The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Valeria Boron
Project title	Jaguar and associated biodiversity conservation across increasing oil-palm landscapes in Colombia. Species ecology and the search for solutions.
RSG reference	14968-1
Reporting period	31/01/2014 → 30/01/2015
Amount of grant	£5,966
Your email address	valeria.boron@gmail.com; vb210@kent.ac.uk
Date of this report	30/01/2015

1. Please 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
1.1 Estimate jaguar density in an agricultural landscape with oil-palm cultivation and pastures			X	I photo-captured 12 individual jaguars. To estimate jaguar density, I used classic capture-recapture models with model Mh that assumes heterogeneity of capture probability between individuals and Spatially Explicit Capture Recapture models (SECR). Density resulted in 3.06 +/- 0.53 with model Mh and the full Mean Maximum Distance Moved (effective trapping area: 425.4 km2); 5.45 +/- 1.04 with half the Mean Maximum Distance Moved (effective trapping area: 238.3 km2) and 3.7 +/- using SECR.
1.2 Produce species inventories and species richness and compare them with other studies conducted in more pristine habitats			X	I recorded a total of 61 species - 2 reptiles, 21 mammals and 38 birds. If considering mammal species alone the total number of species detected (21) is lower than what found by other authors in the Peruvian moist forest, but comparable to values recorded in the Colombian Amazon (22 spp.), in the savannahs of Guyana (22 spp.), and higher than what found at the Volcan Barva Transect in Costa Rica surrounded by a highly fragmented landscape (15 spp.), or in an agroforestry mosaic in the Brazilian Atlantic forest (19 spp.). The number of mammal species recorded was also higher than what found in an oil-palm concession in the Colombian Llanos (16 spp..), possibly due to the larger size of this plantation (4,105 ha).
1.3 Investigate jaguar and prey habitat use and daily activity patterns in these landscapes			X	I calculated capture rates for each species in each habitat. For carnivores I highlight a pattern related to their body mass: medium-sized carnivores such as ocelots, jaguarundis, crab-eating racoons (*Procyon cancrivorus*), tayras (*Eira barbara*), and crab-eating foxes (*Cerdocyon thous*) display higher capture rates in disturbed habitats such as pastures and oil palm areas than large carnivores, i.e. pumas and jaguars, never recorded in oil-palm areas Also prey species such as capybaras (*Hydrochoerus hydrochaeris*), spotted pacas (*Cuniculus paca*), collared peccaries (*Pecari tajacu*), and nine-banded armadillos (*Dasypus novemincinctus*) were never recorded in oil-

				palm areas or pastures. At the edge of oil-palm areas with forested areas detection frequencies increase for several species with respect to the oil-palm habitat. For both pumas and jaguars' photo-captures were predominantly nocturnal nature in this area, which could be a strategy to avoid disturbance.
2. Explore whether retaining forest fragments, while benefiting biodiversity, could also provide ecosystem services to oil-palm growers by preventing the spread of the Rotten bud disease	X			I consulted oil palm producers, experts and stakeholders to gain further understanding of the issue, its relevance and its socio-economic consequences. Important insights are that the rotten bud disease it is considered a key issue in the oil palm sector and local economy, as it is a direct cause of unemployment. There is definitely evidence that its spread it is connected to monoculture (contiguous availability of oil-palms) and that forest fragments and non-palm habitats in the landscape would halt its spread. This should be used to foster the conservation of natural habitats with oil palm producers. However, I did not have time to perform remote sensing in order to quantify forest fragments in different plantations and explore whether there is a relation with the extent of the rotten bud disease in that plantation. Considering time limitations, I decided to prioritise the other objectives due to their relevance and higher feasibility.
3. Identify the key drivers of oil-palm cultivation expansion in the region and their effects on a set of sustainability objectives under the business as usual scenario and alternatives ones			X	I interviewed > 40 key local/regional stakeholders and/or experts, increasing local awareness on jaguar and biodiversity conservation and furthering my understanding of drivers of landscape change and impacts oil palm cultivation expansion in the area. Oil palm plantations affect water resources and dynamics, and have had severe socio-economic consequences, such as violation of human rights, loss of cultural heritage, and forced displacements. Finally, alternative scenarios that could deliver several objectives in the area have emerged (for more details see the following section: 2).
This project aimed at improving our understanding of jaguars and associated biodiversity ecology across increasing oil-palm landscapes (obj.1), and exploring potential solutions to reconcile their conservation with the development of the palm oil industry in Colombia (obj.2-3)				

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Apart from realising that I had planned an over-ambitious project for the timescale I had available (hence the dropping of Objective 2) I didn't encounter any major problems during the project. I did face minor difficulties, which I would regard as normal in the field, such has heavy rains, poor road conditions, and delays. Two of my cameras were stolen, and some were flooded but I was able to replace them thanks to an equipment grant from Idea Wild. I would say that for me personally the most challenging aspect of being in the field overseas has been solitude. Days are busy but it was hard to not have one close person in country! However, it has also been a great adventure and a great learning experience.

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

- Jaguar density estimation. Habitat loss is considered the main threat to biodiversity worldwide, and especially for large carnivores like jaguars (*Panthera onca*), due to their slow reproduction rate and large area requirements. Jaguar population estimates are crucially needed in Colombia to form baseline data for conservation and management, especially in ever increasing oil-palm (*Elaeis guineensis*) landscapes. Even in a heavily-modified area and with jaguar avoidance of oil palm areas (only three out of 12 individuals were recorded in a oil palm plantation and not in pure palm) the densities we obtained are within average, suggesting that the area is still suitable for jaguars probably due to its remaining wetlands and flooded areas, confirmed by the fact that jaguars were mainly recorded in water-associated habitats. We therefore suggest land-use planning, stricter enforcement of existing environmental law the promotion of incentives to achieve good agricultural practices. These results were key to highlight the importance of unprotected areas for species connectivity and survival with local authorities and environmental institutions who are now motivated to develop activities and deploy efforts in the area.

- Understanding of oil palm plantations impact and locally relevant solutions. Interviews findings were that oil-palm plantations impact goes far beyond biodiversity since this crop also affects water resources and dynamics and has had severe socio-economic consequences. The former is because fertilizers, pesticides and waste from palm oil extraction plants decrease water quality; while deforestation, soil erosion, excessive sediments, and suppression of streams to gain further cultivation areas have altered water dynamics affecting aquatic biodiversity, local communities, and even fishermen. Regarding socio-economic consequences, oil palm cultivation has caused violation of human rights, loss of cultural heritage, traditional farming practices and local food security, forced displacements, murders, land concentration, and land abandonment. Sustainability objectives included conserving species, habitats, and natural resources (especially water); promoting rural and social development; strengthen institutions' capacity. Potential solutions (alternative scenarios) that could deliver several objectives in the area and benefitting jaguars and biodiversity as well as people are: incentives for multi-crop farms and agroforestry, mandatory investments by large producers in small farmers alliances/projects, development and enforcement of land use plans, and tax breaks conditional to establishing conservation areas and respecting environmental laws the scenarios will inform key stakeholders on how to achieve it.

- Local engagement and training. Interviews have also been a mean of active awareness raising and discussions on the issue with local stakeholders. In addition, I have engaged with all landowners where I placed camera traps, field guides and three local schools to raise awareness and enthusiasm on local biodiversity (see Section 4 for more details). Finally, I trained two local undergraduates' students, and four field guides, who can continue the presence and engagement in the area, ultimately increasing in-country capacity for conservation and sustainable development. They can also continue monitoring jaguars/biodiversity through camera trapping and organize workshops to share the resulting photos.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

In addition to the activities strictly related to project objectives, I have also engaged with all landowners where I have been placing camera traps and a local community, bringing them some of the good camera trap photos I have obtained so far in the area and CDs. They seemed very appreciative and grateful. I have also visited three local schools, had informal meetings with the teachers and left those copies of a manual of the mammal species photo-captured in the area (see next section). I noticed a lack of institutional presence in the area, so much so that people seemed excited about my presence since it meant someone was interested in their area and in just listening to them. They also showed great enthusiasm for camera trap photos reinforcing how good of a technique camera trapping is not only for research but also for engagement purposes. Finally, two local students benefitted from training, local field guides benefitted from training and income, and local businesses such as small pensions, family houses and restaurants benefitted from income.

5. Are there any plans to continue this work?

People seem receptive and interested to conservation issues hence a constant presence in the area would be very beneficial to achieve greater conservation outcomes. In addition, some important points for jaguars in the area are under threat from agricultural expansion, hence continued presence in the area and engagement with stakeholders, landowners, local and regional authorities, communities, religious authorities, schools, and policy makers local authorities and stakeholders is highly recommended. I will continue to engage with interviewed stakeholders to increase awareness, share project results and good agricultural practices for jaguar conservation in the oil palm cultivation sector. I am also planning to continue biodiversity monitoring in some key points and develop a plan of conservation activities in the area to be implemented in collaboration with local authorities.

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

In terms of publications and dissemination of project results, I am planning to have three to four journal articles published before 2017: one on jaguar density, one on jaguar and prey habitat use in agricultural landscapes with oil palm cultivation, one on species richness, relative abundance and overall community structure, and one using the interviews results. I am also planning to write one or two articles for a wider audience (e.g. Mongabay) and disseminate the best camera trap photos through interested websites. So far, I have written a manual of the mammal species photo-captured in the area (see below), which I have disseminated locally, and an article for the School of Anthropology and Conservation news letter

(https://www.kent.ac.uk/sac/news/index.html?view=1515). I also presented a poster at the British Ecological Society-DICE Symposium, and the project's field assistants presented selected project results at the Colombian Zoological Conference (see below).

In 2015 I will attend the following conferences: the Student Conference on Conservation Science in Cambridge (UK), the Mammal Society Spring Conference in Lancaster (UK), the Bristol Zoo Annual Symposium in Bristol (UK), and the International Congress on Conservation Biology in Montpellier (France)

- **Valeria Boron** & Laura Jaimes Rodriguez (2014) *Manual de mamíferos detectados por cámaras trampas. Sabana de Torres y Puerto Wilches*. Pp 16. (It is a simple manual of mammal species recorded with camera traps in the area targeting local schools and local people).
- **Valeria Boron**, Esteban Payan, Douglas MacMillan & Joseph Tzanopoulos (2014) *the non-sustainability of current oil-palm expansion in Colombia: from jaguars to manatees and social justice.* Poster presented at the British Ecological Society-DICE Symposium: The Future of Conservation. Canterbury, UK, 25-27 June 2014.
- Valeria Boron, **Laura Jaimes Rodriguez** & Esteban Payan (2014) *Jaguar density across increasing oil-palm landscapes in the Magdalena river valley of Colombia.* Talk presented at Colombian Zoological Conference, 1-5 December 2014.
- Valeria Boron, **Andres Quiñones** & Esteban Payan (2014) *large vertebrate's relative abundance and activity patterns across an agricultural landscape with oil palm cultivation in the Magdalena river valley of Colombia.* Talk presented at Colombian Zoological Conference, 1-5 December 2014.

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

As anticipated and originally planned, I have used the Rufford Foundation grant from February to September 2014 to conduct fieldwork for my PhD.

8. Budget: Please 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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
10 Cuddeback Ambush camera traps	1219	1219	0	
AA Batteries and SD Cards	530	615	+ 85	Had to buy more batteries and SD cards as some of the cameras were partially flooded and some SD cards did not record photos
Motorized transport myself + field assistants	905 + 1748= 2653	2903	+ 250	We had to hire a truck in five different occasions to transport field equipment

Lodging field assistants	604	745	+ 141	Prices for accommodation in local family houses increased slightly since my experience in the area in 2012
Food field assistants	960	1153	+ 193	Prices for food increased slightly since my experience in the area in 2012
Total	5966	**6635**	669	1 £ = 3219.86 COP (Exchange rate valid during the period in which funds have been used)

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

Some important next steps would be: to continue engaging with local stakeholders and authorities to further the project in terms of conservation activities as some key natural areas in the study region, including wetlands, are being converted to agriculture, possibly leading to local extinctions; continue biodiversity monitoring in some key areas; continue to engage with local communities, schools, and land owners to increase the awareness on local biodiversity and its threats (see also Section 5). In terms of research feeding conservation and management would be highly beneficial to begin a telemetry study on jaguars. This would provide the ultimate information to prioritise areas that are key for their survival.

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

So far, I have used the Rufford Foundation logo in the following material and/or conferences:
Valeria Boron & Laura Jaimes Rodriguez (2014) *Manual de mamíferos detectados por cámaras Trampas. Sabana de Torres y Puerto Wilches*. Pp 16. (It is a simple manual of mammal species recorded with camera traps in the area targeting local schools and local people).

Valeria Boron, Esteban Payan, Douglas MacMillan & Joseph Tzanopoulos (2014) *The non sustainability of current oil-palm expansion in Colombia: from jaguars to manatees and social justice.* Poster presented at the British Ecological Society-DICE Symposium: The Future of Conservation. Canterbury, UK, 25-27 June 2014.

Valeria Boron, **Laura Jaimes Rodriguez** & Esteban Payan (2014) *Jaguar density across increasing oil-palm landscapes in the Magdalena river valley of Colombia.* Talk presented at Colombian Zoological Conference, 1-5 December 2014.

Valeria Boron, **Andres Quiñones** & Esteban Payan (2014) *Large vertebrates' relative abundance and activity patterns across an agricultural landscape with oil palm cultivation in the Magdalena river valley of Colombia.* Talk presented at Colombian Zoological Conference, 1-5 December 2014.

I have mentioned Rufford support also in the article for the School of Anthropology and Conservation newsletter (https://www.kent.ac.uk/sac/news/index.html?view=1515).

In 2015 I will use the Rufford Foundation logo in the material I will present at the following conferences: the Student Conference on Conservation Science in Cambridge (UK), the Mammal Society Spring Conference in Lancaster (UK), the Bristol Zoo Annual Symposium in Bristol (UK), and the International Congress on Conservation Biology in Montpellier (France).

11. Any other comments?

I would like to take this opportunity to express my deepest gratitude to the Rufford Foundation. I aim at becoming a leader in felid/carnivore conservation, either within an NGO or by conducting applied research in academia. This project increased my project management skills, refined my engagement abilities, as well as my analytical skills in quantitative ecological analyses and social sciences methods. Ultimately, the combination of all of the above will help me to conserve biodiversity with greater impact and success.

This grant enabled me to carry out this project and to work closely with two field assistants (local undergraduate students) and cover their accommodation, food, and transport. It has been essential to have field assistants in the project for building scientific and conservation capacity in the region so that the project can continue beyond my presence, and they can contribute to the country's conservation with growing expertise. Furthermore, working with field assistants also helped to successfully achieve project's objectives, since they brought local expertise and knowledge.