

Final Evaluation Report

Your Details	
Full Name	Jhon Jairo Ospina Sarria
Project Title	Amphibian Diversity from the Serranía de los Paraguas Phase II: Integrating Research, Monitoring, and Public Awareness on Behalf of Hotspot Conservation
Application ID	35562-2
Date of this Report	September 3, 2023

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
<p>To consolidate the efforts of research, monitoring, and participative strategies for the conservation of this hotspot.</p>				<p>Through the development of our research project aimed at mitigating the risk of extinction for threatened amphibian species in the Serranía de los Paraguas, we have gained new allies, such as the Critical Ecosystem Partnership Fund (CEPF) and the Prince Bernhard Fund (PBNF). Indeed, these partners have been instrumental in strengthening each of the activities we have undertaken and have also played a key role in generating new initiatives with the same objective of improving the conservation status of endangered amphibian species.</p> <p>One of the new initiatives we have successfully developed with our new collaborators is the implementation of acoustic and climatic monitoring to assess the threats affecting the diversity of threatened amphibians in the Serranía de los Paraguas. Another initiative includes the development of an action plan document for the conservation of amphibians in this hotspot, which is expected to receive approval from the relevant government entities.</p>
<p>Involving students from regional and national universities in the development of this project.</p>				<p>During the project's development, we engaged six university students pursuing careers related to biodiversity conservation, four biology students and two environmental engineering students. The students come from three universities in the department of Valle del Cauca (University Javeriana, University ICESI and Central University of Valle del Cauca – UCEVA) and one university in the department of Cordoba (University of Cordoba), all of them located in Colombia.</p> <p>For the process of recruiting participants</p>

			<p>for the project, we issued an open call. The call was posted on our social networks (https://www.instagram.com/p/CTUpOC0nLjk/). Gender equality and women's empowerment were central considerations in this call. As a result, out of the six students connected to the project, three were women.</p>
<p>To disseminate the findings of the project to the local communities and the scientific community.</p>			<p>We disseminated our findings in two ways. Firstly, for the local communities, we organised a photographic exhibition showcasing the diversity of amphibians inhabiting the Serranía de los Paraguas from November 25 to 26, 2022. This exhibition was featured as part of the Montañeros en los Paraguas Festival, a multicultural event held in the Serranía de los Paraguas. Additionally, four meetings were conducted with local communities, which included farmers, students, and representatives from local and government organisations. During these meetings, the project results were shared, and training was provided to local communities on field, acoustic, and climatic monitoring of amphibians, ensuring that this monitoring remains a continuous process.</p> <p>To disseminate information about the diverse species inhabiting the Serranía de los Paraguas, we created a poster and a colouring booklet showcasing a selection of amphibian species that inhabit the forests of the area. These products will be distributed to local communities at the Paraguas Frog Festival, an event scheduled for October 2023 in the Municipality of Cairo.</p> <p>Simultaneously, we executed the creation of two murals that celebrate the diversity of amphibian thriving within the forests of the Serranía de los Paraguas. These murals were completed at the San José Educational Institution in the village of Damasco, situated in the municipality of San José del Palmar, Chocó, as well as at the Gilberto Álzate Avendaño Educational Institution in the municipality El Cairo, Valle del Cauca. The realisation of these murals actively involved children, young people,</p>

			<p>and adults from the local communities, fostering an emotional connection aimed at cultivating empathy for biodiversity (https://www.instagram.com/p/CwfSOoEg7xx/).</p> <p>At the regional level, we participated in three events focused on the conservation of natural resources in the cities of Tuluá and Cali, both located in the department of Valle del Cauca. In Tuluá, two talks were conducted at the Central University of Valle del Cauca (UCEVA) and the Juan María Céspedes Botanical Garden – INCIVA. In Cali, we presented a talk about our project at the III Meeting of Researchers from the Colombian Pacific, an event organized by the Cultural Centres of the Banco de la República, held between August 9th and 11th, 2023.</p> <p>Secondly, for the scientific community, we published two scientific papers in peer-reviewed journals (Paper 1: https://doi.org/10.1093/biolinnean/blac036 and Paper 2: https://doi.org/10.1093/biolinnean/blad014). Furthermore, we presented the results obtained from the amphibian conservation project through five oral presentations during our participation in the 3rd Colombian Congress of Herpetology in August 2022. Our participation in the conference provides us the opportunity to share experiences and establish new collaborations to continue working for the conservation of the amphibians of the Serranía de los Paraguas. Besides, the event enabled us to continue strengthening our initiatives for gender equity, women's empowerment and strengthening of local communities in the conservation of amphibians in Colombia.</p>
<p>To propose the development of general principles and management guidelines to mitigate the risk of extinction for threatened amphibian species in</p>			<p>We developed strategies to enhance species resilience in the face of climate change, such as installing fences to protect habitats from the expansion of agricultural and livestock frontiers. Furthermore, we will install signs aimed at safeguarding critical habitats essential for the reproduction and survival of various</p>

<p>the Serranía de los Paraguas.</p>			<p>amphibian species. Additionally, we generated and implemented a disinfection protocol to prevent the introduction and spread of pathogens by visitors to the Community Reserve Cerro el Inglés, one of the most visited sites within the Serranía de los Paraguas. Finally, we established the foundations for creating a manual of ethical conduct necessary when working or coming into contact with wild animals. The objective is to have this manual established in the near future and implemented by visitors to the Community Reserve Cerro el Inglés, one of the most visited sites within the Serranía de los Paraguas. The objective of this manual is to mitigate the threats associated with the presence of visitors in the Serranía de los Paraguas (e.g., tourists, students, researchers, local community, etc.).</p>
<p>To alleviate deep-seated fears of amphibians in people and raise awareness about the significance of these organisms for ecosystem health.</p>			<p>In pursuit of this objective, we have implemented various approaches. Firstly, we have conducted various talks covering topics such as the importance of amphibians for human well-being and the need to exhibit respectful behaviour when interacting with wildlife. These talks have been delivered to local communities (including children, youth and adults) and educational institutions of primary, secondary and university level. Additionally, we have developed activities that involve direct participation from local communities in the project, such as community monitoring events (Amphibian Bioblitz - https://www.inaturalist.org/projects/bioblitz-anfibios-de-la-serrania-de-los-paraguas) and the creation of two murals depicting the diversity of species that share their territory (https://www.instagram.com/p/CwfSOoEg7xx/). We are also developing a poster and a colouring booklet featuring some of the amphibian species that call the forests of the Serranía de los Paraguas their home.</p>

2. Describe the three most important outcomes of your project.

a). The first significant result is closely related to the enthusiastic reception and active engagement of the local communities in the project's development. Specifically, diverse age groups within the local community have actively taken part in all project activities, including field monitoring, socialisation efforts, the implementation of mitigation measures to protect amphibians, and the collection of valuable data to identify the most effective conservation strategies in the field.

Throughout the development of the project, from Phase I to the current phase, we have observed a growing cultivation of empathy among people for the biodiversity with which they share their territory. Today, it is very evident that a deep sense of belonging to the biodiversity rooted in the Serranía de los Paraguas resonates remarkably in each individual with whom we have interacted. In the same way, there is a remarkable enthusiasm to participate in initiatives aimed at the conservation of amphibians. In summing up, we believe that local communities have been empowered through the development of Phases I and II of this project, resulting in an increased interest in preserving biodiversity, particularly, in protecting the habitats of amphibian species.

b). The second important result of our project involves forming new partnerships with other organisations. The establishment of these new alliances was primarily facilitated by the positive outcomes we achieved during Phases II and I of this project. By the end of 2022, the Prince Bernhard Fund awarded us a grant to carry out activities aimed at improving the threat status and habitats of seven endangered amphibian species in the Serranía de los Paraguas. These activities include raising public awareness, community environmental education, and implementing adaptive monitoring. Furthermore, at the beginning of this year (2023), the Critical Ecosystem Partnership Fund (CEPF) provided us with a grant to establish acoustic and climatic monitoring systems, enabling the early detection of potential new threats to 13 endangered amphibian species.

We believe that establishing new partnerships is vital for the future of amphibians in the Serranía de los Paraguas. All biodiversity is important, and every nation, region, and community should do everything possible to conserve their living resources. Therefore, linking with new allies is critical to ensuring a hopeful future for amphibian conservation in the Serranía de los Paraguas.

c). The third important result of the second phase of our project is related to the training of future conservation scientists as well as the publication of peer-reviewed papers in recognised journals. In this second phase, we published two scientific papers in peer-reviewed journals (<https://doi.org/10.1093/biolinnean/blac036>, <https://doi.org/10.1093/biolinnean/blad014>). These papers focused on evolutionary aspects observed in amphibian species of the Serranía de los Paraguas, i.e., climbing ability in *Rhinella paraguas* and the presence of sexual dichromatism in *Pristimantis restrepoi*. As such, both papers contribute to their ecology and evolution, serving as critical tools during crucial stages in the decision-making process for selecting and determining which habitats to protect. Additionally, the predictive power of evolutionary studies suggests how other species (e.g., closely related

species) may be affected by similar environmental changes. The same can be said about environmental contaminants and the effects that pollutants may have on amphibians, both in their aquatic and terrestrial phases.

Regarding the training of future conservation scientists, it is important to note that both papers were led by two female university students linked with our project from phase 1. Indeed, both papers had a significant impact on the scientific community, resulting in both students receiving scholarships abroad to pursue their doctoral studies.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The only difficulty related to the project's development pertains to changes in the dates of the field trips, which were caused by unforeseen events such as heavy rainfall that made road travel impossible, along with typical situations in the political and social context of Colombia (protests against political and social aspects).

To address these delays, we scheduled the field trips when both environmental conditions allowed and social protests in Colombia ceased.

4. Describe the involvement of local communities and how they have benefited from the project.

As mentioned in the most important results section of our project, the participation and involvement of local communities was higher than our expectations. We believe that this great reception is also the result of all the good results that we began to obtain from the first phase of this project, which paved the way for the development of this second phase.

In this second phase, we conducted four training activities on monitoring threatened species, which were spread out over a year and a half. Additionally, we organised the first community-monitoring event (BioBlitz) for amphibians in the Serranía de los Paraguas, with the participation of approximately 40 individuals, including both children and adults (https://www.instagram.com/p/Cs01imlg_cA/). Various local actors took part in the training, including farmers, students from educational institutions, and members of community organisations. During these training sessions, we covered topics such as the management of acoustic and climatic monitoring equipment, the importance of empowering women, and the need to implement gender equity approaches in all future conservation activities.

As a result of these activities, we were able to identify an increase in the number of women participating in project-related activities such as data collection, data analysis, and socialisation (an increase of 40%). Similarly, there was a noticeable rise in the participation of local communities during field days, indicating an enhanced sense of empowerment among these communities in the conservation processes carried out in their regions. Finally, we observed a growing awareness and appreciation for the protection of both biotic and abiotic natural resources. This has

sparked the interest of local communities in continuing to develop projects focused on conserving their biodiversity.

5. Are there any plans to continue this work?

We are certainly going to continue with the amphibian conservation project in the Serranía de los Paraguas. The primary motivations for continuing to pool our efforts in this project stem from the positive results we have achieved. On one hand, the participation and interest expressed by local communities in amphibian conservation have been extraordinary, as evident in their increasing involvement during each stage of the project. The second motivation is linked to the interest and support of new funds for the project, such as the Critical Ecosystem Partnership Fund –CEPF and the Prince Bernhard Nature Fund – PBNF. These opportunities have arisen due to the excellent work carried out since phase one of this project.

Finally, and most importantly, our motivation to continue with this project stems from the improvements in the threat status that we have identified through our monitoring of several threatened amphibian species in the Serranía de los Paraguas. In other words, our conservation project has successfully improved the threat status of several endangered amphibian species, some of which are endemic to this region. Therefore, we believe it is our duty to continue seeking ways to develop further activities for amphibian conservation, as their future depends on the widespread interest in their protection.

6. How do you plan to share the results of your work with others?

As mentioned in the most important results section of our project, we have begun to share the results of our project both with the scientific community and with the community in general. So far, we have published two scientific articles in peer-reviewed journals, the first of them was published in May 2022 (<https://doi.org/10.1093/biolinnean/blac036>), and the second in March 2023 (<https://doi.org/10.1093/biolinnean/blad014>). In addition, we show some of our results through five oral presentations during our participation in the 3rd Colombian Congress of Herpetology in August 2022. Also, at the moment, we are preparing additional scientific articles covering various topics within our amphibian conservation project in the Serranía de los Paraguas. These articles will be submitted for publication in peer-reviewed journals.

With respect to the community in general, we regularly give presentations at local and regional educational institutions, discussing the outcomes of our project. Additionally, we were invited to present our project at the III Meeting of Researchers from the Colombian Pacific, an event organized by the Cultural Centres of the Banco de la República, which took place from August 9th to 11th, 2023.

Scientific publications:

García-Gómez, I., Pereyra, M.O., Cabra-García, J. and Ospina-Sarria, J.J., 2022. Evolutionary history of secondary sexual characters in the most species-rich genus of

anurans, the direct-developing frogs of the genus *Pristimantis* (Anura: Strabomantidae). *Biological Journal of the Linnean Society*, 136(2), pp.264-281.

Ceballos-Castro, I., Cabra-García, J. and Ospina-Sarria, J.J., 2023. Alternate morphological pathways involved in climbing ability in ten Neotropical anuran species. *Biological Journal of the Linnean Society*, 139(1), pp.18-29.

7. Looking ahead, what do you feel are the important next steps?

We believe that through the development of these two project phases, we have created an ideal situation for the future of amphibians in the Serranía de los Paraguas. On one hand, there has been a growing interest from new financing entities, and on the other hand, the local communities have shown a positive reception and a willingness to participate.

Based on these considerations, we believe the next important step is to expand the scope of our activities to areas within the Serranía de los Paraguas that were previously inaccessible due to social and political issues in the country, specifically in the Chocó department. During the development of this second phase, we visited areas of the Serranía de los Paraguas that were off-limits during the first phase, such as San Jose del Palmar, Chocó, primarily due to security concerns. However, in recent visits, we have managed to establish connections with government entities like the National Parks of Colombia, educational institutions, and local organisations.

As a result of these recent visits, we conducted pilot activities to assess the feasibility of implementing additional projects in this area. Among the interesting findings, we discovered the presence of additional amphibian species in the Serranía de los Paraguas that had not been previously reported and are categorised under IUCN threat levels. These newly discovered species include *Oophaga histrionica* (Critically Endangered), *Nymphargus prasinus* (Vulnerable), *Nymphargus megistus* (Endangered), and three new amphibian species.

Regarding our activities with the local communities, we received a warm welcome, largely due to the positive outcomes achieved during Phase I of this project. Some of the activities included the creation of a mural, with active participation from the local communities, and the organization of two informative talks emphasising the importance of amphibian conservation. In general, the local communities showed great receptivity and a willingness to engage in additional activities aimed at conserving amphibians in their territories. Therefore, we are convinced that we must dedicate efforts focused on linking those communities to our project. This will enable the consolidation of our conservation objectives in the Serranía de los Paraguas and, in turn, the implementation of additional conservation measures for the new species records we have found in these new areas.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Certainly, we have included the Rufford Foundation logo in each of the activities we carry out in our project. This includes advertising for the training courses, academic talks, information billboards about the endangered amphibian species to be installed in the forests of the Serranía de los Paraguas, educational products such as the murals created in the municipalities of El Cairo and San Jose del Palar, colouring booklet, and posters of the amphibians of the Serranía de los Paraguas. The colouring booklet and posters will be delivered in October 2023 during the celebration of the Paraguas Frog Festival.

Similarly, we mentioned the Rufford Foundation's name along with the respective identification numbers of our Phase I and II grants as the primary financiers in both articles' publications (<https://doi.org/10.1093/biolinnean/blac036>, <https://doi.org/10.1093/biolinnean/blad014>).

9. Provide a full list of all the members of your team and their role in the project.

Name	Role	Qualifications	Location
Jhon Jairo Ospina-Sarria	Project Leader	Ph.D., MSc., BS.	Colombia
Ayda Susana Ortiz Baez	Co-coordination and management of the project	Ph.D., MSc., BS.	Australia
David Andrés Velasquez-Trujillo	Research team	MSc., BS.	Spain
Valentina Vélez Franco	Internship researcher	Undergrad Student (Pontificia Universidad Javeriana Cali)	Colombia
Ximena Gómez Sepúlveda	Internship researcher	Undergrad Student (ICESI University)	Colombia
Andrés Felipe Rodríguez Betancourt	Internship researcher	Undergrad Student (Pontificia Universidad Javeriana Cali)	Colombia
Iván Darío Morales Vertel	Internship researcher	Undergrad Student (University of Córdoba)	Colombia
Laura Vanessa Silva	Internship researcher	Central University of Valle del Cauca – UCEVA	Colombia
Gustavo Adolfo Mendoza Toro	Internship researcher	Central University of Valle del Cauca – UCEVA	Colombia
Irene Ceballos Castro	Young researcher	BS.	Colombia
Isabella García-Gómez	Young researcher	BS.	Colombia

10. Any other comments?

It is very gratifying to see how the project, which began in 2019 and has now completed its second phase, has yielded such hopeful results for amphibian conservation in this hotspot. On one hand, the empowerment of local communities and their willingness to contribute to the protection of their biodiversity is a desirable outcome in any conservation project. Similarly, the arrival of new allies and financing entities demonstrates confidence in the conservation process developed to safeguard the Serranía de los Paraguas—a task that would not have been possible without the support of The Rufford Foundation.

For our part, we will continue to be committed to collaborating, supporting, and leading activities in favour of the conservation of our biodiversity, since we are convinced that the future of biodiversity depends on everyone's efforts.