

## Final Evaluation Report

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Your Details	
<b>Full Name</b>	Ezequiel Vanderhoeven
<b>Project Title</b>	Pathogens of medical-veterinary importance in Armadillos in the Chacoan region of Argentina
<b>Application ID</b>	35114-1
<b>Date of this Report</b>	31/01/2023

**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
Capturing armadillos for sample collection				<p>During 2021 and 2022 we established relationships with local people in the north-western area of the province of Chaco, Argentina. This area is characterised by self-identified criollo settlers as well as settlers from the indigenous communities of the Qom and Wichi ethnic groups. Throughout this period and with the snowball method we were able to establish collaboration with 10 families of settlers who live in intimate contact with the Chaco Forest. The initial contact was made thanks to the collaboration of the park ranger Lucero Corrales who is the coordinator of the group of collaborators of the Yaguarete Project in Chaco, and that we work in collaboration. During the visits to the local stakeholders, we were able to learn about the intimate relationship that the people have with armadillo species. The inhabitants of the region where we work maintain close contact with these species through hunting, mainly during the cold and dry seasons. In our conversations with the local stakeholders, they told us about their close relationship with the local wildlife, which among other things they hunt for food. Armadillos are part of this diet, and they are one of the main sources of small game. We made several visits to the people in which we were able to establish bonds of trust and identify key people who were not only interested in our project but who could also provide samples of the animals hunted for</p>

			<p>food. In our opinion it was a win-win situation, since on the one hand this type of collaboration allowed us to increase the chance of obtaining samples of high interest value since they were animals that were also going to be hunted for consumption (we made sure to make it clear that we were not looking for them to work for us or to kill any animal that they were not going to consume) and that the parts that the owners consumed (muscle) were not what we needed for our analysis. Instead, we accessed remains that were not consumed (organs such as liver and gastrointestinal tract). Additionally, we established communication channels via text messages, cell phone, and WhatsApp to assist the individuals with any doubts they might have. Having made it clear that we do not belong to any control authority and that they could count on us without intermediaries had strengthened the bond even more. In addition, as a veterinarian, generating a rapport with the local farmers created opportunities to assist with concerns relevant to domestic animals, which are reservoirs for diseases like rabies that can spread to both people and wildlife. Based on the experience of the first meetings and after having identified key villagers to collaborate in the project, we devised a sample collection kit to facilitate storage. This consisted of jars with preservation media of different sizes which allowed us to store the material that the villagers did not consume until our next visit. During the visits, the villagers provided us with a total of 32 samples of four different species from 10 different sites. We consider these samples to be of the highest scientific interest and, in our opinion, we avoided the need for more destructive scientific approaches.</p>
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			<p>In our proposal we had also proposed to collect road-killed animals. Although we travelled more than 5000 km on different types of roads during the field campaigns, we found very few road killed animals and those that we did find were generally in an advanced state of decay. Even if the animal was run over that same day, due to the high temperatures in the area, the animals quickly enter a state of putrefaction, so this methodology was discarded.</p> <p>Live trapping methodology using Tomahawk traps or manual trapping was used in protected areas. In these campaigns we visited two national parks, Copo National Park and El Impenetrable National Park, and two provincial parks, the Loro Hablador Provincial Park and Fuerte Esperanza Provincial Park. With respect to the captures with tomahawk traps, we have not been lucky enough to capture any armadillo. We have identified several disadvantages to this standard methodology, including the difficulty of baiting the animals given the high temperatures, which required constant monitoring of the traps that could scare away armadillos. With manual captures we have been able to capture some armadillos that we spotted from a vehicle or walking in open areas. Our methodology did not require the euthanasia of these animals, so we only took live samples and released them in the place where they were collected.</p>
<p>Laboratory analysis for diseases</p>			<p>We performed preliminary analysis of the first samples collected in the field in collaboration with the Laboratory of Microbiology of the Veterinary Faculty of the La Plata University, this allowed us to improve the sampling techniques that will be analysed in 2023. In collaboration with the Laboratory of Virology of the</p>

			<p>Veterinary School of the University of Buenos Aires, samples were analysed for Coronavirus. So far, they have been negative. In 2023 we plan to complete a metagenomic of animal diets and microbiomes analysis at Brown University.</p>
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**2. Describe the three most important outcomes of your project.**

- a). We have generated a network of contacts with local people in the region.
- b). We have collected samples of different species of armadillos in a short time scale and that are of great scientific interest.
- c). We have participated in the capture and collection of samples of the first two giant armadillos captured for research in Argentina.

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

At the beginning of the project, due to the outbreaks of COVID-19, we had some difficulties in planning and visiting the local population. This was due to the outbreaks that occurred at the beginning of the year, which imposed restrictions by national and provincial authorities in certain regions where the outbreaks were large and exposed the local population. We were very cautious when planning these visits as many of the local population are at risk (over 60 or with pre-existing diseases) and were in areas where the vaccination rate was much slower than in other regions of the country, but by mid 2022 this situation had normalised allowing us to resume the visits. Undoubtedly what most affected the development of the project were the diesel crises suffered in Argentina (<https://www.batimes.com.ar/news/economy/diesel-shortages-wreak-havoc-as-top-soy-exporter-starts-harvest.phtml>) in mid 2022, mostly due to the influence of the Russian invasion of Ukraine. In that line, added to the great economic crisis in Argentina we had an inflation rate of 94% which forced us to reformulate the budget deciding on the way the priorities where to use the resources in a more efficient way.

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

One of the main lessons learned from the first campaigns was the richness of working closely with local communities. This not only generated close bonds of trust with these communities, but we believe that it also brought part of the scientific knowledge to places that by landscape are very far from our realities.

This was also reflected in the quality of our work since they were the ones who provided many samples of great scientific interest, and that without their contribution and support we would not have been able to obtain unless we had

more personnel and logistical support. The alliance that we believe we formed with these villagers in our understanding goes beyond a mere scientific collaboration for the study of armadillo pathogens. Being in the territory and participating in their daily life allowed us to understand more deeply the reality of the Chaco and the importance of continuing to work and collaborate.

Our work and presence in the territory also gave us adjacent activities such as participation and assessment in an outbreak of rabies transmitted by vampires (*Desmodus rotundus*) where, alerted by several villagers who told us about a high mortality of cattle, we concluded that it was a case of rabies. Thanks to the help of a local resident, we were able to establish the location of the colony of vampires. We made a detailed report with GPS point and photographs that we reported to the national animal health authorities SENASA (<https://agroperfiles.com.ar/detectan-en-fuerte-esperanza-vampiros-de-la-rabia-paresiante/>). Based on our report, the authorities were forced to act and carry out a control and analysis of the vampire populations in the area, and to activate a cattle vaccination plan in the region. This fact was appreciated by several villagers who, due to lack of familiarity, did not know who to turn to and how to act. In Argentina, as rabies is a zoonosis, it must be reported by any veterinarian.

Other examples were to assist in collaboration with the Yaguarete Project to several cases of predation by puma and help to confirm or rule out that it was by jaguar. As an example, we participated in an attack on goats by a puma to a villager who collaborated with our project. Faced with the event the villager first contacted me because he did not know who to turn to, through this I contacted the provincial authorities where together with their staff we went to his property and assisted the villager, our efforts helped the province to compensate the producer financially. In the Chaco region, conflicts with puma and small livestock are the main cause of puma hunting and many times due to the remoteness of the area it is not known that there is a conflict. As other examples we collaborate in the assistance to a dystocic birth in a cow, we carry from the big cities of veterinary medicines and any veterinary requirement. It is necessary to state that all these secondary activities did not entail a profit for any member of the project but were planned in collaboration with the producers. In many cases when we could not act on or solve the problem, we referred them to the competent authorities.

## **5. Are there any plans to continue this work?**

Absolutely, driven by the successful capture of the first two giant armadillos in Argentina (<https://www.diarionorte.com/224597-rosenda-la-primera-tatu-carreta-monitoreada-%C2%A0en-el-chaco>), the project has attracted the interest of the provincial authorities with whom we met, Omar Wilchesky, Director of Protected Areas and Biodiversity and Carina Suarez, Subsecretary of Environment and Biodiversity of the Ministry of Environment of the Province of Chaco. They have expressed their interest in supporting the project due to the importance of monitoring possible zoonoses that may be transmitted between the armadillos and the inhabitants of the region. In addition, our project was approved by the recent winner of the Whitley Award, Dr. Micaela Camino and director of the Quimilero Project, who was interested in our work with villagers and armadillos and proposed a

collaboration with members of her team to enrich our data and see how we can optimise our resources and our quality of research. We are reinforcing our collaboration with the Tatu Canastra Project in Brasil, working alongside D.M.V Danilo Kluyber to enhance the pathogens analysis of our samples. Thus, we will keep on working alongside the Giant Armadillos Project to keep on assisting in the handling, capture and sample collection of the specie.

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

Our results will be published in congresses such as the congress of parasitology, and the congress of mastozology. Once we have the first results of the laboratory analysis our intention is to publish in high impact scientific journals. On the other hand, we have already been making oral presentations about our project in educational establishments.

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

In 2023, our priorities will be focused on the processing and analysis of the samples collected in the field. Thanks to the diffusion of our project, the interest of several students who applied to do volunteer work and thesis for their degree completion with the collected samples was enhanced, so now we will try to generate results and later publish our findings. Our goal is to achieve quality publications to be able to continue to enhance our work and reach more members of the scientific community and the general public.

## **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, we have used it in presentations describing our work and in formal and informal presentations. e.g., the Agricultural School No 6 El Sauzalito, Chaco and in classes of the Professorship in Biology Teaching Career, Faculty of Forestry Sciences, Universidad Nacional de Misiones, where I teach.

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

**Ezequiel Vanderhoeven.** Lead member of the project. Member of CelBA and Postdoc at the IBS and Brown University

**Tyler Kartzinel.** Head of the Kartzinel Lab at Brown University

**Juliana Notarnicola.** Vicepresident at the IBS and head of the Laboratory of Parasitology at the IBS

**Lucero Corrales.** Parkranger. Member of the CelBA and coordinator of the net of collaborators of Proyecto Yaguareté at the Chaco region

**Yamil E. Di Blanco.** Member of CelBA and Researcher at the IBS, and Leader of the Giant Armadillo Project in Chaco



**Ana Belen.** Assis, Park ranger student, member of the Laboratory of Parasitology at the IBS

**Sebastián Costa.** Veterinarian. Member of CelBA and Proyecto Yaguareté, and Technician at the IBS.

**Agustín Paviolo.** Member of the CelBA, leader of Proyecto Yaguareté, and Researcher at the IBS.

**Hugo Correa.** Park Ranger from the Loro Hablador Provincial Park

**Lorena Rojas.** Park Ranger from the Loro Hablador Provincial Park

### 10. Any other comments?

I would like to thank The Rufford Foundation for supporting our project and for the importance of continuing to support projects that are developed in the field with threatened populations and natural environments. Your support was very important to generate these ties and it is very valuable that there are institutions that continue to support this type of project that involves human communities, nature and health. The contribution of The Rufford Foundation has not only helped us to deepen our knowledge of pathogens in armadillos but has also allowed us to establish the basis in the territory to be able to contribute to other projects in the future or simply support initiatives that improve the quality of life of the local population.



Left: A Southern three-banded armadillo *Tolypeutes matacus*. Right: Releasing a Six banded armadillo *Euphractus sexcintus* after collecting samples in El Impenetrable National Park.





A nine-banded armadillo was hit by a car, being assisted at Aguara Wildlife Rescue Center.



With the leader and his comrades of the Wichi indigenous community in Sauzalito, Chaco Chaco.





Checking for feces at a Six Banded Armadillo (*Euphractus sexcinctus*) burrow.



Car trouble in field work while searching for armadillo burrows.





Preparing a trap to capture Giant Armadillo (*Prionomys maximus*) in the Loro Hablador Provincial Park.



Talking to local residents about possible armadillo signs.



Left: Collecting blood samples from a Giant Armadillo in the training exchange with the team of Projeto Tatu Canastra in Pantanal, Brazil.



Collecting blood for pathogen analysis from a *Tolypeutes matacus*.





Left: Applying medicine to the horse of a local resident. Right: A burrow of a Six banded Armadillo in the middle of soybean plantation.



Left: An active burrow from a *Cabassus chacoensis*.





With D.M.V Danilo Klyuber and Biologist Gabriel Massocato from the Projeto Tatu Canastra in Pantanal, Mato Grosso, Brasil.



Preparing the sample collection kit to deliver to local people interested in collaborating.





Left: Stool samples collected by a local resident and handed in for analysis. Right: Samples being processed at the Parasitology Lab of the Instituto de Biología Subtropical.



Left: Mounting the Vet Monitor Sensor on a Giant Armadillo. Right: The capture of the Giant Armadillo in the news.



Conference about armadillos in Sauzalito AgroTechnical school N° 6 in Chaco.



Assisting a local producer after a Puma (*Puma concolor*) attack on goats.



Left: A common image, deforestation is the main threat for the Chacoan Forest.  
Right: Sharing a "round of Mate" with local residents and talking about the project.