The Rufford Small Grants Foundation
Final Report

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

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. 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. 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	Abi Henry Nibam
Project title	Evolutionary ecology of marine turtle species in the face of artisanal fishing and climate change
RSG reference	17450-1
Reporting period	June 2015 – May 2016
Amount of grant	£ 5000
Your email address	henrynabi@yahoo.com
Date of this report	May 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
1) **Allowances-** *(patrolmen/field assistants/volunteers)* a) Overnight on-ground nesting monitoring survey			Yes	An average total of 42 turtle nests were recorded/protected in nine nesting beaches; 39 olive ridley turtles, four leatherback turtles and three green turtles climbed up the beaches for nesting, while 12 green turtles, three olive ridley turtles and two hawksbill turtles were bycaught in local artisanal fisheries. The project period registered a new observation in the Ebodje spawning zone, the first ever recorded; Three individual of green turtles successfully nested in the area- two in Ebodje and one in Ipenyendje. We recorded a total of 2766 eggs, coming from 34 clutches; 28 from olive ridley, three from leatherback and three from green turtles were either transplanted to the hatchery or a safe location on the beach for proper follow-up. The continuous presence and conservation work on the nesting beaches by our monitoring teams deterred the poaching activities: three reported poaching incidents were noticed during our follow-up which is relatively low compared to historical data.
b) In-water foraging juvenile green turtle population survey		Yes		Unfavourable weather conditions during the period made it difficult to operate. However, we succeeded to

				identify hotspot areas that will make it easier to continue the surveys in the future. Also, we designed a foraging ground survey protocol in which some prior insights on marine habitat have been evaluated to assist future research. Part of the funds for in-water surveys were diverted to support the unprecedented task of cleaning beaches.
c) Rehabilitation /Hygiene/*Maintenance of* Hatchery and Maison Ndiva – Turtle House (Office)			Yes	Amount also supported the annual rehabilitation work in the hatchery- usually at the start of the nesting season to improve on species incubation success and duration. Other costs were incurred to regularly keep the office and its surrounding clean.
2) **Environmental education/awareness** *(local fishermen, poachers and schools)*			Yes	Over 150 individuals comprising school children/students and community members were reached through education/awareness programmes. Children were introduced to a wide array of environmental conservation issue (marine turtle's biology and ecology, biodiversity, sea grass beds, sandy beach conservation, solid and chemical pollution, waste management). We also discussed dangers of poaching and turtle bycatch, and proposed solutions. Participants were engaged in several activities (children art work, question and answer sessions and beach clean ups). Students, fishers, poachers and other local residents also viewed 1 PowerPoint presentation on these issues and watched projected videos on marine turtle conservation. The amount greatly supported the

				distribution of posters, t-shirts and construction of two metallic signposts in Ebodje village. It fully supported the participation of team members in public celebrations of the World Environment Day. Beach monitoring leaders from each of the 10 neighboring villages were in attendance.
3) **Beach cleaning** activities			Yes	This was a diverted amount in-water surveys that helped in 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. It also support feeding and allowances to volunteers.
4) Student internship training			Yes	This was an innovation that was incorporated into the project activity chart; two master students, one Cameroonian and one French, were successfully trained.

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

The Last Great Ape Organization (LAGA) is an NGO in Cameroon that assist the government in enforcing the 1994 Wildlife Laws. It participates in fighting against corruption within wildlife law/ enforcement personnel, sensitisation, investigations and arrest of wildlife offenders. They are charged with the eradication of corruption in the law enforcement institutions in order to ensure effective enforcement of the 1994 Wildlife Laws, hence contributing to an effective protection of Cameroon's rich biodiversity. Unfortunately, there is a continuous existence of the following enforcement issues: decrees providing protection at a national/local level, yet a shortage of trained personnel; insufficient capacity and funding to implement policies; poor roads and language barriers (by visiting experts who most often does not understand the local *Iyassa* language) all contribute to derisory nationwide enforcement. Many residents are aware that fishing/poaching for turtles are illegal

but are unsure what punishments are. This negatively affected this project as many poached/by-caught species were either unreported or unpunished. To help solve this problem in future, we plan to empower/educate many local marine turtle ecoguards/volunteers with advanced skills through workshops on wildlife laws/enforcement.

Species in-water population data and habitat characterisation at foraging grounds was a daunting task with the use of shaky canoe on roaring waters. Limited coverage of other potential nesting site due to slowness of the canoe was equally a problem. Many potential nesting site were inaccessible due to poor water visibility caused by our choice of month to carry out the surveys. We had no submarine torch light. Accordingly, we plan to use an engine boat or flying boat and other necessary submarine equipment in our next organised in-water research expedition. The team identified two very good swimmers amongst the volunteers who will subsequently be trained in species data collection. Through strict guidance by the team leader, they will occasionally be going to the foraging areas to carry out research work. Interesting is the fact that, records of species were made at that site.

It was also observed that the vulnerability of turtle species to threats were attributed to the following in most of the residents; lack of scientific knowledge, local family dependent on direct harvest of the species, lack of will to conserve the species, little or no turtle facilities, education centre and local community involvement. Also, the direct hunting and incidental capture of the globally important marine turtle species in the region are understudied. There have never been any proper capacity building trainings for rural communities. For instance, responsible fishing training that will help in the collection of biological data on the by-caught species. Hence sustainably controlling the fishing technology/gears of fishers, thereby reducing marine turtle bycatch. This and many other important trainings are in our in our plan to contribute in achieving a lasting conservation of the species. Hence, there will be an exit strategies for fishers; adult education and training in alternative livelihoods (e.g. piggery, poultry and beekeeping) to promote self-fulfillment of rural young people, to develop entrepreneurship spirit and to encourage personal risk and initiative taking. This will indirectly provide institutional integration; building a network connecting rural communities with local, national and international institutions.

An unprecedented sea level rise due to global warming caused serious beach erosion and degradation, which washed away turtle nests and decreased nesting habitat in the longer term. This resulted to a lot of falling off of beach vegetations, thus obstructing turtle climbs on beaches. We plan to continue with regular beach

cleaning activities and instituting climate change adaptation measures such as building of sea walls. This will be carried out at the start of each nesting season.

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

Olive ridley turtles was the highest number (39 individuals) of species climbing the beaches while juvenile green turtles (13 individuals) was the most bycaught species in artisanal fisheries. The different species showed variability in size with leatherback turtles being largest when compared to the carapace length of olive ridley, green and hawksbill in order to accommodate clutches of single, relatively large eggs. The number of eggs per nest correlated with species size. The mean carapace size did not very much differ from the sizes of other nesting populations around the world. No significant changes were found compared to previous years of surveyed data. Average size of the species and its egg size are expected to decrease with increasing environmental stressors. Large eggs may be required to produce large hatchlings capable of surviving the harsh environment. Increased temperature and sea level rise during the project period negatively influenced nesting phenology (reproductive phenology), incubation success and incubation duration. This was indicative when some of the transplanted eggs in the hatchery got rotten. This information is beginning to provide a clue on the species nesting, juvenile habitat usage, early life history strategies and migratory pattern that will have direct applications to marine management and policy interventions, and future research projects.

Through education and awareness, there has been an easy mobilisation of resident volunteers in beach cleaning activities in the area. This is one thing that did not exist if not for the project. Many fishers who participated in beach cleaning exercises were compensated with offers of free firewood to help smoke their fish. The school pupils, students and the entire village communities reached by the project were actively involved in environmental lectures and PowerPoint presentations. Teachers, pupils, fishers, poachers and other local community members attended organised film shows and lectures together thus building relationships among local residents of different classes. The metallic signpost raised thanks to funds from the project attracted the attention many tourists to the Ebodje village. One of the most remarkable visitor was that of a passer-by of high personality; Vice-Consul, British High Commission, Yaounde, Cameroon who made a brief stopover in our office. As a consequence from this visit, three of our team members were invited to take part in an event; "Conservation of Fauna and Forests in Cameroon" at the Consul residence of the British High Commission, Yaounde. This further resulted to our physical interaction/network with several stakeholders, government policy makers

and ambassadors. Our discussion attracted the attention of some of these potential partners who are promising to link our work to possible funding sources.

Within our project timeframe, the Principal Investigator (PI) also stood as co-supervisor to a french student on internship with our association. Student- ''*Master M1 Sciences Pour l'Environnement, parcours écologie littorale, Université de la Rochelle, France pour l'année scolaire 2014-2015''*. As co-supervisor, the PI organised sessions with student on in-water survey design, several field training on index foraging habitat survey; snorkeling strip transect turtle counts and capture–mark–recapture (CMR) methods, species capture by tangle net, helped student on how to effectively apply ESRI ArcGIS tools, ocean colour remote sensing and other geospatial applications. Also, index calculation to estimate the catch per unit effort (CPUE) was introduced to student. As an outcome from the internship, the student delivered a report titled ''*Etude des aires de croissance des tortues vertes juvéniles Chelonia mydas et enquêtes sur les pêcheries artisanales sur les côtes atlantique d'Ebodje, Cameroun*''. (Study of juvenile green turtle (*Chelonia mydas*) in foraging grounds and an assessment of artisanal fisheries in the Atlantic coastline of Ebodje, Cameroon). The full protocol of *In-water* inventory that is developed will greatly assists us in our future in-water research on turtle population surveys in foraging grounds.

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

A positive outcome of this project is the participation and involvement of local residents especially as volunteers. This project has been well accepted and has received the necessary attention towards sustainable environmental development. The project has increased the understanding of locals on marine turtle conservation and habitat protection and also helped influence local communities action through supporting our efforts by volunteering. Changing the perceptions and attitudes of the local community towards the plight of turtles is actually a score that this project realised. As a result, the project saw a positive outcome in reducing the numbers of turtle bycatch thanks to aggressive sensitisation and participation of fishermen in the area. Also, there is a decline in poaching activities when quantitatively comparing the present poaching activities for this project period with those in the late 1990s and early 2000s. More residents are beginning to understand that the harvesting of marine turtle eggs, marine turtles and its products is illegal. Hence, saving more live marine turtle from poaching. Equally, there was massive turn out of fishermen families during beach cleaning exercises whose actions were compensated by offers of free gift of wood to help them smoke their fishes.

5. Are there any plans to continue this work?

Yes, this work is ongoing, and the annual data will continuously be collected until 2018 in order to obtain a longer time series data collection that will provide credible life-history models. Once the data has been reviewed an analysed (as part of my PhD thesis) the next stage of the project will be to actively implement some of the management and conservation strategies by policy makers; limit entry location programs for fishing, fishing gear restrictions, size limits and season closures.

In-water research on marine turtles in Cameroon is in its infancy. In the past, most research efforts in the Atlantic coastline of the South Region, Cameroon and Gulf of Guinea have been concentrating on nesting monitoring of species population (on-ground survey). The developmental, foraging habitats and migratory routes of most population have not yet been fully identified. Integrated knowledge of the different habitats used by individuals within a marine turtle population is indispensable when elaborating conservation programmes. Marine turtles are still faced with a multitude of threats and local pressures. Conservation efforts in the Gulf of Guinea are crucial due to these serious anthropogenic pressures threatening population survival and the likelihood for having a population belonging to this regionally important area. We will continue to work towards achieving a greater conservation status for marine turtle in country.

According to findings by international researchers in analysing green turtle satellite tracking data from around the world. Interestingly, it is found that a notable proportion of turtles are utilising the small proportion of the marine space with limited threats. This does not seem to have happened by chance, and may reflect the fact that these areas are better protected, or that sea grasses, which green turtles eat, need to feature within any future Marine Protected Areas (MPAs) like the case of the future MPA in Kribi. Our future research plan will seek for a comprehensive assessment on the evolutionary adaptation of the species faced with variable environmental stressors. Combining efforts of protecting nesting marine turtles with an assessment of their foraging grounds, will help address imbalances of knowledge concerning the species ecology. This will assist in providing more insights on the species' evolutionary mechanisms. Research on marine turtles in this location is largely limited to regular surveys on nesting beaches; factors e.g. abundance, habitat use, connectivity, and threats meanwhile the impacts on foraging grounds has never been explored. Hence a need for a comprehensive assessment in order to optimize the species protection. This will advance the understanding in the trend at which the ecology of marine turtles change with time in the face of arid

environment in order to facilitate conservation efforts. Generally, our future project will continue to seek for greater involvement of local coastal communities in all aspects of research, monitoring, conservation and capacity building work in marine turtle protection.

Ideally we plan to:

- Continue conducting on-ground nesting monitoring surveys on the coastal beaches.
- Carry out in-water population survey of juvenile green turtles in foraging grounds in order to assess their distribution, abundance and habitat use.
- Carry out capacity building workshop in local communities on wildlife laws/enforcement, ecotourism, alternative livelihood, responsible fishing and organizational development to better contribute to research and conservation of turtles.
- Increase environmental awareness, knowledge, management and conservation of turtle populations.
- Carry out regular beach clean-up activities that will help pave the path for nesting turtles without any hurdle in movement.
- Help train both national and international university students on internship.
- Supporting Chélonée (France) in the lobbying for the creation of the first ever Marine National Park in Cameroon; office work and technical field actions are currently with the Government of Cameroon via the Ministry of Forestry and Wildlife (MINFOF).
- Support the maintenance of the "*Ndiva House*" (our research station) and hatcheries in good running order. For instance, construction of informative notice boards to assist tourists.
- Carry out genetic analysis of samples (especially those killed by poachers and by-caught by fishers). This is expected to clearly reveal novel aspects of green turtle juveniles" migration. This will give understanding of the demographic events shaping the population structure and functioning across the different locations in the area through the use of neutral/adaptive genetic markers.
- Satellite tracking and the application of remote sensing of ocean color in their pelagic environment. This is expected to reveals the species movement, behavior, and distribution that will help elucidate potential areas for mitigating fisheries bycatch interactions, and give insights on mating grounds. This information will give a significant contribution in elaborating management and conservation plan for the species.

As it has been in our ongoing project, we shall continuously involve community members to take part in monitoring and protection of the species, strengthening collaboration with the village eco-tourism association; EBOTOUR. The composition of the training participants of both sexes will include indigenous people, fishermen, poachers, and volunteers. We plan to introduce the Free, Prior, and Informed Consent (FPIC) policies as a managerial weapon in protecting turtle species. All awareness/education campaigns to be implemented in the villages during this project will be through meetings with each chiefdom. Local fishermen and poachers will greatly be involved in the report of nesting turtles thanks to skilled training. Formation of each team responsible for beach cleaning will include local community members / fishermen and their children, volunteers and students. They will ensure that turtle nesting beach-line are cleaned from all debris including falling trees. Meetings involving fishermen will be organized encouraged and promoted and be attended by trained association's ecoguards and/or any invited wildlife officer to enhance the conservation of marine turtle.

We plan to continue the work in two ways. Firstly, we will continue to utilise our research team formed inorder to ensure the conservation and biological importance of the Atlantic coastline of Ebodje that promotes the recovery of species population. The result will indicate to what extent nesting/growing turtles contribute towards the protection of endangered species population. Secondly, we will continue to strengthen this marine turtle conservation programme in the Ebodje spawning zone through networking with other partners/stakeholders to ensure that 20 km coastline stretch from Ebodje upto the soon to be created marine protected area in Kribi, South Region.

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

The results from this project will be an opportunity to add value to my research career, and identify answers to important questions relevant to marine turtle management policies. Infact, a part of the result was shared during an audience at the Prime Ministry in the Government of Cameroon held in Yaounde on the 29th April, 2016. I reiterated the need to stop environmental damage observed in the south of the deep water port of Kribi whose ongoing construction has already been causing destruction of some important nesting beaches of marine turtles. Hence the need to create the much awaited "*Manyangue na Elombo Campo*" Marine National Park. In as much as my results will be published in my PhD thesis, I also plan to publish results in high impact factor articles in peer-reviewed journals that will be cited. I envisaged sharing these results through workshops, conferences, seminars and symposiums. The categories of target audience to be reached will include:

administrative decision-makers, local community stakeholders, conservation leaders and NGOs, schools, academic research community, and the Department of Wildlife and Protected Area in the Ministry of Forestry and Wildlife (MINFOF), Government of Cameroon. Also, results will be communicated to key stakeholders such as local fishermen, social and cultural movements and local / national / international organizations to support the protection strategies of marine turtles.

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

The RSG was used during the entire period of 1 year of the project from June 2015 to May 2016. Thus this was in line with the proposed time schedule. Most of the activities were concentrated around the nesting season of the turtle species (October to March).

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**
Allowances- Overnight survey *(patrolmen/field assistants/volunteers)* + **In-water survey** + Rehabilitation /Hygiene/*Maintenance of* ***Hatchery & Maison Ndiva*** (Office)	1400	1700	-300	We extended the morning patrols of marine turtle nesting beaches to distant sites like Campo beach, to stop a rampant poaching of turtle eggs, meat and shells. A monitor received extra subsistence payment for this task, which proved to be successful in stopping the poaching. Also, additional resources invested on student interns came from diverted funds from limited in-water survey activities.
Transportation *Car rental (Intersite*	900	900	0	

surveys at neritic and oceanic stages)				
Boat rental for oceanic surveys	782	350	+432	Although the objective could not be fully achieved, extremely difficult field conditions (bad weather) pushed boat owners to increase hiring prices during the few trips in the ocean. Balance fund supported other activities
Car/Boat fuel for neritic and oceanic transport	950	750	+200	Limited activities at sea, thus less fuel consumption.
Boat driver	285	130	+155	Although the full objective could not be achieved, we made inventory trips in the ocean. Balance fund supported other activities
Environmental education/awareness *(local fishermen, poachers and schools)*	200	400	-200	Additional cost was covered with funds donated by CHEC Cameroon
Beach cleaning activities (10 beaches)		450		Invested resources came from diverted funds from limited in-water survey activities
Personal field gears: backpack, sunscreen, water, pruning shears to clear beach vegetation, maps, mosquitoes' repellent, towel, plastic bag etc	100	200	-100	Two rechargeable lamps were needed for the night patrols. Also, the battery and charger of a team member's laptop was bought. The extra cost was covered from self funding. Felix was provided with a new mobile phone after his phone mistakenly dropped into water.
Stationaries: *note book, pens, questionnaire form, internet, phone call, printing forms, clipboard, pencils, printing, photocopying, generator hire, RSGF report production etc*	383	457	-60	Extra support came from self funding especially the repairing of Felix's laptop
TOTAL	**5,000**	**5,337**	**127**	RSG's amount was $5,000

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

- To better carry out research on growth estimation of species during nesting monitoring survey, this study will also be introducing measurement of body mass of species to add to ongoing calculations of species carapace length. This will assist in formulating models on the age-at-maturity for the species.
- We will continue to look for answers on how oceanographic conditions influence migration and reproductive phenology of species. Environmental data will be used to investigate how variability in oceanic processes influences migratory routes and phenology.
- To strengthen the engagement of local communities, particularly distant villages where nest poaching and by-caught turtles often go unreported especially during nesting season. This will help to continuously reduce marine turtle mortality both on beaches and foraging habitats.
- To strengthen research and monitoring of juvenile green turtles in foraging habitats.
- To engage in outreach and education activities in all the 10 coastal village communities along the 20 km stretch from Kribi to Campo particularly during the nesting season.
- To carry out capacity building trainings on wildlife laws/ enforcement.
- To secure funding for marine turtle conservation and management. We will continue our appeal for a second RSGF as well as submitting application to other funders to ensure a continuation of our current work

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

Yes, RSGF logo was used both on the Midterm report produced and on each of the two metallic sign board that were constructed in the Ebodje village. Also, RSGF logo has been used in our presentations during meetings and letter-heads.

11. Any other comments?

I am very grateful to RSG for supporting this research on endangered marine turtle conservation in a data deficient country; Cameroon. Without the financial support from RSG this project would not have occurred. This data will form part of the baseline for marine turtle research in Cameroon and will provide an invaluable contribution towards future conservation research. Thank you very much for this support that has impacted the thoughts, behaviour and attitudes of locals. I look

forward to opportunities of sharing our conservation strategies with the RSGF and possibly benefit from your continued support.