# 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 jane@rufford.org.

Thank you for your help.

**Josh Cole, Grants Director**

| **Grant Recipient Details** | |
|---|---|
| **Your name** | Michael Joseph Liles |
| **Project title** | Blood values and heavy metal accumulation in hawksbill turtles in El Salvador |
| **RSG reference** | 13554-2 |
| **Reporting period** | May 2013 – March 2014 |
| **Amount of grant** | £5931 |
| **Your email address** | mliles@gmail.com |
| **Date of this report** | April 1, 2014 |

**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 |
|---|---|---|---|---|
| Determine baseline blood chemistry values and heavy metal accumulation | | | X | |
| Strengthen technical capacity of local students via participatory research | | | X | |

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

Obtaining the materials necessary to complete the study was more difficult than anticipated, particularly a container for liquid nitrogen, vacutainer tubes (red top) containing coagulants for serum, and a centrifuge. Because of our close collaboration with the University of El Salvador, we were able to borrow a liquid nitrogen container and professors were able to contact local hospitals to secure enough vacutainer tubes for our study. We ended up having to purchase a field centrifuge, which we will continue to use in future studies.

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

1) We determined the baseline blood chemistry profiles and heavy metal concentrations of nesting hawksbills in Bahia de Jiquilisco, El Salvador (Tables 1-3). These values are invaluable for providing an indication of the overall health of a wild population, for measuring the health of a population over time, for comparing the health of populations, and for use as prognostic indicators for individual health assessments (Deem et al. 2009).

**Table 1. Hematologic values in free-ranging hawksbill turtles (*Eretmochelys imbricata*) nesting in Bahia de Jiquilisco, El Salvador in 2013 (n = 28).**

| Measure* | Mean | SD | Range |
|---|---|---|---|
| PCV (%) | 28.3 | 2.7 | 22.0 – 34.0 |
| WBC (X $10^3$/ul) | 6.1 | 2.5 | 3.6 – 16.4 |
| Heterophils (X $10^3$/ul) | 4.2 | 2.2 | 2.2 – 13.5 |
| Lymphocytes (X $10^3$/ul) | 1.3 | 0.6 | 0.2 – 2.7 |
| Monocytes (X $10^3$/ul) | 0.4 | 0.2 | 0.1 – 1.0 |
| Basophils (X $10^3$/ul) | 0.2 | 0.1 | 0.0 – 0.6 |
| Eosinophils (X $10^3$/ul) | 0.0 | 0.1 | 0.0 – 0.3 |

*PCV, packed cell volume; WBC, white blood cells.

**Table 2. Biochemistry values in free-ranging hawksbill turtles (*Eretmochelys imbricata*) nesting in Bahia de Jiquilisco, El Salvador in 2013 (n = 18).**

| Measure* | Mean | SD | Range |
|---|---|---|---|
| Glucose (mg/dL) | 92.8 | 17.0 | 58.0 – 130.0 |
| AST (U/L) | 40.1 | 13.2 | 19.0 – 66.0 |
| ALT (U/L)[a] | <5.0 | -- | <5.0 – 7.0 |

| | | | |
|---|---|---|---|
| GGT (U/L) | 1.1 | 1.6 | 0.0 – 7.0 |
| ALP (U/L) | 43.2 | 12.1 | 18.0 – 67.0 |
| CK (U/L) | 377.8 | 285.2 | 155.0 – 1187.0 |
| LDH (U/L) | 580.5 | 401.2 | 108.0 – 1913.0 |
| Cholesterol (mg/dL) | 247.1 | 67.6 | 121.0 – 391.0 |
| TP (g/dL) | 3.3 | 0.5 | 2.6 – 4.3 |
| Phosphorus (mg/dL) | 9.8 | 3.2 | 5.0 – 16.9 |
| Calcium (mg/dL) | 14.4 | 5.6 | 3.3 – 24.3 |
| Sodium (mmol/L) | 152.0 | 2.8 | 148.0 – 157.0 |
| Potassium (mmol/L) | 4.7 | 0.5 | 3.8 – 5.6 |
| Chloride (mmol/L) | 112.9 | 3.4 | 107.0 – 118.0 |
| Bicarbonate (mmol/L) | 21.6 | 6.1 | 5.0 – 32.0 |
| Uric Acid (mg/dL) | 0.1 | 0.4 | 0.0 – 1.8 |
| Anion Gap (mmol/L) | 22.2 | 7.5 | 7.0 – 43.0 |

*AST, aspartate aminotransferase; ALT, alanine aminotransferase; GGT, gamma glutamyl transferase; ALP, alkaline phosphatase; CK, creatine kinase; LDH, lactate dehydrogenase; TP, total protein.
[a]Reporting limit = 5.0 U/L.

**Table 3. Heavy metal values in free-ranging hawksbill turtles (*Eretmochelys imbricata*) nesting in Bahia de Jiquilisco, El Salvador in 2013 (n = 28).**

| Measure | Mean | SD | Range |
|---|---|---|---|
| Arsenic (ppm)* | 0.25 | 0.38 | 0.02 – 2.00 |
| Lead (ppm)[a] | <0.06 | -- | <0.01 – 0.08 |
| Mercury (ppm)* | <0.02 | -- | <0.01 – 0.04 |

*Reporting limit = 0.01 ppm
[a]Reporting limit = 0.05 ppm

2) We helped strengthen the technical capacity of local biology and veterinary students at the University of El Salvador by incorporating nine students into all aspects of project activities. They participated directly in field work, data analyses, and presentation of results.
3) We strengthened the technical capacity of members of the Local Hawksbill Conservation Network by facilitating their involvement in the project. Local community members helped us locate nesting turtles and collect biological data, which further enhanced opportunities for information-sharing, trust-building, and joint-ownership of outcomes.

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

See important outcome #3 above.

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

Yes, we will continue this work at least through 2015 so that we can obtain blood values of female hawksbills over multiple nesting seasons.

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

The local students that participated in this project presented their results to their peers at the University of El Salvador. Additionally, we are preparing a manuscript to be published in an international, peer-reviewed journal. Once published, we will translate the contents into Spanish for local audiences and decision-makers.

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

We used The Rufford Foundation grant from May 2013 through March 2014, which aligned with our anticipated project length.

**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.**
**1 USD = 0.6563 GBP**

| Item | Budgeted Amount | Actual Amount | Difference | Comments |
|---|---|---|---|---|
| (2) 3-day training workshops | 525 | 477 | 48 | We saved money by collaborating with a local fishing cooperative. |
| Supplies for blood sample collection | 131 | 359 | -228 | Unexpected purchase of a field centrifuge. |
| Blood chemistry analysis | 787 | 806 | -19 | Shipping samples was less expensive than expected. |
| Heavy metal analysis | 1181 | 1099 | 82 | An additional 8 samples were analysed. |
| Fuel for boat | 1151 | 1211 | -60 | The collection of additional samples required additional trips to disperse nesting beaches. |
| Fuel for vehicle | 1033 | 962 | 71 | Gasoline was less expensive than expected. |
| Food | 992 | 886 | 106 | By purchasing food items in bulk we saved money. |
| Presentation of results | 131 | 131 | 0 | |
| Total | 5931 | 5931 | 0 | |

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

Important next steps are to continue monitoring blood values in Bahia de Jiquilisco, El Salvador and to extend this research into Estero Padre Ramos, Nicaragua (the other important hawksbill nesting site). Over 90% of hawksbill nesting in the eastern Pacific Ocean occurs at these two sites, making them critically important for health monitoring activities.

**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?**

Yes, we used The Rufford Foundation logos in all presentations about this study given both locally and internationally. Additionally, we will recognize The Rufford Foundation's support of this work in our peer-reviewed publication.

**11. Any other comments?**

We thank The Rufford Foundation for having provided financial support for this important project and for having trusted us to carry out the proposed activities.