

# Interim report for the Rufford Foundation on *Conserving Desert Biodiversity through Crocodile-Based Ecotourism in Mauritania*

## Goal:

The project goal is to investigate the suitability of Mauritanian waterbodies for the development of West-African crocodile-based ecotourism and how it may improve the conservation of Saharan biodiversity.

## Objectives:

1. Collect biodiversity, environment and cultural relevant data to ecotourism development in each waterbody.
2. Fulfil biodiversity databases on yet poorly-known bird and macroinvertebrate species.
3. Estimate the economic value of the West-African crocodile for ecotourism.
4. Rank the different waterbodies according to their ecotourism potential.

## Results:

### Data collection:

We did a scientific expedition to Mauritania from 3<sup>rd</sup> January to 10<sup>th</sup> February to collect all the data we needed for the analyses. A total of 30 waterbodies were assessed (Figure 1), covering different latitudinal, longitudinal and altitudinal gradients, but also experiencing different climatic and human influences. This way we could expect statistical differences in the values collected in each waterbody. In each site we assessed 19 different variables (two biological, nine environmental, and eight anthropogenic; Table 1).

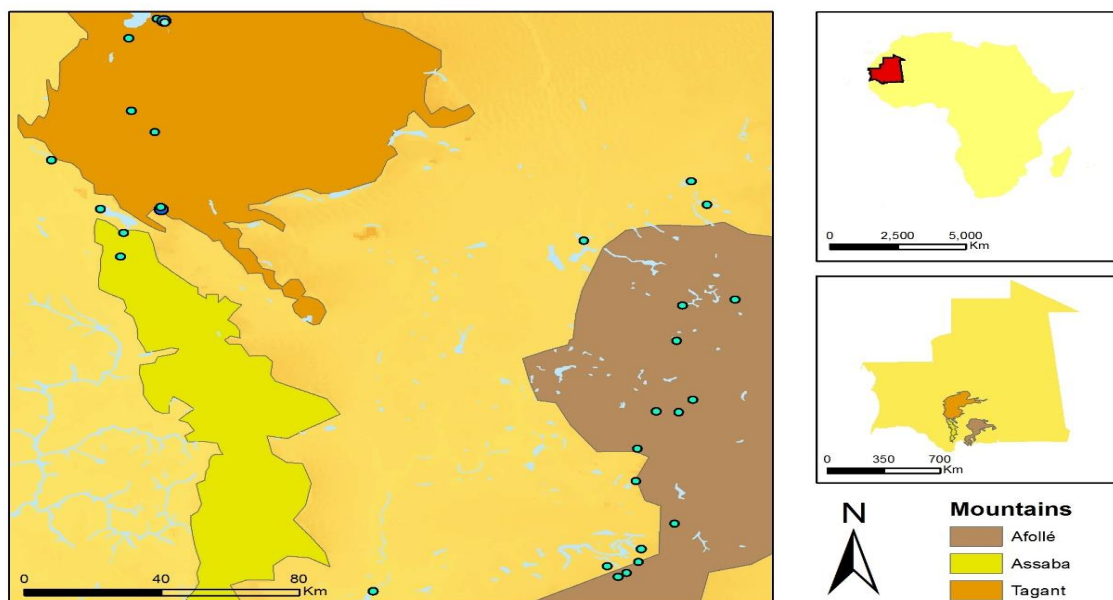


Figure 1. The location of the 30 Mauritanian waterbodies where biological, environmental, and cultural data were collected.

Note that due to the lack of cultural features (rock-art, ancient buildings, etc.) near the waterbodies accessed, we have to drop out those variables and adapt. Thus, we considered other anthropogenic variables that may affect the ecotourism potential of a site.

Table 1. Biological, environmental and anthropogenic variables collected in each of the 30 waterbodies.

Type	Variable	Description	Units
Biological	Number of Crocodiles	Maximum number of crocodiles detected or reported in a waterbody	N
	Number of Birds	Maximum number of bird species detected in a waterbody	N
Environmental	Area	Surface area of waterbody	m <sup>2</sup>
	Landscape heterogeneity in the waterbody	Standard deviation of slope surrounding waterbody (1x1km window); slope derived from altitude	Degrees
	Water availability	NDWI	--
	Vegetation Productivity	NDVI	--
	Distance to nearest waterbody	Euclidean distance from waterbody to the nearest waterbody	m
	Waterfall	Presence of waterfall within waterbody surrounding (1x1km window)	0 - absence; 1 - presence
	Canyon	Presence of canyon within waterbody surrounding (1x1km window)	0 - absence; 1 - presence
	Waterbody heterogeneity	Number of land-cover categories surrounding waterbody (1x1km window)	N
	Landscape heterogeneity from the road to waterbodies	Number of land-cover categories from nearest paved road to waterbody (1x1km window)	N
Anthropogenic	Walking accessibility	Walking time to access the waterbody	0 - 0min; 1 - walk <5min; 2 - walk >5min
	Vehicle accessibility	Road category to access the waterbody	0 - paved road; 1 - unpaved road; 2 - off-road
	Distance to roads	Distance from waterbody to nearest paved road	m
	Distance to infrastructures	Distance from waterbody to nearest support infrastructures (hospitals, hotels, restaurants)	m
	Water quality	Water quality level	0 - eutrophicated and turbid; 1 - not-eutrophicated and turbid; 2 - not-eutrophicated and clean
	Vegetation preservation	Preservation of ethnographic elements in the nearest village of waterbody	0 - unpreserved; 1 - preserved
	Habitat intactness	Presence of shrubby and herbaceous vegetation in waterbody	0 - absence; 1 - presence
	Number of threats	Number of The International Union for Conservation of Nature (IUCN) threat factors categories	N

### Bird and macroinvertebrate species databases:

We collected 1076 bird records along the road and in the 30 waterbodies, many of which contributed to update the known distribution of some species in Mauritania. These records are now being properly mapped and we intend to publish a paper in an ornithology scientific journal and collaborate in updating the Atlas of the birds of Mauritania project (<http://atlasornmau.org/>).

All the macroinvertebrate records that we collected in waterbodies are not new to Mauritania, but represent an important update of the distribution of many species. Colleagues from our Research Center (CIBIO/InBIO – Research Center in Biodiversity and Genetic Resources) are currently identifying all the specimens we collected/photographed in the field to check for important distribution updating data.

### Economic value of the West-African crocodile for ecotourism:

Tourism in Mauritania is now in its lowest levels ever (Euromonitor International, 2016). We noted this during the research expedition, having recorded no tourists in any of the 30 sites we have visited. Even at the country borders we saw international tourists desiring to cross the country only to reach Senegal, with no one staying in Mauritania or visiting its natural environments.

Due to this fact the inquiries that would be developed in the field had to be dropped down, and now we are fine tuning the online inquiries. We plan to make them available in early May.

### Waterbodies ecotourism potential:

We have already performed a multivariate analysis (through a Principal Component ordinate Analysis, PCoA) and used a decision support tool (Zonation v4.0; Moilanen *et al.*, 2012) to hierarchize the 30 waterbodies to develop ecotourism. We found that all the variables chosen explain the ecotourism potential of a site independently – i.e., they are not correlated – thus being perfect for ecotourism model designs. Our methodology is novel and proved to work well in identifying the best places for ecotourism purposes.

A manuscript is being prepared to be submitted soon to a top-leading journal in tourism research – *Tourism Management*.

## **Outcomes:**

I published already a paper concerning to desert ecotourism and collaborated in the preparation of many others to which we will acknowledge the Rufford Foundation financial support. I show some examples under. Note that to the title of the paper it follows the scientific journal where it is published, under review or to be submitted to. You can see a copy of the published paper in the Appendix A (please refer to <http://www.sciencedirect.com/science/article/pii/S2211973615000768> for the complete version).

### Published:

- Conserving desert biodiversity through ecotourism; *Tourism Management Perspectives*.

### Under review:

- Update of distribution, habitats, population size, and threat factors for the West African Crocodile in Mauritania; *Amphibia-Reptilia*.

### Being prepared:

- New method to assess sites' ecotourism potential: A case study with Mauritanian wetlands; *Tourism Management*.
- Economic evaluation of the West-African crocodile for ecotourism; *Ecological Economics*.
- Updating distribution data for Mauritanian birds; *Ostrich*.

## **Bibliography**

Euromonitor International (2016) *Travel and tourism in Mauritania: Country report*. Accessed in <http://www.euromonitor.com/travel-and-tourism-in-mauritania/report> in 23-04-2016.

Moilanen, A., Montesino Pouzols, F., Meller, L., Veatch, V., Arponen, A., Leppänen, J. and Kujala, H. (2012). *Zonation: Spatial conservation planning methods and software v. 4*. User manual, 290 pp. ISBN 978-952-10-9920-5 (PDF).