Final Evaluation Report

Your Details	
Full Name	Lara Inés Baccaro
Project Title	Confused Robber Frog (Oreobates berdemenos) as a Model to Assess and Propose Conservation Efforts in the Southern Andean Yungas Forest
Application ID	38665-1
Date of this Report	10/17/2023

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
Field Work				During 2022 and 2023, the Yungas forests ecoregion experienced one of the driest years recorded accompanied with record temperatures. This situation impacted the field work with anuran amphibians. Despite this, we conducted six long field campaigns in the main protected areas of the Yungas Biosphere Reserve, this extended fieldwork was complemented by short campaigns when the climatic conditions were favourable to find the target species. We obtained 28 genetic samples, morphological measures, georeferenced point and photographs of *O. berdemenos*. We confirmed the presence of the confused robber frog in three new PAs: Zapla Provincial Reserve (Jujuy province), in Baritú National Park, and in the recently created PA Native Community El Arazay (Salta province). Implementation cost of the field campaign where higher than expected.
Laboratory Work				We generated a total of 56 mitochondrial Cyt-b and 29 nuclear RAG-1 sequences from seven different localities throughout *O. berdemenos* distributional range.
Priority Conservation Areas and Corridor Proposal				We conducted all the genetic diversity analysis proposed, detecting a marked population structure with high genetic distance between the populations. Regarding genetic diversity of *O. berdemenos*, we delimitated four priority conservation areas: Northern, Central, Western and Southern. We did not reach to analyse all environmental data and conduct the landscape analysis, mainly due to the computational power needed for this. However, we create a network with main stakeholder that showed interest in the project for the future workshops after analysing these data.

Dissemination and Ambiental Education				We recorded and edited the totality of the documental series "The Yungas, a biodiversity treasure". It is currently available in our YouTube Channel @ConservacionYungas, except for Chapter 5. For the documentary, we gather a huge amount of audio-visual material that will serve for future publication and events. The Instagram account reached over 1,000 followers, much of them interacted with likes, comments or answering surveys. We participated and conducted several outreach events. The documentary series was use in several talks to introduce the topics to be discussed. We are still and will continue publishing interviews and audio-visual material in both our YouTube Channel and Instagram account.

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

a) **Documental series "The Yungas, a biodiversity treasure" and other audio-visual production:** the documental and all the audio-visual material gathered became the most useful tool in outreach events. We reached over 1,000 followers on Instagram and over 40 in our YouTube Channel. Our Instagram account, with 24 publications up to today, gathers a total of 50.624 accounts reached and 4.569 interactions. Several teachers asked to use our production in their classes, and we were invited to various schools to give talks. The greatest achievement of the documentary is that the second chapter "Anurofauna" was selected to be part of the anurofestival in the XII Latin-American Congress of Herpetology. Here is the link to our YouTube Channel https://www.youtube.com/channel/UC7wraRgJYvqHWkrTLBKR5OA and to our Instagram account https://www.instagram.com/conservacion.yungas/.

b) **Confirmed presence of *O. berdemenos* in new protected areas:** despite of the adverse environmental conditions, we were able to confirm the presence of *O. berdemenos* in three new PAs along YBR: Zapla Provincial Reserve, Baritú National Park, and the recently created PA Native Community El Arazay. These PAs represent the northern and southern distribution of the species, for which they are more vulnerable to threats for not having a "buffer area" surrounding them. In addition, the genetic diversity observes for these localities add to the definition of the Priority Conservation Areas, mainly the case of the Zapla Provincial Reserve population.

c) **Priority Conservation Areas:** Regarding genetic diversity of *O. berdemenos*, we delimitated four priority conservation areas: northern, central, western and southern. The Northern Priority Area includes Nogalar de Los Toldos National Reserve, Baritú National Park, and El Arazay Native Reserve; the Central Priority area includes Calilegua National Park; the Southern Priority Area the Zapla Provincial Reserve; and the Western Priority Area the Tiraxi Private Reserve and

Aldea Luna Natural Reserve. All these areas showed a characteristic genetic diversity, being highly different between them. Thus, due to the genetic distance between each area, the vulnerability *O. berdemenos* increases given that any case of local extinction would wipe a distinctive diversity of the species.

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

Harsh environmental conditions resulted in fewer genetic samples than expected. To enhance our chances of detecting *O. berdemenos* in the field, in each campaign we explained to local communities how auditory search works and gives them *O. berdemenos* call recording. Through this method, for example, we detected a new locality for the species in northern Salta province.

We also had difficulties when analysing spatial data, due to the computational power needed to process high resolution maps or satellite images. For this, we will look for further funding to increase the processing capacities and reach the settled objectives. Complementary, we started a collaborative work with colleagues in Tucumán province that work in landscape analysis.

Due to these difficulties, we focused the team effort in the genetic and outreach objectives of the project.

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

The involvement of local communities and park rangers was fundamental for the development of this project. They help us in several tasks: dissemination of the project and creating the network of key stakeholders, informing of sites where they have heard confused robber frog calling, reaching field work sites, between others. From the outreach activities in the local communities, not only we created awareness about the menaces acting upon the Yungas Andean Forest and the amphibian inhabiting it, but also it gave a platform to the communities to express their main concerns about the environmental situation of the area where they are settled. In this way, they express the need for more knowledge about anuran diversity of the Yungas, effects of climate crisis, logging good practices, and solid urban waste management/recycling. Regarding logging and waste management, we provided for them different sources of information and other project working in these matters. All local communities showed interest in the creation of a biological corridor, mainly those that live in natural areas because they recognised the importance of protecting as much of Yungas forests as possible for their exosystemic services. Moreover, through interviews conducted in the local communities, they recognised in our project as novel way to express is point of view inside a framework of nature conservation.

5. Are there any plans to continue this work?

Yes, we intent to fulfil in the future the inconclusive objectives of field work and corridor proposal. We hope for better environmental conditions for anuran activity in

coming wet seasons, and we intend to expand the analysis of genetic diversity to other endemic and threatened anuran species of YBR. And, as we were able to generate a network involving several key stakeholders, the only step lacking for the corridor proposal are the spatially explicit analysis in relationship to the genetic diversity of *O. berdemenos*. We intent to tackle this difficulty by acquiring new equipment and collaborating with other scientific institutions in northwestern Argentina.

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

The results and data we already generated will be soon available in open repositories such as GenBank, the official data repository of CONICET (https://ri.conicet.gov.ar/handle/11336/215241), and the System of Biological Information of National Parks (SIB-APN). All of our audio-visual productions are free access in our YouTube Channel (@ConservacionYungas) and Instagram account (@conservacion.yungas). We gave to some local communities and all PAs visited a lamina with information related to the confused robber frog and the Yungas anuran diversity for public display. We also presented two posters about genetic biodiversity of the Yungas in the Argentine Herpetological Congress and The Mexican Population Genomic Meeting. The documental was projected in all our talks, which include but were not restricted to tertiary of tourism, administrative building of national parks, schools, and native communities. We also participated in four dissemination fairs and two radio interviews in San Salvador de Jujuy, where the project updates were presented. Finally, we have a manuscript in revision in a highly prestigious journal, in which we address hot spot for conservation of biodiversity in the Yungas in consideration of genetic biodiversity, including obviously the confused robber frog case.

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

The pending objective of corridor proposal for conservation of endemic species of YBR is the mandatory next step. As mentioned before, only the spatially explicit analyses are due to be done for the proposal to be design. Moreover, in the talks and dissemination events, we gather other claims from the general public; by this means, we depict high demand for an "Anuran from the Yungas Field Guide". Finally, as each species is affected in a different way by habitat loss and fragmentation, we consider that knowing the genetic diversity of other endemic and threaten anurans of the Yungas would be a valuable complement to the definition of priority conservation areas and corridor proposal.

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?

Yes, in all our Instagram publication we tagged @ruffordgrant, and in all the audio-visual material posted in our YouTube Channel the logo is shown in the credits. In every talk, the logo appeared in the presentation and after each chapter projection. In addition, the logo was used in all of our posters and laminas; and we

created stickers for the public with the Rufford Foundation logo. Finally, in the article in revision, we thank The Rufford Foundation in Acknowledgements.

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

Lara Baccaro: team leader. I was in charge of coordinating conjunct work between the team members and working with them in order to a cohesive project advance.

Facundo Alvarez: film director and editor. He was the producer of the documentary series.

Laura Hagg: she was in charge of our social media and in the logistic and organization of the dissemination events.

Lucas Fernandez Vidal: he played a key role in field work campaigns and in dissemination events.

Juan José Martinez: he was the scientific advisor of the project.

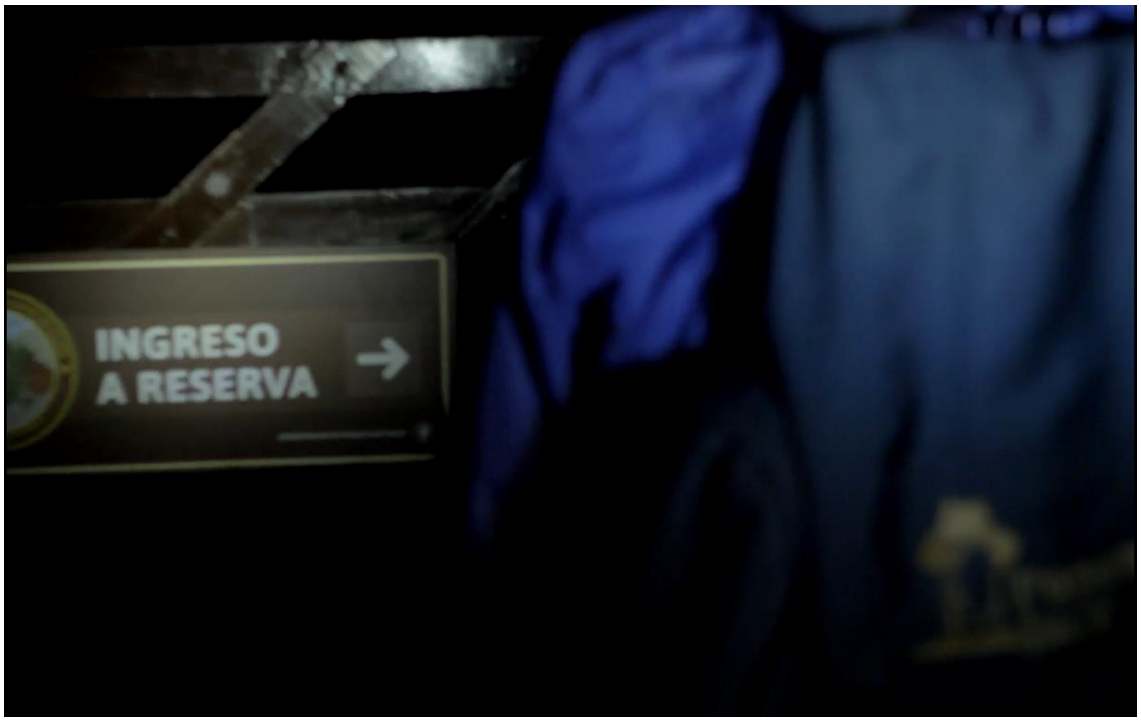
10. Any other comments?

During the project, the team expanded particularly in relation to the development of the documentary. Andrea Fusco provided her expertise and performed the voice-over of the documentary, in collaboration with Santiago Rodriguez Lira, who lent his recording room to obtain high-quality material. In turn, Lucas Bravo assisted Facundo Alvarez with sound editing.

I attach a compile of photos in another file that show the project advance during its development.

Documentary Series Production


BIENVENIDOS
PARQUE NACIONAL CALILEGUA


INGRESO
A RESERVA


STANLEY

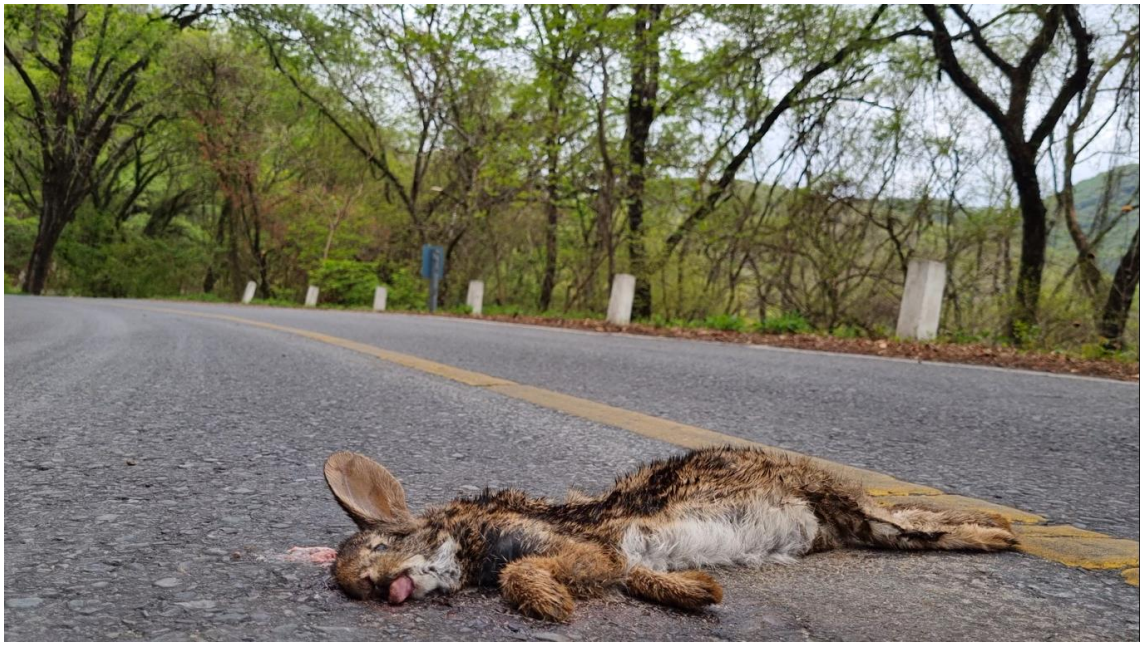
Interviews


PARQUE NACIONAL BARITÚ


FOX


SALIDA
PARQUE NACIONAL "CALILEGUA"
JUJUY ARGENTINA

Threats



Talks and Dissemination Events


PARQUE NACIONAL CAMILEGUA
Sapos y Ranas de las Yungas

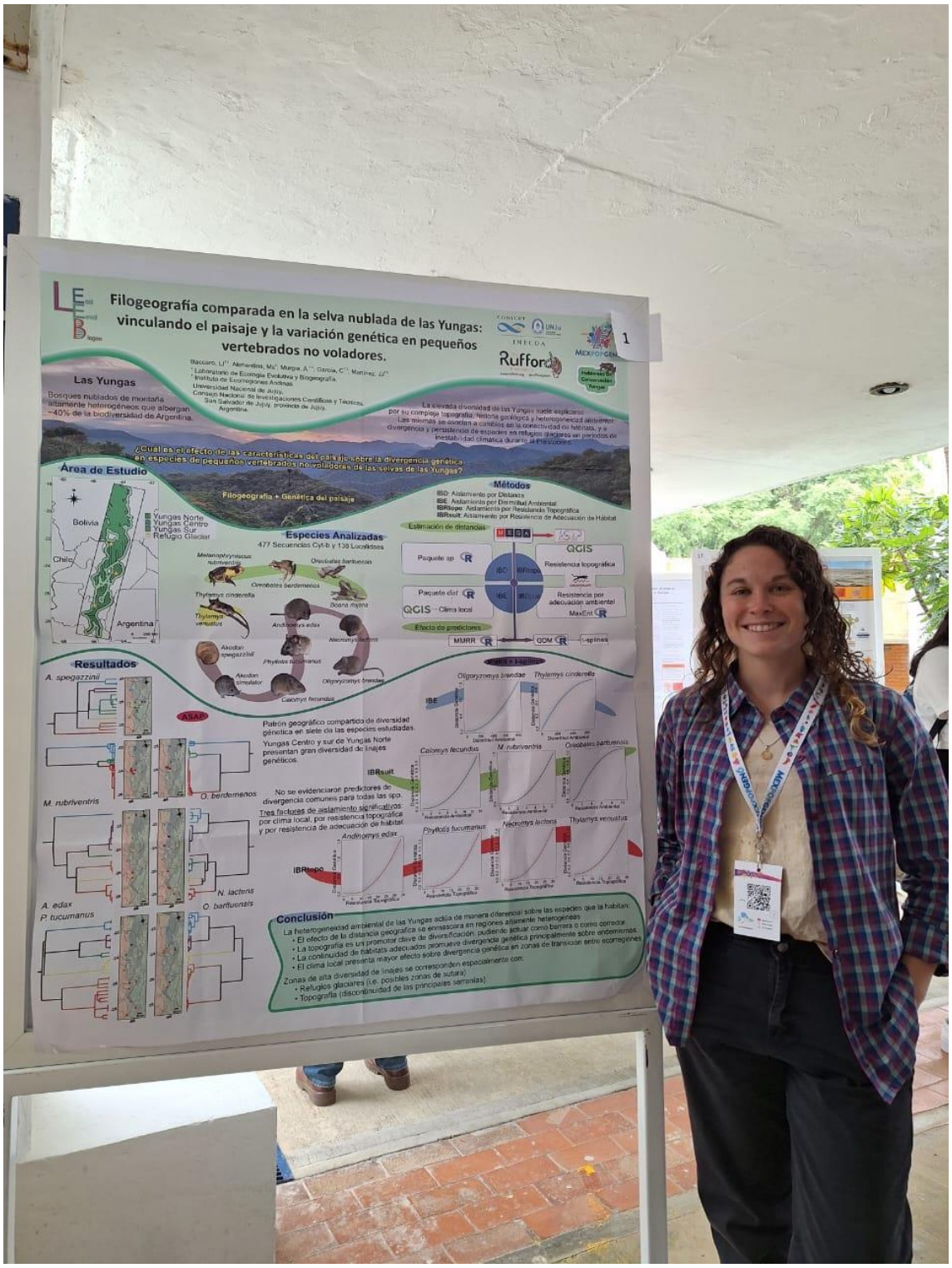

¡Muchas Gracias!
Rufford
Hablemos de Conservación Yungas


HUEVOS


¿Cómo trabajamos?
Rufford
Hablemos de Conservación Yungas
INSTRUCCIONES PARA LA PREPARACIÓN Y CONSERVACIÓN DE MAMÍFEROS
Publicaciones Especiales, N° 1
1998


CASA NACIONAL DE ESTUDIOS DE JUJUY
AÑO 1869


¡Muchas Gracias!
Ruffor
Hablemos de Conservación Yungas


Filogeografía comparada en la selva nublada de las Yungas: vinculando el paisaje y la variación genética en pequeños vertebrados no voladores.
Las Yungas
Bosques nublados de montaña altamente heterogéneos que albergan ~40% de la biodiversidad de Argentina.
¿Cuál es el efecto de las características del paisaje sobre la divergencia genética en especies de pequeños vertebrados no voladores de las selvas de las Yungas?
Filogeografía + Genética del paisaje
Área de Estudio
Bolivia
Chile
Argentina
Yungas Norte
Yungas Centro
Yungas Sur
Refugio Glacial
Especies Analizadas
477 Secuencias Cyt-b y 138 Localidades
Métodos
IBD: Aislamiento por Distancia
IBE: Aislamiento por Disimilitud Ambiental
IBRtopo: Aislamiento por Resistencia Topográfica
IBRsuit: Aislamiento por Resistencia de Adecuación de Hábitat
Estimación de distancias
Paquete ap
Paquete dist
QGIS - Clima local
QGIS
Resistencia topográfica
Resistencia por adecuación ambiental
MaxEnt
Efecto de predictores
MMRR
GDM
Resultados
A. spegazzinii
M. rubriventris
O. berdemenos
N. lactens
O. bartlyetsi
A. edax
P. tucumanus
ASAP
Patrón geográfico compartido de diversidad genética en siete de las especies estudiadas.
Yungas Centro y sur de Yungas Norte presentan gran diversidad de linajes genéticos.
No se evidenciaron predictores de divergencia comunes para todas las spp.
Tres factores de aislamiento significativos: por clima local, por resistencia topográfica y por resistencia de adecuación de hábitat
Oligoryzomys brendae
Thylamys cinderella
Calomys fecundus
Oreobates barbarensis
Andinomys edax
Phyllotis tucumanus
Necromys lactens
Thylamys venustus
Conclusión
La heterogeneidad ambiental de las Yungas actúa de manera diferencial sobre las especies que la habitan:
• El efecto de la distancia geográfica se enmascara en regiones altamente heterogéneas
• La topografía es un promotor clave de diversificación, pudiendo actuar como barrera o como corredor
• La continuidad de hábitats adecuados promueve divergencia genética principalmente sobre endemismos
• El clima local presenta mayor efecto sobre divergencia genética en zonas de transición entre ecorregiones
Zonas de alta diversidad de linajes se corresponden espacialmente con:
• Refugios glaciares (i.e. posibles zonas de sutura)
• Topografía (discontinuidad de las principales serranías)


Altos Andes: un hotspot de biodiversidad
Roedores altoandinos del NOA
¿Cómo trabajamos?
Un enfoque diferente para conservar pequeños vertebrados del NOA
Agustina Murgia y Lara Baccaro
Genética de la Conservación
El NOA y sus pequeños vertebrados
LA DIVERSIDAD GENÉTICA
La diversidad genética tiene mucho para decir en la conservación
Áreas Protegidas
Corredores Biológicos
Roedores
Construyendo desde la Genética
Ruffor

Field Work and Laboratory Work


PARQUES NACIONALES

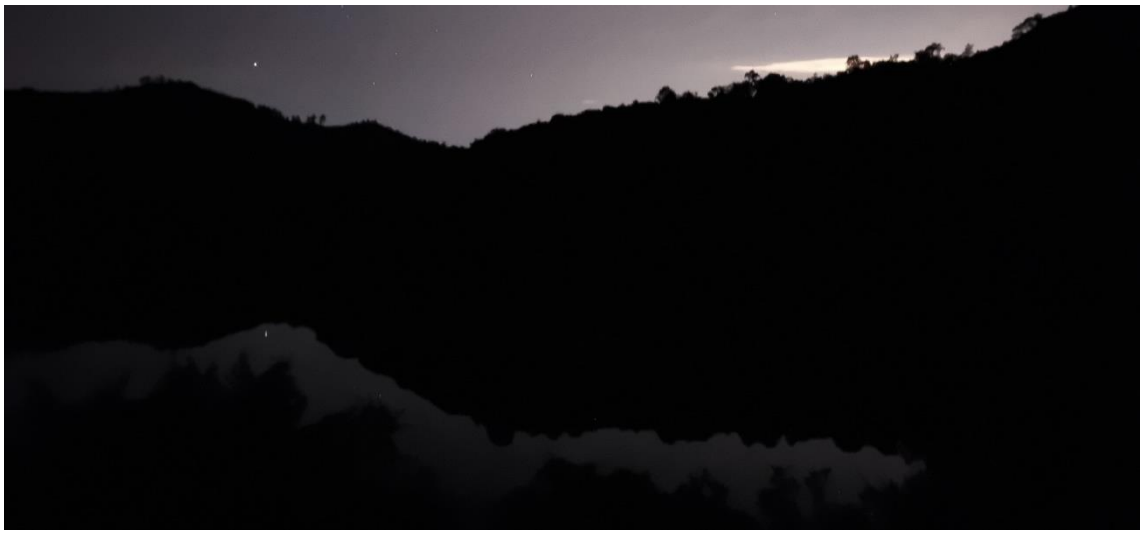

RESERVA NACIONAL
EL NOGALAR
DE LOS TOLDOS


etrex 10
S 22.45341°
W 064.74513°
GPS
4m
1614m
GARMIN


Kestrel
17.5
2500
Kestrel

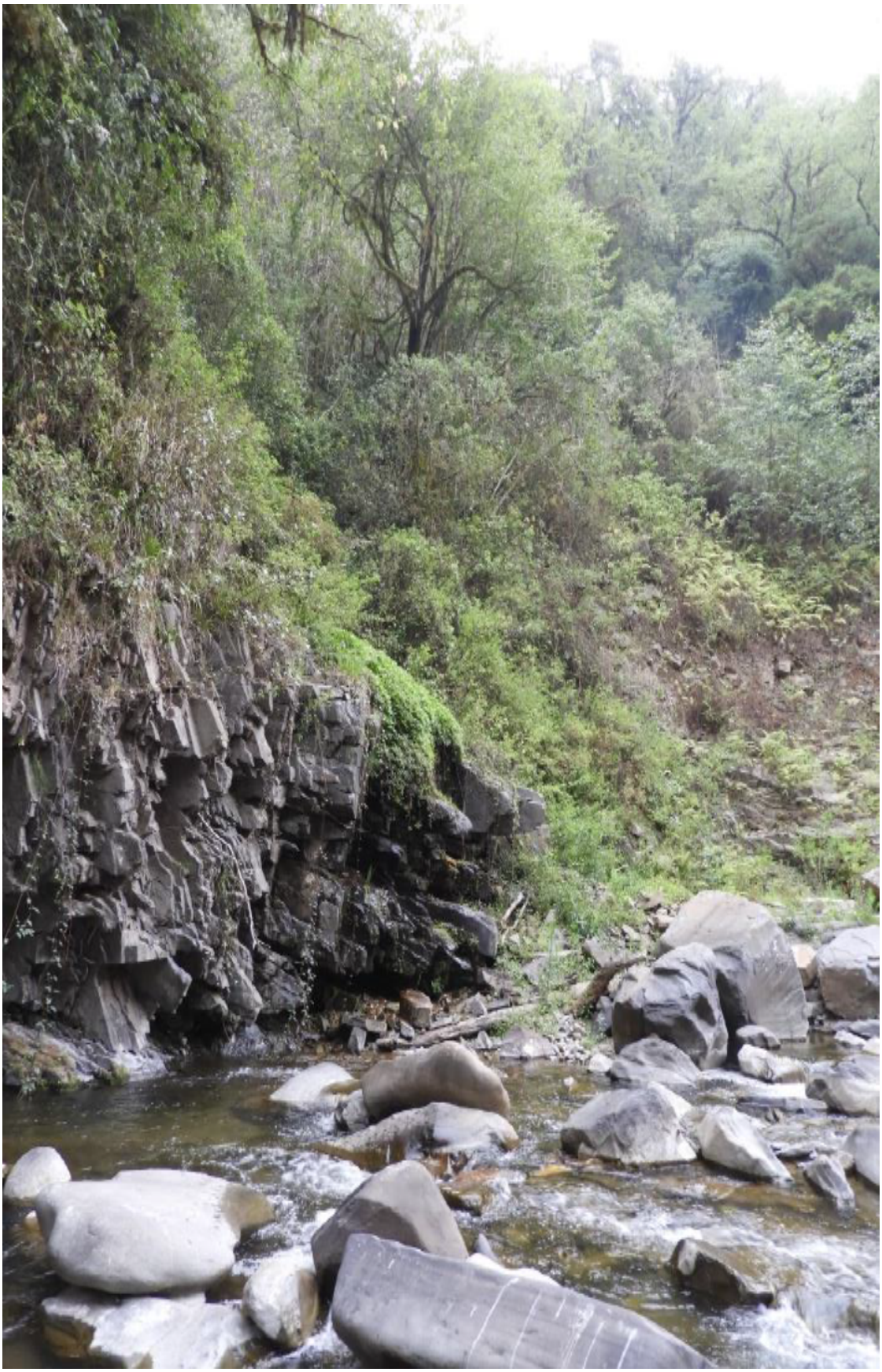

Anfibios de las Selvas de Yungas de Argentina
Conservation Leadership Programme
Black Diamond
Kestrel


BIENVENIDOS
PARQUE NACIONAL EL REY
ADMINISTRACION DE PARQUES NACIONALES




RUTA PROV. N°7
USTED ESTÁ INGRESANDO
ÁREA PROTEGIDA
COMUNIDAD ORIGINARIA EL ARAZAY


PARQUE NACIONAL BARITÚ
ADMINISTRACION DE PARQUES NACIONALES
República Argentina



Some anurans of the Yungas we encountered during field work