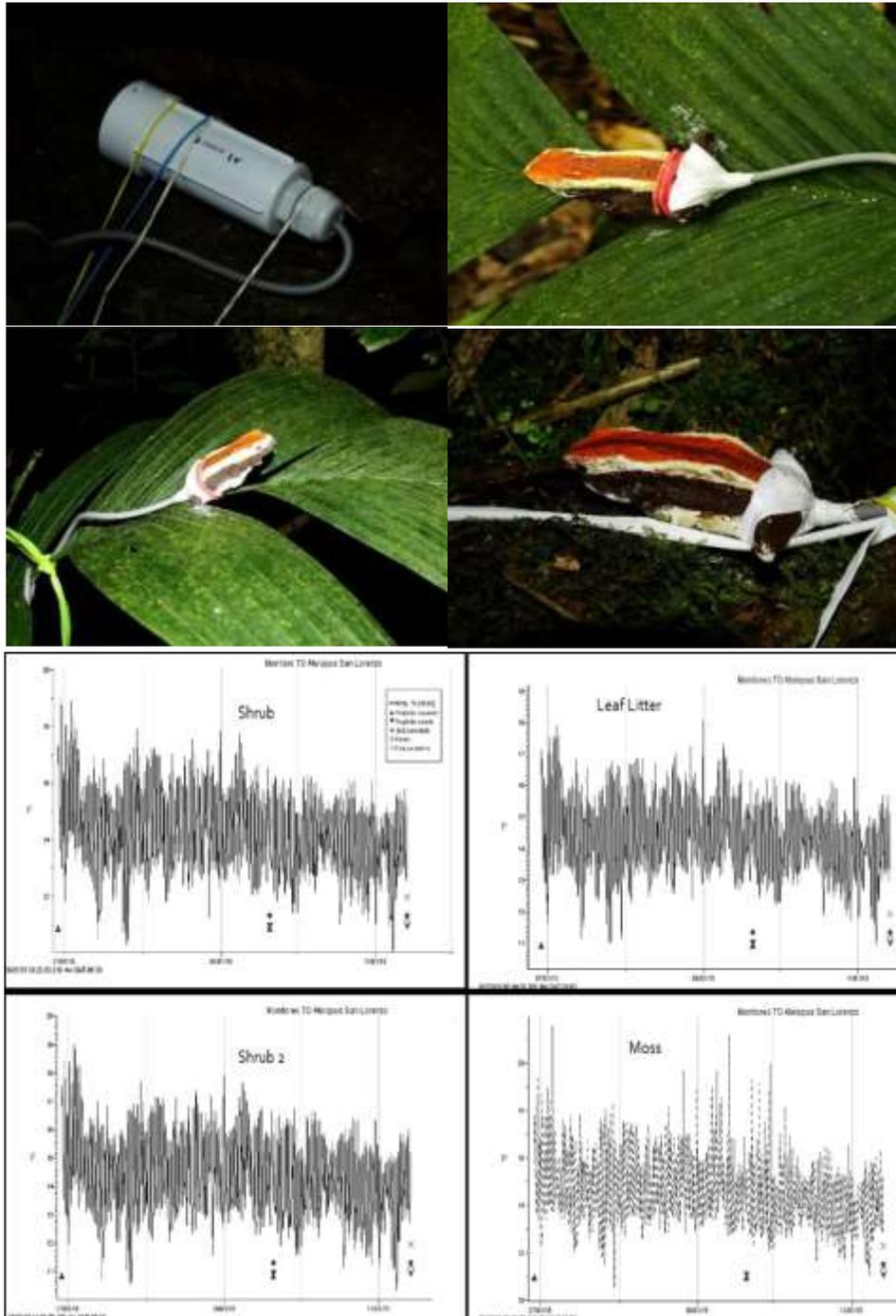


Figure 5. Operative temperature of plaster frog models in different microhabitat associate to *Atelopus laetissimus*.

Field sampling for the body temperature of the species of *Atelopus laetissimus* and *A. nahumae*

To date we have 21 data of body temperature of the specie *Atelopus laetissimus* with mean  $15^{\circ}\text{C}$ .  $\text{SD} \pm 2.684$ ;  $\text{N}=30$  Ind. We still are registered body temperature of *Atelopus*; we can establish a trend in the future.



## **OBJECTIVE 4 AWARENESS ABOUT THE ATELOPUS FROGS AND THEIR CONSERVATION NEEDS HAS BEEN SIGNIFICANTLY INCREASED AMONGST LOCAL COMMUNITIES, STUDENT COMMUNITIES AND VISITING ECOTOURISTS**

Activity 1 Educational campaigns with the student community (Unimagdalena) are conducted

Activity 2 Workshops with Santa Marta school students and people from the local community

Activity 3 Educational posters will be made for ecotourists

Activity 4 A short-video that promotes the conservation of harlequin frogs in the Sierra Nevada de Santa Marta will be held

### **Outputs from objective 4**

#### **EDUCATIONAL CAMPAIGNS WITH THE STUDENT COMMUNITY (UNIMAGDALENA) ARE CONDUCTED**

We have implemented several education campaign, with University students and high school student:

##### **1. Save the Frog Day (April 2014 -2015)**

In these events, there were participation of 12 students and they were realized in April 25-28 of 2014 and 24 april of 2015. Save the Frogs is a global initiative where each year we are participated. These years CLP and Unimagdalena support our Save the Frog Day Santa Marta. In both years, we realized a monitoring of harlequin frog with biology students of Uninimagdalena.

<http://savethefrogs.com/day/2014/>



##### **2. Interview with local media News CampusTv;**

CampusTv is a massive media of the Univeridad del Magdalena. This media is viewed by many people in the Caribbean region of Colombia, due to it is transmitted in teleCaribe Channel, the principal Channel in the Caribbean coast of Colombia.

<https://www.youtube.com/watch?v=oZgze9muroc>



Also, there are two newspapers about our project!! One in Santa Marta city (Magdalena) and other in Riohacha city (La Guajira). <http://www.diariodelnorte.net/noticias/generales/19319-bi%C3%B3logo-guajiro-lidera-proyecto-de-unimagdalena-ganador-de-15-mil-d%C3%B3lares.html>

### 3. Conferences

Doctor Vargas Salinas conference (October 2014):

In this event, the doctor Fernando Vargas Salinas talked about the importance of the behavior studies in frog's conservation. Especially in reproductive behaviors of crystal frogs (Centrolenidae). This conference was realized in October 6 of 2014, the Doctor Vargas – Salinas spoke an hour with 24 students of biology at the Universidad del Magdalena. Doctor Vargas Salinas is an advisor of Atelopus project.



Conference Doctor Marco Rada (November 2014):

In this event, the doctor Marco Rada talked about phylogenetic studies in crystal frog Centrolenidae. This conference was realized in November of 2014, the Doctor Rada spoke with 50 students of biology at the Universidad del Magdalena.



Conference Luis Alberto (Beto) Rueda Solano in LatinoAmerica Herpetology Congress (December 2014):

During X Latinoamerican Herpetology Congress in Cartagena Colombia, the professor Beto Rueda had two conferences about studies with Harlequins Frogs in the Sierra Nevada. Conservation Leadership Programme supports this studies.

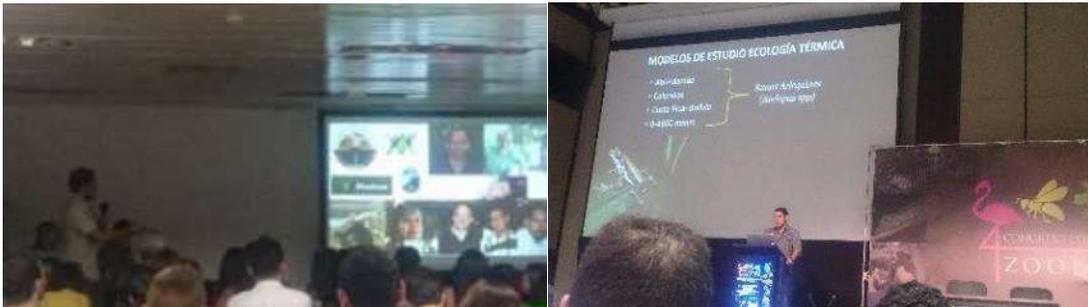


Photo Alumni network in Cartagena, Colombia (December 2014)

#### 4. Workshop Project Planning with students Unimagdalena (August 2014)

We realized one workshop of five (5) days with students of Biology, when we worked in several conservation problems of Harlequin frog in Sierra Nevada de Santa Marta. This workshop was done in august of 2014. Around 15 students worked under logical framework matrix. The leader Luis Alberto Rueda Solano was who instructed this technique. We could construct a big problem tree and objective tree. Some student's ideas were included in this objective tree.



5. Workshop Project Planning in The Latinoamerican Herpetology Congress (December 2014)

This workshop was done in the December of 2014. Around 10 students worked in the leadership session especially understanding their stakeholders. Luis Alberto Rueda Solano was who instructed this technique.



## 6. HERPETARIUM (October 2014)

Each October the Universidad del Magdalena realize the science week. This year, we could show an amphibians and reptiles stand, with typical species of our Caribbean region. Besides, we could promote conservation of herpetological species and our Atelopus project. The team members, Jorge Eguis and Thomas Mejia headed this initiative. They are great speakers and other students help them too. More than 200 persons of general public could visit the Herpetarium in only one day.



7. **WORKSHOPS WITH SANTA MARTA WITH PARQUES, STUDENTS AND LOCAL COMMUNITY FROM SERRANIA OF SAN LORENZO**

**Atelopus Project with local community of Serrania of San Lorenzo. (September 2015)**

We could conduct one conference with 10 people in the Serrania of San Lorenzo with presence of official's Parques Nacionales. We showed them several aspects about Atelopus Project and how they can help us to amphibian's conservation and reduce the climate change.



## 8. WORKSHOPS WITH SANTA MARTA SCHOOL STUDENTS AND PEOPLE FROM THE LOCAL COMMUNITY

### Atelopus Project with high school students of Santa Marta City. (September 2014 and March 2015)

We could conduct two conference with 60 high school students. We showed them several aspects about Atelopus Project and how they can help us to amphibian's conservation and reduce the climate change.

First School conference (September 2014)



Second School conference (March 2015)



Song for kids:



Atelopus Project Colombia has a beautiful song for kids. Listen it in this link.

<https://www.youtube.com/watch?v=67sVoGfbHeE>

## MEDIA PLAN

### Atelopus Project Colombia Website:

It is a viewing and communication platform of all our social and investigative activities.

<http://www.luisruedasolano.com/proyectos/proyecto-atelopus/>



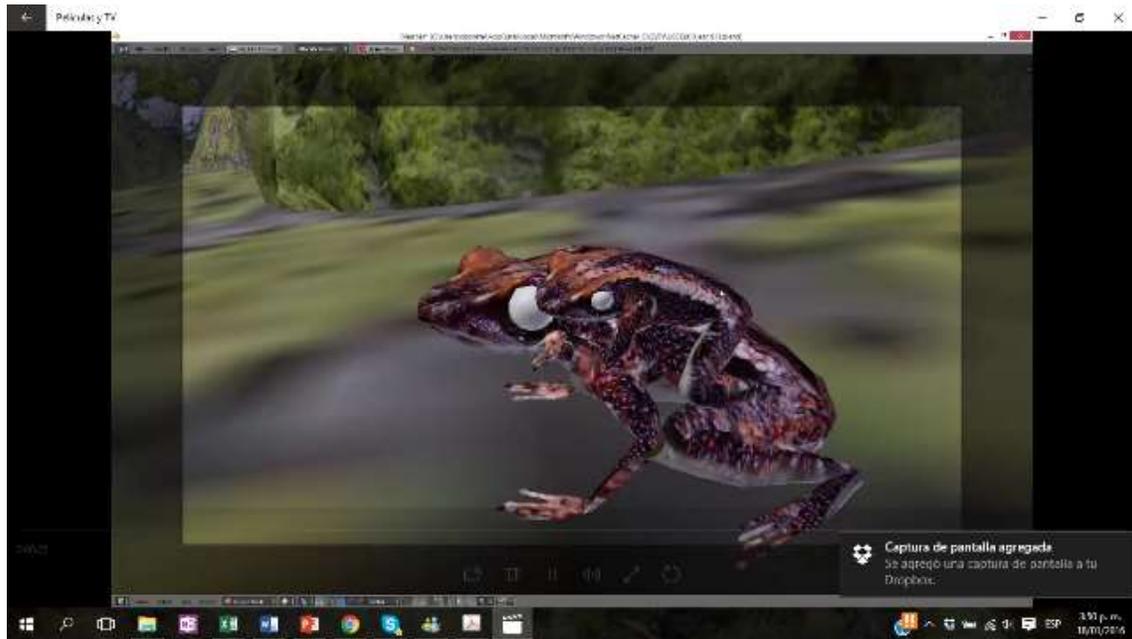
### Atelopus Project Colombia - Facebook FanPage

Atelopus Project Colombia is our FanPage in facebook. In this FanPage can find pictures, videos, blogs, and other activities our activities in relation to conservation of Amphibians in Sierra Nevada and whole world. In addition following in real-time all activities, it is a viewing and communication platform among project members and the interested public in amphibian conservation. This FanPage has more than **1000 likes** in few months.

<https://www.facebook.com/atelopusprojectcolombia>



A short-video that promotes the conservation of harlequin frogs in the Sierra Nevada de Santa Marta was made, it will be published soon in youtube.



Educational posters were made for ecotourists and local community





# PARE



## **INFORMACION IMPORTANTE**

LA QUITRIOMICOSIS ES UNA ENFERMEDAD QUE HA ARRASADO POBLACIONES DE ANFIBIOS ALREDEDOR DEL MUNDO Y SE PROPAGA A TRAVÉS DE LAS BOTAS Y EL CALZADO

**¡SALVA LAS RANAS NO TE CONVIERTAS EN TRANSMISOR DE EXTINCIÓN, LAVA TUS BOTAS!**

**¡ SAVE THE FROGS DO NOT BECOME A VECTOR OF EXTINCTION, WASH YOUR BOOTS !**



**OBJECTIVE 5 SUPPORT FROM GOVERNMENT AGENCIES AND NGOS IS SECURED TO HELP ENSURE THE SUSTAINABILITY OF THE MONITORING AND CONSERVATION EFFORTS TO SAVE THE ATELOPUS FROGS IN SERRANIA DE SAN LORENZO.**

**Activity 1 Support from government agencies that cooperate in conservation programs in SNSM**

**Activity 2 Support from non-governmental entities cooperating in conservation programs in SNSM**

**Outputs from objective 5**

We have had six (10) meetings with Parques Nacionales de Colombia. Parques is a governmental Institution. Furthermore Proaves NGO support our project in the sector of San Lorenzo. We achieved compromise of Parques Nacionales and Proaves under support documents. In addition, Proaves is an important NGO, due to they have a big reserve and eco-tourist business in Serrania de San Lorenzo. In addition, we got the legal documents that enables to work with these species, the Universidad del Magdalena. Beside we could include Kogi indigenous in our activities. They share ancestral knowledge about harlequin frogs with our project.



**Important Social Outcome, we achieved compromise of Parques Nacionales, Proaves and indigenous for harlequin frog conservation in SNSM.**



Socialization Atelopus Project with Parques Nacionales and Kogi indigenous

### Section 3:

## ACHIEVEMENTS AND IMPACTS

In this first project phase, we have achieved several important results. Not only from scientific component but also with the community and environmental organizations. The most important scientific result has been lower threat category of *Atelopus laetissimus* and *A. nahumae*. Due to the stability of their populations in the Serrania de San Lorenzo and new populations in other localities in the Sierra Nevada de Santa Marta.

We know population estimated for *Atelopus laetissimus* now, which is a species with high abundance inside of a sector reduced. We are getting very important ecological data for *Atelopus* conservation, such as weight, size, adult survival, microhabitat and operative/body temperatures activity data. The dataset will be used for biology student like undergraduate study, besides we will publish in international journal our results, however we must be clear about our outputs, they need more information and analysis but we have a lot information that we have to process. Our objectives in this phase were a little bit about the time that we had it. However, we achieved all objective.

In addition, we have made great achievements in social component with the inclusion of governmental organizations, NGOs, student community of Santa Marta and the Kogi Indigenous in our conservation project. Especially, University of Magdalena student community. They will continue with monitoring protocols and the conservation initiative that we have established.

## CONCLUSION

*Atelopus Project was a wonderful experience!!*

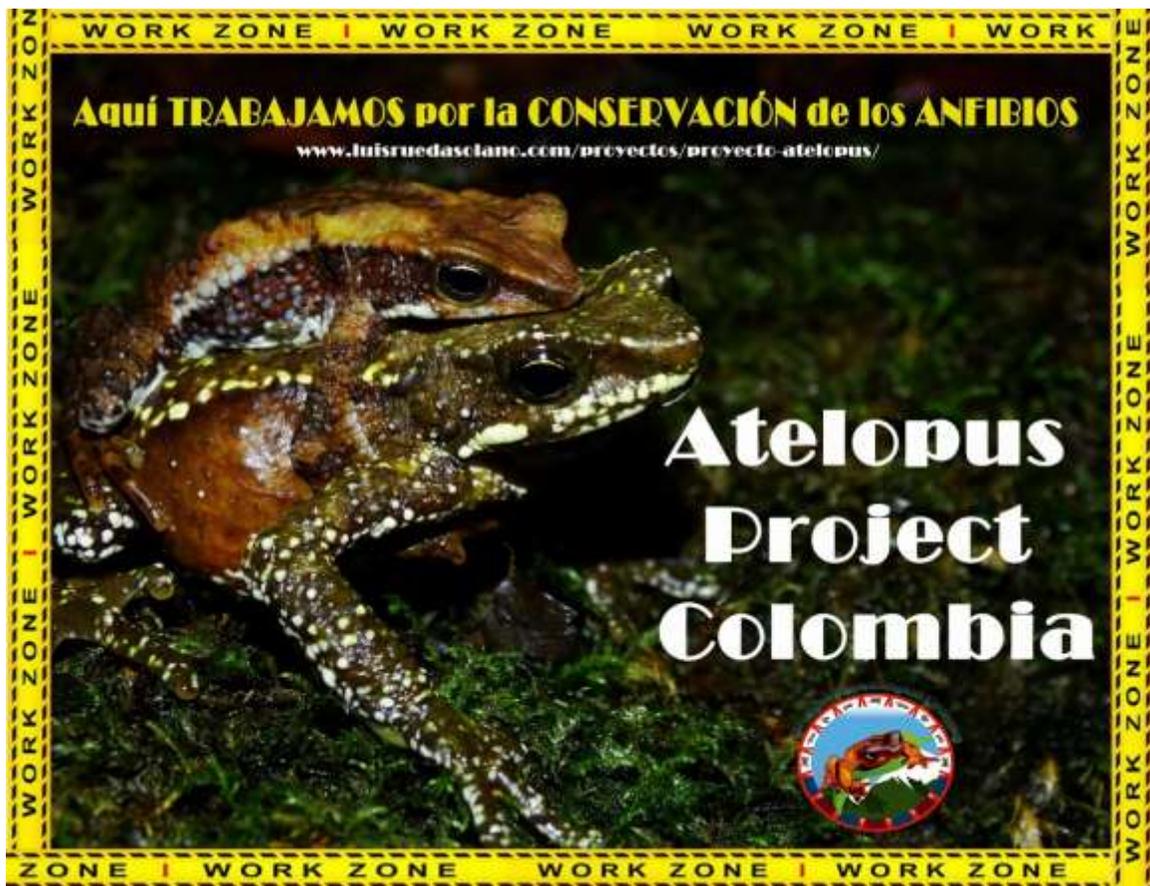
The purpose of this project was to establish the baseline for monitoring of *Atelopus laetissimus* and *A. nahume*. This document is an important reference in the conservation of *Atelopus* species in the Sierra Nevada de Santa Marta, because it contains long-term monitoring protocols, also important dataset about several demographic, ecological, and health status for these species.

This project is significant in Latin-American amphibian conservation, especially for *Atelopus* genus, because we could demonstrate that Sierra Nevada is an irreplaceable ecosystem in the Neotropic, where there are many individuals and health populations of endemic amphibians, mainly of *Atelopus* species. Making of the Sierra Nevada de Santa Marta a sanctuary for harlequin frogs in Colombia in contrast to other upperland areas in Latin-America where *Atelopus* are apparently already extinct.

## IN THE FUTURE

We need analyse our results deeper, then we will write some paper about our studies. *Atelopus* project had a good impact on local communities, mainly on stakeholders Parques Nacionales, Proaves, local community, Indigenous and student of Santa Marta. Now, we need that our project has good impact on international academy community. Due that, in the short term, we will dedicate our efforts to finish our researches. In the long term, we will make the second phase of this project creating new and keeping old and good conservation strategies, social and political activities that guarantee the Amphibian conservation in Sierra Nevada de Santa Marta.

We must to keep our work in amphibian conservation, especially monitoring our endemic and thread *Atelopus* species.



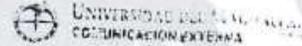
Section 4:  
Appendices



**PROSPERIDAD  
PARA TODOS**

MINISTERIO DE AMBIENTE Y DESARROLLO SOSTENIBLE  
28/9/2014 15:24:0 FOLIOS:1 ANEXOS:4  
AL CONTESTAR CITE: 8210-E2-30492  
TIPO DOCUMENTAL: RESPUESTA SOLICITUD  
REMITE: DIRECCIÓN DE BOSQUES BIODIVERSIDAD Y SERVICIOS ECOSISTEMICOS  
DESTINATARIO: DIRECTORA DE TRANSFERENCIA DEL

Bogotá



07 OCT. 2014

No. de P. 824509

Hora 2:30 P.M.

YG05879011 00

Doctora  
DIANA MILENA GONZÁLEZ GÉLVES  
Directora de Transferencia del Conocimiento y Propiedad Intelectual  
Vicerrectoría de investigación  
Universidad de Magdalena  
Carrera 32 No. 22 – 08 Sector San Pedro Alejandrino, Edificio Administrativo "Roque Morelli Zárate" 2-P  
Santa Marta

Respetada Doctora González

Dando respuesta a su comunicación radicada con el No. 4120-E1-30492 de septiembre 5 de 2014, por medio de la cual solicita autorización para la colecta de especies amenazadas, vedadas o endémicas del proyecto de investigación titulado: Monitoreo de ranas arlequines en la Sierra Nevada, muy amablemente le solicito nos envíe la siguiente información:

1. Certificación del Ministerio del Interior donde se informa que se registra o no la presencia de comunidades Indígenas, Negras, Afrocolombianas, Raizales y Palenqueras, en las localidades del área del proyecto de referencia en los departamentos de Magdalena, Cesar y Guajira.
2. Aclarar el método de captura de los especímenes e indicar si una vez marcados serán regresados a la población natural o si por el contrario serán removidos del área de estudio y sacrificados.
3. Si las especies a coleccionar serán sacrificadas presentar información del estado poblacional de cada una de las especies por localidad para poder determinar si se autoriza o no el número de especímenes a coleccionar.

Cordialmente,

**MARIA CLAUDIA GARCÍA DÁVILA**

Directora Dirección de Bosques, Biodiversidad y Servicios Ecosistémicos.

| Proyecto | Nombre        | Cargo                           | Firma         |
|----------|---------------|---------------------------------|---------------|
|          | Antonio Gómez | Profesional Especializado DBBSE | Antonio Gómez |

Calle 37 No. 8 – 40 Bogotá, Colombia  
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RECEPCIONADO EN EL DEPARTAMENTO DE COMUNICACION PRESENTADO EN AMBIENTE

### CONVENIO DE COOPERACIÓN PARA LA REALIZACIÓN DE PROYECTOS DE INVESTIGACIÓN

Nosotros, ALONSO QUEVEDO, mayor de edad, vecino de Bogotá, identificado con cédula de ciudadanía 52.869.957 de Bogotá, obrando en nombre y representación de LA FUNDACIÓN PROAVES DE COLOMBIA y quien en adelante se denominará LA FUNDACIÓN, por una parte y por la otra, LUIS ALBERTO RUEDA SOLANO mayor de edad, identificado con cédula de ciudadanía No. 84091773 de Riohacha quien obra en representación de PROYECTO ATELOPUS: MONITOREO DE RANAS ARLEQUINES EN SIERRA NEVADA, COLOMBIA, en su calidad de COORDINADOR y para efectos del presente documento se denominará PROYECTO ATELOPUS hemos convenido celebrar el presente Convenio, el cual se regirá por las normas que regulan la materia y especialmente por las siguientes cláusulas:

**PRIMERA. OBJETO:** PROYECTO ATELOPUS realizará parte del proyecto titulado "PROYECTO ATELOPUS: MONITOREO DE RANAS ARLEQUINES EN SIERRA NEVADA, COLOMBIA", dentro de las instalaciones de las Reservas Naturales de Aves de la FUNDACIÓN, denominadas EL DORADO. Conforme a las condiciones y detalles de las actividades a desarrollar conforme al Anexo 1. (Cronograma adjunto)

Para el desarrollo del objeto PROYECTO ATELOPUS se obliga con LA FUNDACIÓN a ejecutar todas las actividades propias del convenio, de conformidad con las condiciones y cláusulas adicionales del presente documento, teniendo en cuenta la operación del proyecto bajo el permiso marco de investigación científica de la Universidad del Magdalena otorgado por la Autoridad Nacional de Licencias Ambientales (ANLA) mediante resolución N0 1293 de 2013.

#### SEGUNDA. OBLIGACIONES DE LAS PARTES:

**1. POR PARTE DEL PROYECTO ATELOPUS:** En desarrollo del objeto mencionado LA PROPUESTA DE LUIS ALBERTO RUEDA SOLANO se obliga a:

1. Cumplir los objetivos planteados para el proyecto, los cuales se muestran en el Anexo 1.
2. Realizar y entregar copia de un informe técnico final de la investigación, una vez concluida la fase de campo y el análisis preliminar de la información obtenida en el proyecto.
3. Entregar copia a LA FUNDACIÓN del informe final, en formato digital, y fotos representativas en cuanto a la realización del proyecto y hallazgos importantes.
4. Dar los créditos y agradecimientos respectivos a LA FUNDACIÓN en el documento final y en los demás documentos generados con los datos de dicha investigación.
5. Contribuir con información documentada a la publicación de avances y conclusiones del proyecto en la página web de la fundación ProAves con autorización por parte de la investigadora del contenido publicado.
6. Cumplir con los requerimientos establecidos por la Normatividad de investigación establecida para las Reservas Naturales de las Aves en Colombia.
7. Entregar a la fundación un cronograma de actividades que se realizaran en la reserva.
8. Entregar una lista con las hojas de vida de los investigadores, respecto de los cuales sea necesario que tengan acceso a la reservas.

|   |                        |                          |
|---|------------------------|--------------------------|
|  <p>Parques Nacionales<br/>Naturales de Colombia</p> | <b>ACTA DE REUNIÓN</b> | Código: GAINF_FO_05      |
|   |                        | Versión: 2               |
|   |                        | Vigente desde 26/10/2011 |

|                 |   |  |
|-----------------|---|--|
| <b>No Acta:</b> | <b>Dependencia:</b><br>Parque Nacional Natural Sierra Nevada de Santa Marta | <b>Fecha (dd/mm/aaaa):</b><br>15/08/2014 |
|-----------------|---|--|

**EQUIPO DE TRABAJO:**

Parque Nacional Natural Sierra Nevada de Santa Marta –PNN SNSM  
 Universidad del Magdalena\_ Facultad de Ciencias Básicas -Luis Alberto Rueda y estudiantes del programa de Biología

**OBJETIVO DE LA REUNIÓN:**

Socialización de proyecto de investigación, avances en la coordinación interinstitucional y seguimiento epidemiológico de ranas arlequines en el marco del comité interno del PNN SNSM

**TEMAS A TRATAR:**

1. Introducción a la visita del docente de herpetología de la Universidad del Magdalena en el marco del Comité interno del Parque Sierra Nevada.
2. Presentación de avances de investigación y de esfuerzos de coordinación interinstitucional para la gestión de conservación de anfibios por parte del docente investigador Luis Alberto Rueda
3. Inquietudes y sugerencias por parte del equipo del PNN SNSM

**RESUMEN TEMAS TRATADOS:**

| No. Tema | Resumen  |
|----------|--|
| 1.       | En el marco del comité interno realizado por el equipo de trabajo del PNN Sierra Nevada de Santa Marta se abrió un espacio en la agenda para escuchar al docente investigador de la Universidad del Magdalena, Luis Alberto Rueda, quien dio a conocer las iniciativas de investigación, seguimiento epidemiológico y coordinación interinstitucional que viene promoviendo desde la academia, para alcanzar propósitos de conservación de la fauna anfibia de la Sierra Nevada de Santa Marta. Sobre este respecto, Borish Cuadrado, profesional del Parque inicialmente expuso los antecedentes relacionados con el seguimiento epidemiológico y los protocolos de bioseguridad que se vienen implementando desde el año 2009 bajo la tutoría del investigador, y el cual ha tenido como fin mantener información de alertas tempranas frente a la posible ocurrencia de quitridiomycosis dentro del área protegida y de la Estación de San Lorenzo. Acto seguido, se efectuó la presentación de los miembros del equipo del Parque y de representantes de los estudiantes vinculados al grupo de investigación que lidera el profesor Rueda y acto seguido. |

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