# The Rufford Foundation
# Final Report

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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**

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| **Grant Recipient Details** | |
|---|---|
| **Your name** | Frederico da Costa Santarém |
| **Project title** | Conserving Desert Biodiversity through Crocodile-based Ecotourism in Mauritania |
| **RSG reference** | 17893-1 |
| **Reporting period** | 23th July 2015 – 28th July 2016 |
| **Amount of grant** | £5,000 |
| **Your email address** | fredericosantarem@gmail.com |
| **Date of this report** | 22-09-2016 |

**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 |
|---|---|---|---|---|
| Update local biodiversity databases, fulfilling the knowledge on birds and macro-invertebrate species richness and endemicity levels in Mauritanian *gueltas* | | | X | We recorded 188 different species, during fieldwork, especially birds (147 species) and macroinvertebrates. The expedition was important to fill in gaps on bird species distribution, contributing to the development of the Atlas of the Birds of Mauritania (http://atlasornmau.org/). We also increased the number of records of dragonflies, contributing to updating the knowledge on their distribution. Some of the collected specimens still require molecular identification and new species may be described in the future. |
| Identify ecologically relevant characteristics of different *gueltas*, including landscape features, natural rock formations, and vegetation cover, which will allow identifying natural attractions for ecotourism | | | X | We identified nine environmental variables that may influence the ecotourism potential of *gueltas*, including area, slope, water availability, vegetation, nearest waterbody, presence of waterfall, presence of canyon, number of different habitats surrounding the waterbody, and number of different habitats seen from the nearest paved road to the waterbody. |
| Get insights on cultural heritage in *gueltas'* surroundings, which will improve our knowledge about cultural attractions for ecotourism, | | | X | We recorded eight different anthropogenic-related variables that can influence the cultural attraction of *gueltas* for ecotourism, including distance of the waterbody to the nearest paved road, distance of the waterbody to the nearest supporting infrastructures (hospitals, hotels, |

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| including sedentary and nomadic lifestyle, millenary watering livestock systems, and uses of animal pieces in daily livelihoods (cooking; tent housing), unique features to this desert region | | | | restaurants), walking time to access the waterbody, type of road to access the waterbody, water quality, preservation of ethnographic elements in the nearest village, habitat intactness, and number of International Union for Conservation of Nature (IUCN) threat factors. No animal pieces were identified as being used in daily livelihoods. In addition to the initial objective, factors that can threat *gueltas* and the development of local ecotourism were quantified, as well as cultural and anthropogenic characteristics that can play a key role in attracting international tourists. |
| Assessment of the economic value of the West African crocodile, which will allow predicting the likely contribution of ecotourism for its long-term conservation and potentially change local negative behaviours that threaten this species | X | | | The assessment was expected to be retrieved from inquiries developed in the field to tourists visiting *gueltas* and in online forums and social media. While in Mauritania, we found no tourists in *gueltas* (Mauritania tourism is underdeveloped and the country is one of less visited in Africa; http://www.euromonitor.com/travel-and-tourism-in-mauritania/report). As such, we have focused analyses on on-line inquiries, using more flagship species that can attract tourists to Mauritanian *gueltas* rather than only the West African crocodile. The identification of Saharan-Sahel flagship species for ecotourism is currently being done, and we will use the top flagship candidates to infer the income that can be retrieved for local communities and national entities if ecotourism based on these flagship species is to be developed in *gueltas*. |
| Predicting the ecotourism potential of different *gueltas* and ranking them by their priority for | | X | | A Principal Coordinates Analysis (PCoA) was performed to identify which of the 19 initial variables are more responsible for the ecotourism potential of each *guelta*. We are now ranking the most |

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| conservation, threat levels and recreational uses | | | | suitable *gueltas* for ecotourism using a prioritisation approach with the decision-support tool Zonation. This will infer in which top five *gueltas* we should develop ecotourism first, based on potential and threat factors.<br>The methodology developed showed to be effective in the identification of the most suitable waterbodies for ecotourism development and we will use it to assess the ecotourism potential of all Mauritanian waterbodies. |

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

Prior to the expedition, we thought that rock-art would be a relevant variable to annotate in assessing the ecotourism potential of *gueltas*. While in the field, we found no rock-art engravings close to the waterbodies, thus discarding this variable. We also discarded the number of excavating and pumping water sites, as these structures as well as wells were found in almost all villages close to the waterbodies.

The absence of tourists in Mauritania made impossible the task of forecasting the economic revenues brought by crocodile-based ecotourism based on inquiries to tourists visiting waterbodies. Tourism levels in Mauritania are currently extremely low (http://www.euromonitor.com/travel-and-tourism-in-mauritania/report). Thus, we refocused this task. Firstly, we are analysing which Saharan-Sahel vertebrate species are more suitable to be used in ecotourism campaigns. Secondly, we will use the top-candidates to forecast the potential economic contribution if ecotourism based on those species is to be developed. Finally, online-inquiries will be developed, using Sahara forums (http://www.saharaconservation.org/, http://www.horizonsunlimited.com/hubb/north-africa/, http://www.sahariens.info/, http://www.desert-info.ch/desert-info-forum/index.php?sid=c9846fe5f5b7e545ad5b97a121deca8c, http://conbio.org/groups/working-groups/conservation-marketing-working-group) and social media (Facebook, Twitter, Google+).

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

1. The identification of endemic and poorly-studied taxa living in *gueltas*, namely birds and macroinvertebrate species, which contributed to fulfil biodiversity databases on these groups. We updated distribution gaps on

many different bird species and we are now contributing with our records to the Atlas of the Birds of Mauritania (http://atlasornmau.org/). We got many new distribution records for dragonflies, presenting the data on the 4th European Congress on damselflies and dragonflies in Sweden, with the title "*Odonata from Mauritania: past, present and future*". With the financial support of this RFSG, we also updated the knowledge on the distribution of West African crocodiles, by publishing a paper in Amphibia-Reptilia, a leading journal devoted to herpetology entitled "*Update of distribution, habitats, population size, and threat factors for the West African Crocodile in Mauritania*". With the financial support given by Rufford, in our scientific expedition in January and February 2016 we were able to assess 30 different waterbodies (the triple of the original number), increasing our chances to assess all Mauritanian inland waterbodies in the forthcoming years. With this assessment, we were able to record many pictures and videos of local wildlife, which help attracting worldwide interest for species and habitats preservation in Mauritanian inland waterbodies. We believe this can help attracting more financial mechanisms for wider wildlife protection in this unfunded country.

2. The identification of ecological and cultural values for ecotourism as well as of activities practised by local communities that can compromise ecotourism development and local biodiversity conservation. The methodology developed here showed to be efficient in forecasting the most suitable waterbodies for ecotourism, concerning their natural and cultural attractions and factors threatening ecotourism development. For instance, none of the variables analysed were correlated. This methodology will be used as a framework for assessing the full set of Mauritanian waterbodies (about 100) in the forthcoming years. Importantly, the methodology can be used by other researchers in assessing the ecotourism potential of waterbodies elsewhere in the world.

3. We established contact with key stakeholders in Mauritania and in Finland for a sustainable strategy of ecotourism development and biodiversity conservation. In the former, we connected with Dr Andack Saad Sow, to whom we are acknowledged for his help in the fieldwork. He will be a key contact in the field from now on, being able to contact local communities in a way we are not able to. In the later, we established contact with Dr Jarkko Saarinen, professor of Human Geography, Tourism Studies, and Sustainability Management at the University of Oulu and University of Eastern Finland. He supported our work and will be associated in following works.

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

We have been sharing scientific knowledge with Mauritanian researchers, namely Andack Saad Sow, who made a substantial contribution to this work. The final results of this pilot project will be shared among local stakeholders (MDE: Ministry of Environment; FST-USTM: Faculty of Sciences and Technology, Nouakchott), to provide them with a framework that helps conserving local threatened biodiversity through ecotourism.

The involvement of local communities who live in the surroundings of the top-waterbodies for ecotourism is aimed (see section 5.), via advanced training to manage ecotourism in the future by themselves.

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

Yes.

- We still have to do the economic analyses related to flagship species.
- We want to assess the full set of Mauritanian waterbodies with this approach and examine in which ones sustainable ecotourism should be developed first.
- It is planned to provide local communities living in the surroundings of Mauritanian waterbodies with a framework to manage ecotourism activities. This way we can increase job opportunities and revenues sharing among locals. We will apply for a second Rufford Grant and for a European Outdoor Conservation Association Project to fund our travels to Mauritania and to build local capacity and tourism infrastructures in the short-term.

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

- We have been sharing our results with other interested parties, namely by publishing articles in scientific journals and sharing results in international conferences. We published an opinion piece concerned to ecotourism benefits to deserts entitled "*Conserving desert biodiversity through ecotourism*" (see http://www.sciencedirect.com/science/article/pii/S2211973615000768).
- We published an article in *Amphibia-Reptilia* that updates the distribution, habitats, population size, and threat factors for the West African Crocodile in Mauritania and presented an oral communication on the Sahelo-Saharan Interest Group Meeting that occurred in 2016 in Barcelona with the title "*Distribution, habitats, population's size, genetic variability and threat factors for the West African Crocodile in Mauritania*".

- We updated the known distributions on dragonflies and these were presented in the *4th European Congress on damselflies and dragonflies in Sweden*.
- We will submit a paper to *Bird Conservation International* with the new bird distribution points recorded in the field during the overland expedition.
- A manuscript about the methodology here developed is under preparation to be submitted to *Tourism Management*, a leading journal in tourism development and management. The results are planned to be shared in the next Sahelo-Saharan Interest Group meeting in Dakar, 2017 and in the next Ecotourism and Sustainable Tourism Conference in South Korea, 2017.

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

The Rufford Foundation grant was used especially during January and February 2016, when we performed an overland expedition in Mauritania. The funds were used exclusively to the expedition, as intended from the beginning.

**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 |
|---|---|---|---|---|
| Lodging | 410 | 61 | +349 | We spent most of our nights in our own outdoor tents. Only in few occasions we used local parking sites or hotels. |
| Food/supplies | 1143 | 752 | +391 | We were able to spend fewer funds on food/supplies. |
| VISA and paperwork | 216 | 353 | -137 | |
| Local Field Guides | 360 | 14 | +346 | We already knew most of the waterbodies that we assessed during this expedition. Thus, only few new sites were in need for local guides, who were paid for showing us the directions to those waterbodies. |

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| Fuel | 2975 | 784 | +2191 | The initial budget was counting with the costs of two vehicles. As we were travelling to remote regions, two vehicles would provide more safety. However, one of the vehicles warned-out before our planned travel, thus hindering our initial plan. We decided to do the expedition anyway with only the available vehicle. |
| Tolls | 0 | 131 | -131 | |
| Car insurance in Mauritania | 0 | 37 | -37 | |
| Parking | 0 | 14 | -14 | |
| 4x4 maintenance | 0 | 2408 | -2408 | The harsh conditions of Mauritanian roads and tracks to accede gueltas caused damaged to several vehicle parts. Maintenance of the vehicle was thus higher than initially predicted. This setback was compensated by the savings in item Fuel. |
| Boat Strait of Gibraltar | 0 | 221 | -221 | |
| Border taxes | 0 | 37 | -37 | |
| Sampling material (binoculars, monocular, tripod, photocopies, telephone for local communications, camping equipment, outdoor clothes) | 0 | 366 | -366 | Some of our fieldwork material was broken. We bought some new and proper equipment to help us on fieldwork. |
| Vaccination and | 0 | 49 | -49 | Vaccination against |

| | | | | |
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| diseases prevention | | | | yellow fever and typhoid fever; malaria pills. |
| Passport | 0 | 48 | -48 | One passport was outdated, thus needed to be updated. |
| **Total** | 5104 | 5275 | -171 | |

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

Continue the assessment of ecotourism potential of the full set of Mauritanian waterbodies in order to identify the ones where ecotourism should be first developed in partnership with the local communities.

Assess the revenues to be retrieved from ecotourism based on Saharan-Sahel flagship species to see which species should be publicized in ecotourism campaigns. Share knowledge and build capacity among locals and help them managing ecotourism activities in the future. The involvement of local communities on ecotourism development and management will be a stone step on this project.

**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?**

The logo was used in the oral communication presented on the Sahelo-Saharan Interest Group Meeting. It will be used on the next conference communications to be presented. The RSGF received publicity in two scientific papers, in one oral communication, and in one poster communication.

The present RSGF was publicized in social media contents
https://www.facebook.com/Biodeserts/photos

https://www.facebook.com/media/set/?set=a.1106984669351874.1073741849.100001210540347&type=1&l=d98372cee5

https://www.facebook.com/media/set/?set=a.1122161501167524.1073741851.100001210540347&type=1&l=1e1ce3edb2

https://www.youtube.com/user/biodeserts/videos

https://www.youtube.com/c/FredericoSantar%C3%A9m) and will be publicized in the forthcoming papers and communications in scientific meetings, as well as in any

training workshop to be done in Mauritania under the goal of developing ecotourism.

**11. Any other comments?**

We intend to carry on this project by applying for a 2nd Rufford Small Grant. This will help us complete our 100 waterbodies survey and develop the inquiries for the economic assessments (after flagship species identification).

If additional grants can be provided to carry on this project, we can involve local communities who live in the surroundings of the top-waterbodies for ecotourism. We are aware of the difficulties found in the field but with the help of Mauritanian and Finnish colleagues we will be able to provide local communities the tools and the knowledge to manage ecotourism activities by themselves.

We would like to thank Sónia Ferreira for dragonflies (lab) identification, and João Carlos Campos and Fábio Sousa for fieldwork assistance.