

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 <u>jane@rufford.org</u>.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Stephanny Arroyo-Arce
Project title	Jaguar Conservation in the North-eastern Caribbean Coast of Costa Rica
RSG reference	17678-B
Reporting period	July 2015 – December 2016
Amount of grant	£ 9700
Your email address	sturnina@gmail.com
Date of this report	December 29, 2016



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
Monitor jaguar predation on marine turtles in Tortuguero National Park, Costa Rica				We successfully monitored jaguar predation on three species of marine turtles (Chelonia mydas, Dermochelys imbricata, Eretmochelys imbricata). As in previous years, our data indicates that jaguars do not represent a threat to the population of green turtles that nest in Tortuguero beach, and it is not the main cause for population decline for the local leatherback population. As predation on hawksbills and loggerheads occurred sporadically, it is difficult to discern the potential impact of the loss of few females on the nesting population of these species in Tortuguero beach.
Assess jaguar population trends in Tortuguero National Park, Costa Rica				We successfully assessed jaguar population trends in the study area. As in previous years, jaguar population trends are strongly related to the high availability of prey (marine turtles) in Tortuguero beach. See Arroyo-Arce et al. (2014) for more information.
Assess jaguar social organisation in relation to availability of prey species in Tortuguero National Park, Costa Rica				We successfully assessed jaguar social organisation. Among the most important discoveries include the following: a. It seems that during the nesting season jaguars, which are described as a solitary carnivore, tend to display a social behaviour which is characterised by an evident home range overlap between males and to a lesser extent between females. b. Tortuguero beach constitutes an important breeding site for the local jaguar population. In this sense, we are recording new information regarding mother-cub



	interactions				
	interactions.				
Determine the	During our study period, we collected a total				
diet of jaguars	of 75 scats, and identified 12 prey species.				
in Tortuguero	During the first semester of 2017 we will				
National Park,	complete data analysis, as well as the				
Costa Rica	scientific publication.				
Assess the	Our study in Pacuare Nature Reserve was				
status of wild	carried out between April 2015-March 2016.				
felid	During this period, we were able to:				
populations	1. Conduct the first camera trap survey in the				
and its prey	Reserve.				
	2. Identified three species of wild cats,				
Pacuare	including the jaguar (Panthera onca), the				
Nature	puma (<i>Puma concolor</i>) and the ocelot				
Reserve,					
Costa Rica	3. Identified eight prey species distributed in				
	4. The most common species recorded was				
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	· · · ·				
	5. A noticeably absent species common				
	throughout the area was the Central				
	American agouti (Dasyprocta punctata).				
	6. Documented an adult male ocelot at two				
	separate sites. This ocelot was first				
	recorded in Tortuguero National Park in				
	November of 2012, and then again in July				
	2015 in Pacuare Nature Reserve; this				
	represents a straight-line distance of 41km				
	that the individual has travelled. This				
	constitutes the first evidence of movement				
	(or connectivity) between these protected				
	areas.				
Dissemination	During 2015 our main dissemination activities				
activities in	were the following:				
Tortuguero	1. July: we were invited by 'Tortuguero				
National Park	Conservation Area' (ACTo) to give a				
and Pacuare	workshop about 'Use of Camera Traps to				
Nature	Study Felids and Other Mammals' to				
Reserve	community leaders of La Aldea, Barra del				
	Colorado Wildlife Refuge.				
species in Pacuare Nature Reserve, Costa Rica Dissemination activities in Tortuguero National Park and Pacuare Nature	 Identified three species of wild concluding the jaguar (Panthera onca), the puma (Puma concolor) and the oce (Leopardus pardalis). Identified eight prey species distributed six orders and eight families. The most common species recorded with the common opossum (Didelpamarsupialis). A noticeably absent species common throughout the area was the Centamerican agouti (Dasyprocta punctata). Documented an adult male ocelot at the separate sites. This ocelot was recorded in Tortuguero National Park November of 2012, and then again in Jacobs in Pacuare Nature Reserve; represents a straight-line distance of 41 that the individual has travelled. That the individual has travelled constitutes the first evidence of movement (or connectivity) between these protect areas. During 2015 our main dissemination activities were the following: July: we were invited by 'Tortugue Conservation Area' (ACTo) to give workshop about 'Use of Camera Traps Study Felids and Other Mammals' community leaders of La Aldea, Barra of the part of the protect of th				



- August: Sebastian Kennerknecht, a professional photographer from Panthera, visited our project to document jaguar predation on marine turtles by using custom camera traps.
 He featured our project on his website: http://www.pumapix.com/thank-you-for-2015/
- 3. September: our fifth scientific paper entitled 'Impact of jaguar Panthera onca (Carnivora: Felidae) predation on marine turtle populations in Tortuguero, Caribbean coast of Costa Rica' was published by the 'International Journal of Tropical Biology'. For this edition, two of our jaguar photos were selected for the cover and back cover.
- 4. October: we presented the main results of the project to the directive and scientific committee of ACTo, as well as the Minister of the Environment and the director of SINAC, to support future management actions in the area.
 - We also took part in 'Turtle Bogue Festival', a celebration of the end of the '2015 Nesting Season' in Tortuguero National Park. During this event we shared the main results of the project with the local community.
- 5. We renamed the project to 'Coastal Jaguar Conservation' from 'Jaguar Conservation in the Northeastern Caribbean Coast of Costa Rica'. We also launched the official logo of the project.

During 2016 our main dissemination activities were the following:

1. March: a Japanese film crew, which was documenting different jaguar conservation projects in Costa Rica, visited the project to film our work carried out in Tortuguero National Park, Costa Rica. The programme was shown in Japan on April 16th 2016



A charity event was also organised in					
Kirkcaldy, Scotland in order to support our					
conservation project. This event was					
organised by Shaun Davidson and Gavin					
Peschaud as part of Gavin's college					
course work. This event was published in					
the local newspaper of the district of Fife.					

2. April: we presented our preliminary results regarding jaguar sightings and possible habituation to human presence to the directive and scientific committee of ACTo, in order to support future management actions in the area.

We also provided a workshop regarding the biology and ecology of the jaguars to the local guides of Tortuguero National Park.

Further, the project finalised the protocols regarding how to behave during a jaguar encounter. These protocols have been adopted by local research organisations working in the area of Tortuguero National Park. Related to this, we produced and disseminated educational posters regarding this topic, which were featured on the Panthera website:

https://www.panthera.org/blog/2016/07/0 6/what-to-do-if-you-meet-jaguar

- 3. May and June: we provide environmental education activities for two schools, two high schools, one environmental group and one community group from Barra del Colorado Wildlife Refuge. The main objective of the activity was to share the main findings of the study carried out in the refuge. These activities were done in collaboration with rangers.
- 4. June: the project was asked by the administration of ACTo to participate in a weeklong refreshment seminar for the guides of Tortuguero National Park. During this seminar we presented the main finding



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trair	ning	and	reso	urces	based	on	our
prot	ocol:	s for jo	ıguar	encou	ınters.		

- 5. July: we presented our project during the celebration of 'Wild Cat Day' held by the University of Costa Rica.

 Another scientific paper was accepted for publication 'King vulture (Sarcoramphus papa) scavenging at green turtle (Chelonia mydas) carcasses in Tortuguero National Park, Costa Rica'.
- 6. August: our protocols regarding how to behave during a jaguar encounter were legalised by the administration of ACTo (Resolución SINAC-ACTo-D-RES-053-2016).
- 7. October: we took part in 'Turtle Bogue Festival', a celebration of the end of the '2016 Nesting Season' in Tortuguero National Park. During this event we shared the main results of the project with the local community.
 - Other three scientific papers were published including 'Relative abundance activity patterns of terrestrial and mammalian species in Barra del Colorado Wildlife Refuge, Costa Rica', 'First record of a marine turtle predated by a jaguar in Pacuare Nature Reserve, Costa Rica' and vulture (Sarcoramphus papa) scavenging at green turtle (Chelonia mydas) carcasses in Tortuguero National Park, Costa Rica'.
- 8. November: A photo of a jaguar taken by our project in Tortuguero National Park was featured on the book 'Costa Rica: Greatest Wildlife Spectacles'.
- 9. Throughout 2016 we took the opportunity to thank all the staff of Tortuguero National Park and ACTo for their continuous support to our project, and for their tireless hard work and dedication for the conservation of this area. To honour this, the project



	decided to name the new generation of
	jaguars in the Park after these amazing
	people. The first jaguar was named 'Sandí'
	after the ranger Francisco Sandí Aguirre,
	who was presented with a
	commemorative plaque. Since then
	another jaguar was named 'Minor' after
	local ranger Minor Zúñiga Siles, who was
	also presented with a commemorative
	plaque.

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

The main difficulty was a delay in approval of permits for one of our partner organisations at the beginning of 2016. This resulted the project not having access to a pool of voluntary support workers usually available during this period. However, this issue was quickly remedied and occurred during the quietest part of the year for the project with negligible impact.

Also, as in previous years, some camera traps were stolen while other camera traps malfunction due to the extreme weather conditions.

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

One of the most important outcomes for our project has been the adoption and legalisation by the administration of the Tortuguero Conservation Area (ACTo) of our protocol regarding how to behave during a jaguar encounter (Resolución SINAC-ACTo-D-RES-053-2016).

Our work has also helped to re-evaluate the importance of Tortuguero National Park for the conservation of jaguar in Costa Rica and potentially in the region. In this sense, our data has helped to draw attention of the importance in protecting Tortuguero as it constitutes not only a feeding site but also a breeding area. Further, Tortuguero has a resident and migratory population that could be essential for supporting other populations of jaguars located in adjacent areas.

Finally, throughout this year the project has placed a greater emphasis on raising awareness about the work conducted in this area, and has worked in collaboration with local communities, scientific researchers, government institutions and the media to successfully disseminate its findings.



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

One of the main goals for this year has been to present the project's findings and recommendations to the local community. This has involved several educational activities involving primary and secondary educational institutions throughout the local area, as well as workshops and training of the local guides of Tortuguero regarding our protocols on how to behave safely during a jaguar encounter.

Also, over the course of the year we have had several opportunities to work with the local guides and communities to help them further understand 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 population, and to give them a greater understanding of some of the unique behaviours documented in the jaguars of Tortuguero to support their work in tourism.

After some potentially dangerous encounters between humans and jaguars in the area, we have also started 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 answer the following questions: are jaguar encounters in the park becoming more frequent? If so, what are the reasons behind this increase in frequency? What steps should be taken if necessary?

5. Are there any plans to continue this work?

Since the inception of our project, one of our main goals was to establish a long-term camera trap study in Tortuguero National Park. Therefore, we are working to secure the continuation of our project for years to come.

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

- In 2017 we are planning to attended the 'Mesoamerican Society for Biology and Conservation' to be held in Costa Rica.
- Continue with the dissemination activities that we have carried out in the communities located within our study area (see Question 1 for more detail on examples of activities carried out to share our work with third parties).
- We produced several posters for educational activities regarding our main findings obtained in Tortuguero National Park, Barra del Colorado Wildlife



Refuge and Pacuare Nature Reserve. We also created two posters regarding our protocols in case of a jaguar sighting. These materials were distributed among the local communities, educational centres and the staff of the protected areas (see Appendix section).

• Since the inception of our project we have had published the results of our work throughout scientific papers in peer-review journals, including:

Arroyo-Arce, S., I. Thomson, E. Harrison, G. Baker & S. Wilmott. In Press. First record of jaguar (Panthera onca) predation on a loggerhead sea turtle (Caretta caretta) in Tortuguero National Park, Costa Rica. Herpetology Notes. Forthcoming 2017.

Arroyo-Arce, S., I. Thomson, C. Fernández & R. Salom-Pérez. In Press. Relative abundance and activity patterns of terrestrial mammalian species in Pacuare Nature Reserve, Costa Rica. Research Journal of the Costa Rican Distance Education University/Cuadernos de Investigación UNED. Forthcoming 2017.

Arroyo-Arce, S., I. Thomson, C. Fernández & R. Salom. 2016. First record of a marine turtle predated by a jaguar in Pacuare Nature Reserve, Costa Rica. CatNews 64: 6-7. Arroyo-Arce, S., I. Thomson & R. Salom. 2016. Relative abundance and activity patterns of terrestrial mammalian species in Barra del Colorado Wildlife Refuge, Costa Rica. Research Journal of the Costa Rican Distance Education University / Cuadernos de Investigación UNED 8: 131-137.

Arroyo-Arce, S., I. Thomson & K. Cutler. 2016. King vulture (Sarcoramphus papa) scavenging at green turtle (Chelonia mydas) carcasses in Tortuguero National Park, Costa Rica. Vulture News 70: 30-36.

Arroyo-Arce, S. & R. Salom-Pérez. 2015. Impact of jaguar Panthera onca (Carnivora: Felidae) predation on marine turtle populations in Tortuguero, Caribbean coast of Costa Rica. Revista de Biología Tropical 63: 815-825.

Guilder, J., B. Barca. S. Arroyo-Arce, R. Gramajo & R. Salom-Pérez. 2015. Jaguars (Panthera onca) increase kill utilization rates and share prey in response to seasonal fluctuations in nesting green turtle (Chelonia mydas mydas) abundance in Tortuguero National Park, Costa Rica. Mammalian Biology 80:65-72.

Thomson, I., S. Arroyo-Arce & F. Spooner. 2014. Record of two jaguar cubs suckling from their mother in the wild. Catnews 61: 8.

Arroyo-Arce, S. & R. Salom-Pérez. 2014. First record of Puma concolor in Tortuguero National Park, Costa Rica. Brenesia 81-82: 115-118.

Arroyo-Arce, S., J. Guilder & R. Salom-Pérez. 2014. Habitat features influencing jaguar Panthera onca (Carnivora: Felidae) occupancy in Tortuguero National Park, Costa Rica. Revista de Biología Tropical 62: 1449-1458.

Arroyo-Arce, S. 2013. Reporte de Agamia agami (Ciconiiformes: Ardeidae) y Dendrocygna autumnalis (Anseriformes: Anatidae) en el Parque Nacional Tortuguero, Costa Rica. Zeledonia 17: 62-64.



• We also shared our project throughout gray literature, including:

Arroyo-Arce, S. & I. Thomson. 2016. Protocol of conduct to reduce potential human impact on jaguars, and other wild felids, in Tortuguero National Park, Costa Rica. Coastal Jaguar Conservation. Heredia, Costa Rica.

Arroyo-Arce, S. & I. Thomson. 2014. Jaguar Project Manual: Tortuguero National Park, Costa Rica. Heredia, Costa Rica.

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

Initially we expected to use the RSG to cover expenses during the period July 2015-July 2016, for both Tortuguero National Park and Pacuare Nature Reserve. However, we could extend the length of the project thanks to the support received by our partners throughout the study period. Therefore, we could use the RSG for a longer period than previously anticipated, specifically from July 2015-December 2016.

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
1 researcher assistant @ £201 monthly salary/12 months	1005	1005	0	
Travel cost to Pacuare Nature Reserve @ £98 per round trip (for 2 people)/1 monthly trip (7 days each)/12 months	527	300	+227	We did not have to rent a boat, this was provided by our partners.
Travel cost to Tortuguero National Park @ £97 per round trip (for 2 people)/1 monthly	780	1709	-929	Due to delays in the permit application process for our partner organisation we were required to visit the site more frequently.
Lodging & Meals in Tortuguero National Park @ £32 per day per person/7 days/2	1745	1675	+70	Some of the local hotels, lodges and restaurants offered us discounts.



	1	1	1	
people/12 months				
Browning Recon Force FHD Trail Camera @ £94	1541	1767	-226	Cameras were more expensive than anticipated.
per unit/25 units				
Trail Camera Equipment (security kit, memory cards, batteries) @ £52 per unit/25 units	811	343	+468	We could save money as equipment from the previous year was still in good conditions.
Trail Camera Cleaning & Maintenance Kit @ £43 per unit/1 unit	43	11	+32	We could save money as equipment from the previous year was still in good conditions.
Stationary Equipment for the Field (field books, pencils, sharpeners, markers, counter	39	39	0	
Field Equipment (WD- 40, flashlight, battery charger, lantern, pepper spray, scent) @ £53 per kit/4 kits	200	200	0	
Nikon® Coolpix® AW130 Digital Camera @ £235 per unit/1 unit	235	0	+235	
WD 2 x 2TB My Passport Ultra USB 3.0 Portable Hard Drive Kit @ £121 per unit/1 unit				
Waterproof Electronic Cases @ £50 per unit/6 units	276	110	+166	Cases were cheaper than anticipated.
Diet Analysis Equipment (plastic bags, gloves, face mask, microscope slides, soap, sieve) @ £330 complete package	330	346	-16	The project was able to collect more samples than anticipated.
Elaboration, design and printing of informative materials (T-shirt, stickers, brochures, posters) @ £1340	1340	1340	0	
Workshops (children and	405	500	-95	As we gradually had more



adults): refreshments and materials @ £740				opportunities to present the projects findings, and support community educational activities, we felt more of an investment
				should be made in this area.
Postage Delivery Expenses	302	202	+100	Postage was cheaper than
@ £302				anticipated.
TOTAL	9700	9700	0	

It is important to highlight that the money we could save in some items was invested in those which were more expensive than initially budget. Exchange rate used: £1 = ¢678,42

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

In the short term, a key step is to secure the funding for the period 2017. In the long term, we are planning a strategy for the project to be economically self-sufficient. This will help us to continue with our work in the area, which we believe is essential for the conservation of the species.

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?

- RSGF was mentioned in all scientific papers and grey literature published so far regarding the data obtained on our project (see Question 6 for more detail on the publications).
- RSGF logo was used on all educational posters regarding the main findings of the project (see Appendix section).

11. Any other comments?

We would like to extend our sincere gratitude to The Rufford Small Grants Foundation for its continued support to our project, since its inception in 2012. 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 such an important area as the Northeastern Caribbean coast of Costa Rica. Our conservation efforts would not have been possible without the support of the 'Área de Conservación Tortuguero (ACTo)' and rest of partners who also played a key role in the success of our project.



APPENDIX A. Educational poster regarding the main findings of our project in Barra del Colorado Wildlife Refuge, Costa Rica





APPENDIX B. Educational poster regarding the main findings of our project in Pacuare Nature Reserve, Costa Rica



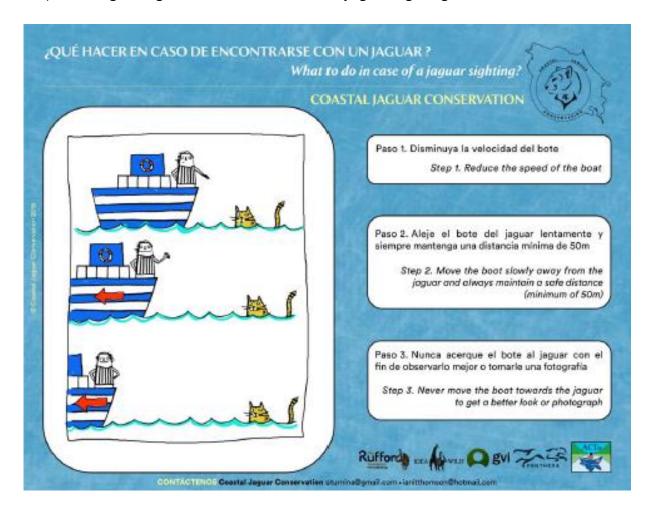


APPENDIX C. Educational poster regarding 'What to do in case of a jaguar sighting?





APPENDIX D. Educational poster regarding 'What to do in case of a jaguar sighting?





APPENDIX E. Links to publications related to our project

Date	Title	Link
July 2016	What to do if you meet a jaguar	https://www.panthera.org/blog/2016/07/06/what-to-do-if-you-meet-jaguar
January 2016	Thanks for 2015	http://www.pumapix.com/thank-you-for-2015/
Permanent	Coastal Jaguar Conservation	https://www.facebook.com/JaguarConservationCostaRica/?fref=ts