

## 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](mailto:jane@rufford.org).

Thank you for your help.

**Josh Cole, Grants Director**

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Grant Recipient Details	
<b>Your name</b>	Henry Nibam Abi
<b>Project title</b>	Beach patrols for marine turtle nesting stock estimation in the Atlantic coastline of Ebodje, Cameroon
<b>RSG reference</b>	23716-2
<b>Reporting period</b>	2018-2019
<b>Amount of grant</b>	£ 5,000
<b>Your email address</b>	<a href="mailto:henrynabi@yahoo.com">henrynabi@yahoo.com</a>
<b>Date of this report</b>	March 2019

**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
Monitoring of nesting activity				Further work is necessary to better understand nesting seasonality in the face of stressors
Monitoring of sand temperatures in the nesting habitat				Delayed deployment of equipment in the field owing to slow customs delivery / omission of some materials to Cameroon. This was compounded by the slow renovation work to complete change the old roofing of our 'Turtle House' serving as our office / museum. The pluviometer was used as it was planned to be attached on the rooftop of the office.
Capacity building of local communities and institutions				<p>Further work is necessary to increase outreach to a larger portion of the fishing community in some distant villages and engage turtle poachers.</p> <p>The alternative livelihood project was established as locals were drilled in the use of improved seeds for their agricultural food crop farming; maize, cassava and plantain. Through a workshop, about 250 villagers were encouraged to practice food crop farming alongside fishing.</p>
Environmental education/awareness				Over 150 individuals, comprising school children/students, were reached through education/awareness programmes. They were introduced to a wide array of environmental conservation issues concerning marine turtles; sandy beach conservation, plastic and chemical pollution, waste management, and turtle poaching and bycatch. Other activities included student art work and book distribution, question and answer sessions and beach clean ups.

				Also, we carried media sensitisation through the radio. An interview was granted me about the plight of conserving marine turtles in Cameroon. This was done in Ebodje by of journalist of CRTV Littoral and later re-broadcasted via their weekly environmental program; <i>Echo Environmentale</i> .
Beach cleaning activities				This involved the purchasing/hiring of the following items to cut-off fallen trees on the beaches caused by erosion as a result of an unprecedented sea level rise (global warming); rake, hand glove, rope, spade, cutlasses and engine-saw. We also supported feeding and allowances to volunteers.  Also, amount supported the creation / rehabilitation work of a new hatchery at the start of the nesting season to improve on species incubation success and duration.
Data processing and Report production				Complete data captured by the various data loggers deployed into nests will be validated and uploaded to a database by the end of May 2019.

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

Fluctuations of the West Africa monsoon caused significant changes of the regional atmospheric circulation which adversely affected air and sea surface temperature in the area. This resulted to shifts in the South West Guinea monsoon that increased the dryness of the sand used in covering the species nests.

Also, the increase sea level rise experienced during the season caused increase wave action coupled with a particularly high tide event to extensively washover and washout the beaches. This caused some serious erosion which had to narrow certain beach profiles, hence resulted to some nests being washed out or needed to be re-established.

Though still ongoing, the research to estimate sex ratio of the rookery is faced with the challenge to examine increase embryo mortality, and dead hatchlings found in most nests especially those in the hatchery. Identification of highly skewed hatchling sex ratios might be difficult as species had long-term incubation temperature data.

This is further compounded by the lack of distinct morphological differences in hatchling sexes. Hence, decrease in hatching success.

Conventional data loggers were typically deployed to study nest / sand incubation temperatures that would later be downloaded for offline analysis. This meant a delay between data collection and data analysis, with detrimental effects on the flexibility of the research timeframe.

Incubation temperatures influences incubation duration, hatchling sex ratio, emergence, embryonic growth, phenotype and recruitment into a population. The use of a datalogger in this study was one way to provide these, but there were some associated disadvantages. Dependence on a single piece of equipment was a drawback in isolated places. In more open / accessible beaches there was a risk of theft.

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

1. During the nesting season of 2018/2019, the locations of 82 nests distributed along the beaches in the Atlantic coastline of Ebodje were marked with GPS. This number of nests produced 2,488 eggs which were either transplanted to the hatchery and in-situ owing to predation and erosion reasons. 17.67% of nests (15 nests) which provided 1,453 eggs were transplanted to the hatchery. Most nests were near to some type of vegetation; tree, bush and low lying vegetation (74%), on open beach (16%), and 11% of nests were a bit closer to the sea.
2. In the marine space adjacent to the coastal beaches, we generated a graph showing monthly variability of sea surface temperature (SST) against species number of nest / mean incubation duration during the nesting season from 2010 – 2019. SST was used as an orientation cue by sea turtles; it showed a correlation with the length of the nesting season and the inter-nesting period. There were significant differences in hatching success among nesting seasons. Thus, the anthropogenic global warming influenced the viability of the species nests.
3. Seven Electronic HOBO TidbiT v2 UTBI-001 temperature data loggers were successively deployed for a number of months now on the nesting beaches in *Ebodje, Likodo, Mbenji* and *Campo*, and in hatcheries of Ebodje and Campo to measure sand temperatures at 35 cm (average nest depth of olive ridley) and 75 cm (average nest depth of leatherback) at 1 hr intervals. Also, control data logger was placed to monitor sand temperature along the beaches and in hatcheries. These temperature recording instruments can record temperature continuously for up to 5 yrs. However, for the purpose of this study, we shall collect sand temperature data until May 2019. Temperature data loggers were deployed at various times and locations at the different rookeries to monitor long-term data in the nesting habitat.

By the end of May 2019, we will be able to collect sufficient information in order to deepen our understanding of this population; namely we will be able to estimate the pivotal temperature (temperature at which the sex-ratio is balanced), allowing us to predict the expected sex ratio in the current conditions and model future sex ratios under different climate change scenarios e.g. sea surface temperature (SST).

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

Eight young men and women from the local communities collaborated in the project during the nesting season, and were paid a stipend for the time of collaboration. One of the collaborators we trained has joined our staff as a full-time field assistant.

Also, we worked with young men from the distant villages of Mbondo and Campo, located in the far south of Ebodje. The number of collaborators added increased our human capacity from six to 14. Each of these young men participated in all the research and conservation activities in local village communities for the duration of the nesting season, and was given a stipend and material support to carry out patrols. They were trained in all the field work and sampling techniques and in evening gatherings we would talk about the biology and conservation of sea turtles, problems of poaching, and others that concern their way of living. We equally involve the neighbouring village communities in celebration marking the World Environment Day 2018; chiefs, notables, administrative heads and others were invited. This went a long way to improve management decisions and reduce conflict.

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

Yes. Marine turtle rookery in the Ebodje nesting zone is of regional importance and this project; sand incubation temperature monitoring is very valuable parameter to better understand the status of this population by determining the species hatchling sex, developmental time, size, mass, amount of yolk content and locomotor performance for hatchlings. However there are key questions that remain to be addressed, such as: 1) How other ecological variables; air temperatures, rainfall, relative amount of vegetation cover, and beach sand albedo also correlate with changes in sand temperatures at nest depth and/or turtle hatchling sex ratios?; and 2) What are the links between each variable?; which we hope to address in the near future in order to reconstruct historical sex ratio estimates, thereby enhancing the overall sex ratio information for a population.

Yes, this work is ongoing and baseline data will be collected until 2020. Once the baseline data has been reviewed and analysed (as part of my PhD thesis) the next stage of the project will be to actively implement some of the management option and conservation activities deemed suitable.

Additionally, the research and conservation of turtles in Cameroon is in its infancy. Sea turtles still face a multitude of threats and local pressures; we will continue to work towards achieving a greater conservation status for sea turtle in the country. Ideally we plan to have a time series analysis on the effect of the variability of the various environmental constraints on the species population.

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

- I. We have a planned impacting workshop in March/April 2019 on the “The provision of alternative livelihood for local residents in the 10 neighbouring villages to Ebodje”. I will present some of the results of this project during the training workshop.
- II. As in the previous year, I prepared a technical report on my PhD programme to the University of Valencia, Spain and the Russels E. Train Fellowship (USA), for them to compile the achievements of this project in order to present my results board meetings.
- III. With the data gathered through this project, in 2018 - 2019, further scientific work and a news report on the first ever occurrence of loggerhead turtle, *Caretta caretta* will be published, on the African Sea Turtle Newsletter, including key individuals from our community-based association; Tube Awu as co-author.
- IV. All presentations, articles, newsletter and dissertation that will originate from this work will be promoted in the social media through twitter, Facebook and press releases.

#### **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 actual length proposed for the project was 12 months, which included 1 month of preparation for field work, 6 months of the field work (establishment of protection camps in the five beaches and beach patrols), placement of data-loggers and continuous monitoring (6 months), recovery of data-loggers, data download and analysis (2 months), 1 month for statistical analyses, writing and presenting results, and 1 month for monitoring / evaluation.

I travelled to the University of Valencia (Spain), to undergo an important training on the use of use of temperature data loggers. During the time, the 2017/2018 nesting season was about ending and my supervisor advised me to only begin field deployment in October 2018 (start of the nesting season). Also, I had to experience a delay in the posting of certain accessories for the loggers (from Spain to Cameroon). This caused a delay in the deployment of the data loggers in the field sites. Hence, upon the advices from supervisors, I took the opportunity to extend some activities proposed within this project on cost-free. Therefore the RSG was used for a period of 14/15 months.

**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
<b>Personnel subsistence</b> – Overnight /Day survey (patrolmen / field assistants / volunteers) + Sand incubation temperature survey + Rehabilitation /Hygiene /Maintenance of Hatchery & Maison de Ndiva	1,300	1,500	-200	We extended the morning patrols of marine turtle nesting beaches to distant sites e.g. Campo beach, and to stop species poaching. A monitor received extra subsistence payment for this task, which proved to be successful in stopping the poaching. Also, additional resources invested on the building on shades over the hatcheries (both in Ebodje and Campo) to prevent increased heat from the sun.
<b>Transportation-</b> Local travel (to / fro fieldsites and networking (1 year) a) Car hire (Intersite surveys) b) Car driver c) Fuel d) Vehicle / motor-bike in-kind	1,900	1,900	0	
<b>Food</b> (7 persons at fieldsite and neighboring coastal villages)	1,000	1,500	-500	Additional cost supported the feeding of monitors in distant villages
<b>Equipment-</b> a) Computer (1 piece)	350	450	-100	Extra cost (from co-funding) supported the provision of a GPS device and digital camera for Felix
<b>Stationeries:</b> note book, pens, questionnaire form, internet, phone call, printing forms, clipboard, pencils, printing, photocopying, generator hire, reports	250	300	-50	Extra support came from co-funding to provide external hard-drive and memory cards for Nestor's laptop and Camera
<b>Project administration and reports production</b> (Write-ups, progress and annual reports)	200	200	0	
<b>TOTAL</b>	<b>5,000</b>	<b>5,850</b>	<b>-850</b>	

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

- In order to understand if nesting seasonality is shifting at the sites in the Ebodje nest zone, monitoring programmes will continuously be implemented to better understand the different nesting season. Improve monitoring protocols at distant beaches where marine turtles also nest to increase protection and get important data on the nesting success and habitat availability.
- Complete manuscripts to be published in peer-reviewed scientific journals to further disseminate results of this project.
- To continue monitoring and protecting nesting sea turtles and nests from poachers.
- To continue to promote sea turtle and ecosystem conservation through teaching and conservation activities with local children/students, and more outreach, education and alternative livelihood workshops with the fishermen in order to foster the next generation of conservationists among the local population.
- Before the start of this project, we lacked pre-project data that could have been used as a baseline to compare impacts during and after the project. Therefore, we hope to continue the ongoing monitoring of sand and nest temperatures, as a means to both continue assessing post-project impacts (e.g. temperature, rainfall, shade, nourishment, etc) on sea turtle reproduction, and constitute a baseline against which to assess impacts of future projects.
- To expand on the results from this study, a temperature projection will be modelled to assess how sand temperature might change in the future under various IPCC climate change scenarios. Other studies have used sea surface temperature (SST) as a proxy for sand temperature. Derived air temperature data could also be used to create the projection in the Ebodje nesting zone. In addition, for future studies I would suggest deploying air temperature loggers during the duration of the study, and all HOBO temperature loggers will be calibrated prior to the study.
- Research on how temperature influences the phenotype of turtles need lots of consideration of thermal fluctuations. These studies should be done using parameters that mimic temperature fluctuations from the field. Understanding the mechanism of TSD and how it can adapt over time would provide key insight into how thermally-sensitive species respond to the impacts of climate change. In order to conserve and protect sea turtles in Ebodje, much more information is needed on the local populations. This includes movement patterns, sex ratios, pivotal temperature, transitional range, thermal thresholds, etc. A continuation of our tagging activities will provide information on nesting sites, key foraging areas, and migratory routes, all of which is crucial to understand in order to implement policies to protect turtles within the soon to be created MPA in the region.

- High priority will be given to study the important nesting habitats in the area; *Ipenendjé, Ilale Motto, Likodo, Ebodjé, Mbendji, Pandé, Bouandjo*, which could potentially be a refuge from the effects of climate change in the future. The cool temperatures and sex ratio prediction mean that this could be an important nesting region for the survival of the turtle species. In addition, this area will undergo a massive transformation in the advent of the soon to be created MPA in the area.
- Also, it would be useful to compare other attributes that may affect hatchling survival, such as growth rate and prolonged swimming performance between hatchlings with the modal scute pattern and hatchlings with non-modal scute patterns. These factors may explain differences in the proportion of turtles with non-modal scute patterns as adults and hatchlings, because selection may be occurring after the first few hours. It would also be useful to investigate the proportion of turtles with the modal scute pattern at the different life stages between hatchling and breeding adult. Another potential avenue of research would be to dissect the hatchlings to determine whether non-modal scute patterns are indicative of abnormalities in the internal anatomy of hatchlings with non-modal scute patterns.

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

The RF logo appeared in every document printed for workshop purposes and in every PowerPoint presentation shown in local schools and training courses. All the correspondent letterheads, certificate of participation and personal ID cards that we gave out carried the WWF's Russell E. Train and Rufford logo amongst others. RSGF logo was inserted / acknowledged in a newsletter prepared for publication in the 'African Sea Turtle Newsletter' and during interview by the "Environmental Programme" of CRTV Radio Douala. Also, I will be inserting the RF logo in all oral presentation related to this study work and in peer reviewed papers in my university and workshops/conferences.

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

**Abi Henry Nibam** (Applied Marine Scientist- PhD candidate/Principal investigator)

**Denis Gnamaloba Moudjel** (Trained marine turtle ecoguard- Field Surveyor/Monitor and Field Coordinator: South Zone)

**Mpinde Felix** (Trained marine turtle ecoguard- Field Surveyor/Monitor and Field Coordinator: North Zone/Hatchery guarding)

**Nestor Kowe** (Field Surveyor/Monitor- South Zone/Hatchery guarding)

**Albert Ndomi** (Field Surveyor/Monitor- Incharge of Far Southern Zone)

**Yannick Besoora** (Field Surveyor/Monitor- Incharge of Campo beaches/hatchery guarding (Further Far South Zone)

**Tchuisseu Njagang Sandrine** (MSc graduate- Field technician/Research assistant)

**Prof. Jesus Tomas**, University of Valencia (Spain): Academic supervisor1

**Dr. Ohiana Revuelta**, University of Valencia (Spain): Academic supervisor2

**Dr. Jacques Fretey** (Expert in endangered marine turtle conservation- Field supervisor)

Field assistants/volunteers (7 persons)

## 12. Any other comments?

We are looking forward to continue to work with The Rufford Foundation. Your assistance has been of great meaning to our Tube Awu Association and most especially a significant contribution to my PhD. I will be adding some selected photos in a more detailed report which will be published soon.

I am very grateful to RF for supporting our research and conservation efforts through sand incubation temperature monitoring in Cameroon which is at its infancy. Without the backing from RF this project would have not occurred. The early data collected will form part of the baseline for sea turtle nest incubation temperature monitoring in Ebodje and is an invaluable foundation for all future research. I look forward to the opportunity share our future conservation successes with the RF and the potential of continued support from RF.



