

## Final Project Evaluation Report

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Your Details	
Full Name	Stephanny Arroyo Arce
Project Title	Monitoring jaguar predator-prey interactions and implementation of mitigation methods to reduce human-wildlife conflict in Tortuguero National Park, Costa Rica
Application ID	23000-D
Grant Amount	£10,000
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Date of this Report	September 11, 2018

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
Implement and evaluate the success of anti-predatory measures to reduce the attacks of jaguars on livestock in the communities located in the buffer zone of TNP.				<p>We were able to work with 12 farms instead of the eight farms initially proposed.</p> <ul style="list-style-type: none"> <li>- The farms were around 20-75 ha.</li> <li>- Each farm contained around 20-100 animals.</li> </ul> <p>After implementing the measures, no more attacks were reported. However, in the 'control farms' (the ones without any measure), the attacks continued.</p> <p>Our partner organization 'Panthera' will continue working in the area until 2020 to support other farms around the buffer zone of TNP.</p>
Activity 2. Monitor the predator-prey interaction between the jaguar and the local nesting population of marine turtles of TNP.				<p>We have successfully monitored the predation of marine turtles by jaguars in the coastal habitat of TNP both during the nesting season 2017 and 2018.</p> <p>For this year, our last survey will be performed on November 22<sup>nd</sup>.</p>
Activity 3. Monitor local jaguar population, other wild cats and their prey species in TNP.				<p>We have successfully monitored the wildlife in TNP during the seasons 2017 and 2018 through our camera traps.</p> <p>For this year, our last survey will be performed on November 19<sup>th</sup>.</p> <p>This year we recorded for the first time a margay (<i>Leopardus wiedii</i>) – adding another wild cat species to our list. So far, we have documented the jaguar (<i>Panthera onca</i>), the puma (<i>Puma concolor</i>), the ocelot (<i>L. pardalis</i>) and the margay (<i>L. wiedii</i>).</p>
Activity 4. Evaluate the bioaccumulation of methylmercury on jaguars due to their consumption of marine				<p>We have collected scat samples from jaguars in TNP.</p> <p>The methylmercury has been postponed as we are still looking for a laboratory that can help us with</p>

turtles.				the analyses. The laboratory initially proposed on our application cannot longer perform the analyses.
Activity 5. Disseminate the information generated with key stakeholders (e.g. Ministry of Environment and Energy, NGOs, local farmers, researchers) to promote conservation actions at a local and national levels.				We have carried out different dissemination activities: <ul style="list-style-type: none"> <li>- Educational activities for children and adults.</li> <li>- Presentations at international and national conferences</li> <li>- Presentations for university students.</li> <li>- Scientific publications.</li> <li>- Newspaper publications.</li> </ul> See Appendix 1

**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.**

The major difficulty we faced during the 2017-18 period relates to our proposed evaluation of the bioaccumulation of methylmercury in jaguars due to their consumption of marine turtles. While we were able to collect a substantial number of samples during this period, issues arose relating to our proposed collaboration with the researcher who specialised in the field of mercury analysis. After several attempts were made to finalise dates for the submission of the samples with the researcher, the person was unable to agree on a date due to different reasons. Therefore, we decided to end this collaboration and we are currently trying to find other potential partners to complete this objective.

**3. Briefly describe the three most important outcomes of your project.**

- a. In 2017 our project's data was used by the scientific committee of ACTo (Tortuguero Conservation Area) to expand the 'Absolute Protection Zone' of TNP. Specifically, tourist visitation on a 2 km human-made trail was closed in order to protect the local jaguar population against human disturbance.
- b. We were able to encourage the coexistence between the local farmers and the jaguar in the buffer zone of TNP, which is an area considered as a hotspot for livestock depredation by large felids in Costa Rica.
- c. Our project's data was used (among other studies) to determine for the first time the 'Conservation Status of the Jaguar (*Panthera onca*) in Costa Rica through the Integration of Species Record Data and Habitat Modeling'. This initiative was led by the government and included various research teams working throughout the country.

**4. Briefly describe the involvement of local communities and how they have benefitted from the project.**

This year our project has expanded to support local farming communities living in the surrounding buffer area of TNP. In relation to this, we have provided equipment and educational material to help reduce the impact of jaguar predation on livestock in this area. Thanks to our project, we have been able to directly support 12 farms in this regard, resulting in no further loss to livestock since the implementation of the antipredation methods.

Additionally, and as in previous years, one of our main goals has always been to present the project's findings to the local community. This has involved several educational activities (see Appendix 1) focusing in understanding the nature of the relationship between jaguars and turtles. Due to the economic dependence of the area on tourism based around the nesting sea turtle population, it is important to inform these key stakeholders about the project findings regarding the negligible effect of jaguar predation on the total nesting population, and to give them a greater understanding of some of the unique behaviors documented in the jaguars of Tortuguero.

We are also continuing to collect information on jaguar encounters with the help of the local community (e.g. boat captains, tourist guides, locals). This information will be presented to the administration of the Park to determine if jaguar encounters in the park are becoming more frequent? And if so what are the reasons behind this increase in frequency and what steps should be taken if necessary.

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

Yes, since the inception of our project, our goal has always been to establish a long-term monitoring project of the predator-prey interaction between the jaguar and the local nesting population of marine turtles of TNP, as well as to monitor the local jaguar population, other wild cats and their prey species in TNP. We are achieving this goal thanks to the partnerships we have develop throughout the years with NGOs, the local government and the local communities.

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

We will share our results by different means of communication, including:

- Presentations targeting the local government, local communities and other key stakeholders.
- Submission of technical reports to the local government.
- Participation in national and international conferences.
- Scientific and popular papers.
- Social media (our project's Facebook page).

**7. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?**

The grant was used to cover the period between the 2017 and 2018 seasons, which is consistent with the estimated time in the initial proposal.

**8. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.**

Item	Budgeted Amount	Actual Amount	Difference	Comments
Bells @ £6 per unit/20 units per farm/8 farms	960	593	+367	We found a good deal on Amazon, which was cheaper than anticipated. A total of £153 pounds was used to ship all the equipment to CR. The remaining money was used to support 4 additional farms.
Anti-predatory lights @ £15 per unit/40 units per farm/8 farms	4,800	4105	+695	We found a good deal on Amazon, which was cheaper than anticipated. The remaining money was used to support 4 additional farms.
Lodging & Meals for field trips to implement anti-predatory measures @ £135 per trip/12 field trips	300	300	0	NA
Travel cost to Tortuguero National Park @ £100 per round trip (for 2 people)/1 monthly trip (7 days each)/12 months	900	900	0	NA
Lodging & Meals in Tortuguero National Park @£23 per day per person/7 days/2 people/12 months	1,300	1,300	0	NA
Trail Cameras @ £139 per unit/25 units	1,040	579	+461	It was cheaper than anticipated as we were able to get part of the equipment throughout one of our partners.

				The remaining money will be used to cover the camera traps and related kit for the Season 2019.
Trail Camera Equipment (security kit, memory cards, batteries) @ £54 per unit/25 units	700	700	0	NA

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

- We will continue to monitor the effects of jaguar predation on the local nesting population of sea turtles in Tortuguero National Park, and the impact this is having on the social dynamics of the jaguar.
- We will also continue to seek for new partners to conduct the methylmercury analysis on the scat samples collected.
- Further dissemination of our 'Protocols of Conduct During Jaguar Encounters' in other conservation areas, with the hope that it will be adapted to each conservation area and implemented as legislation the same way it has been done in Tortuguero National Park.

### 10. 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 acknowledge RF in all scientific papers, oral presentations given to different audiences and posters presented at conferences (see Appendix 1).



**11. Please provide a full list of all the members of your team and briefly what was their role in the project.**

**Daniel Corrales Gutiérrez** help us to identify the farms with livestock predation due to jaguar attacks, and to implement the anti-predatory measures.

**Roberto Salom Pérez** has provided us with expert advice since the inception of our project.

**Ian Thomson** has help me manage the project since 2014.

**Danny Guy, Emily Watson** and **Amber Searcy** have helped us collect data in the field during the seasons 2017-2018.

**12. Any other comments?**

We would like to extend our sincere gratitude to The Rufford Foundation for its continued support to our project. Thanks to this support our project has not only successfully met all proposed goals but has also allowed us to have an active role in the conservation of the jaguar and its habitat in Tortuguero National Park. Our conservation efforts would not have been possible without the support of the 'Área de Conservación Tortuguero (ACTo)' and the rest of our partners who have also played a key role in the success of our project.

**APPENDIX 1.** Summary of the main dissemination activities carry out between the seasons 2017-2018.

Year	Date	Dissemination Activity	Location
<b>Conferences</b>			
2017	30 October to 03 November	XXI Congress of the Mesoamerican Society for Biology and Conservation	Crowne Plaza Corobici, San José, Costa Rica
2018	July 03	Symposium: Current Conservation Status of Wild Cats in Costa Rica	Hotel Hacienda La Pacífica, Cañas, Guanacaste, Costa Rica
<b>Presentations</b>			
2018	March 07	Lectures in Biological Science	School of Biological Science, Latina University, Costa Rica
2018	September 02	The role of the jaguars in the ecosystems	Tortuguero, Costa Rica
2018	September 02	Screening of the documentary 'Costa Rica's Fauna: ocelots, pumas and jaguars'	Tortuguero, Costa Rica
2018	September 02	Social dynamics of jaguars in Tortuguero National Park, Costa Rica	Tortuguero, Costa Rica
<b>Workshops</b>			
2018	May 22	Protocols of conduct: what to do in case of a jaguar encounter	Hotel Hacienda Guachipelín, Guanacaste, Costa Rica
<b>Popular Papers</b>			
2017	Newspaper	Científicos recurren a saliva para conocer genética de jaguares en Tortuguero	<a href="http://www.nacion.com/vivir/ambiente/Cientificos-recurren-genetica-jaguares-Tortuguero_0_1625437551.html">http://www.nacion.com/vivir/ambiente/Cientificos-recurren-genetica-jaguares-Tortuguero_0_1625437551.html</a>
2017	Newspaper	Tránsito de felinos comprueba conectividad entre Tortuguero y Pacuare	<a href="http://www.nacion.com/vivir/ambiente/Jaguar-comprueban-conectividad-Tortuguero-Pacuare_0_1626037408.html">http://www.nacion.com/vivir/ambiente/Jaguar-comprueban-conectividad-Tortuguero-Pacuare_0_1626037408.html</a>
2017	Newsletter	It is a jungle out there: sea turtles and jaguars interact in Tortuguero National Park	<a href="https://conserveturtles.org/jungle-sea-turtles-jaguars-interact-tortuguero-national-park/">https://conserveturtles.org/jungle-sea-turtles-jaguars-interact-tortuguero-national-park/</a>



2017	Blog	A Little saliva goes a long way	<a href="https://www.panthera.org/blog/2017/02/24/little-saliva-goes-long-way">https://www.panthera.org/blog/2017/02/24/little-saliva-goes-long-way</a>
2018	Blog	Coastal Jaguars	<a href="https://www.pumapix.com/portfolio/coastal-jaguars/">https://www.pumapix.com/portfolio/coastal-jaguars/</a>
2018	Blog	A jaguar's puzzle solved with scats and carcasses	<a href="http://investiga.uned.ac.cr/urbanecology/2018/02/26/a-jaguars-puzzle-solved-with-scats-and-carcasses/">http://investiga.uned.ac.cr/urbanecology/2018/02/26/a-jaguars-puzzle-solved-with-scats-and-carcasses/</a>
2018	Blog	Coastal Jaguars National Geographic	<a href="https://blog.nationalgeographic.org/2018/03/15/coastal-jaguars/">https://blog.nationalgeographic.org/2018/03/15/coastal-jaguars/</a>
2017	Magazine	Conserving biodiversity. Wildlife management in Costa Rica	Biological Sciences Review 29, 4
2018	Magazine	This big cat's seafood snack is an endangered turtle	<a href="https://www.newscientist.com/article/mg23831743-600-this-big-cats-seafood-snack-is-an-endangered-turtle/">https://www.newscientist.com/article/mg23831743-600-this-big-cats-seafood-snack-is-an-endangered-turtle/</a>
2018	Magazine	This big cat's seafood snack is an endangered turtle	<a href="https://www.newscientist.com/article/mg23831743-600-this-big-cats-seafood-snack-is-an-endangered-turtle/">https://www.newscientist.com/article/mg23831743-600-this-big-cats-seafood-snack-is-an-endangered-turtle/</a>
<b>Scientific Papers</b>			
2017	Arroyo-Arce, S., I. Thomson, E. Harrison, G. Baker & S. Wilmott. 2017. First record of jaguar ( <i>Panthera onca</i> ) predation on a loggerhead sea turtle ( <i>Caretta caretta</i> ) in Tortuguero National Park, Costa Rica. <i>Herpetology Notes</i> 10: 17-18.		
2017	Reyna-Hurtado, R., J. Radachowsky, L. Mcloughlin, D. Thornton, J. F. Moreira-Ramírez, R. García-Anleu, G. Ponce-Santizo, R. McNab, F. Diaz-Santos, F. Elvir, H. Orlando Portillo-Reyes, R. Moreno, N. Meyer, A. Artavia, R. Amit, M. P. G. Hofman, B. J. Harmsen, F. Castañeda, K. Sanchez-Pinzon, E. Hernández-Perez, W. Martinez, M. Mérida, N. Solis, V. Hugo-Ramos, D. Juárez, C. Tot, E. López, R. Leonardo, O. Machuca, P. Calderón, C. Estrada, J. Morales, S. Guerrero, F. Morazan, E. Carrillo, J. Carlos-Cruz, V. Montalvo, J. F. González-Maya, D. Gómez, J. J. Jiménez, S. Arroyo-Arce, I. Thomson & J. Polisar. 2017. White-lipped peccary in Mesoamerica: status, threats and conservation actions. <i>Suiform Soundings. Newsletter of the IUCN/SSC Wild Pig, Peccary and Hippo Specialist Groups</i> 15: 31-35.		
2018	Arroyo-Arce, S., I. Thomson, K. Cutler & S. Wilmott. 2018. Feeding habits of the jaguar <i>Panthera onca</i> (Carnivora: Felidae) in Tortuguero National Park, Costa Rica. <i>Revista de Biología Tropical</i> 66: 70-77.		
<b>Documentary</b>			
2018	Documentary	Fauna de Costa Rica: manigordos, pumas y	<a href="https://www.youtube.com/watch?v=4s1JAmuCBYA&amp;">https://www.youtube.com/watch?v=4s1JAmuCBYA&amp;</a>

		jaguares	feature=youtu.be
<b>Permanent Educational Murals</b>			
2017	Mural	A Little bit of the jaguars in Tortuguero National Park, Costa Rica	Cuatro Esquinas Ranger Station, Tortuguero National Park, Costa Rica



Left: Children's Activities. ©Ian Thompson. Middle: Conference Presentation. ©Ian Thompson. Right: Jag Team Season 2017 and 2018. ©Coastal Jaguar Conservation.