

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

Thank you for your help.

**Josh Cole, Grants Director**

Grant Recipient Details	
<b>Your name</b>	Aura Mariela Alonso-Rodríguez
<b>Project title</b>	Land Use Effects on Moth Species Composition and Diversity across a Rural Landscape in the Golfo Dulce Region, Costa Rica
<b>RSG reference</b>	12885-1
<b>Reporting period</b>	May 2013 to May 2014
<b>Amount of grant</b>	£5984
<b>Your email address</b>	<a href="mailto:aurapr15@gmail.com">aurapr15@gmail.com</a>
<b>Date of this report</b>	June 12 <sup>th</sup> 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
Characterise diversity and composition of geometrid and arctiine moth assemblages in four land use types			X	
Evaluate the relationship between geometrid and arctiine moth assemblages and the vegetation and microclimate characteristics found in each land use type			X	
Determine how Neotropical geometrid and arctiine moths are being affected by local land use practices			X	
Measure the value of secondary forests for the conservation of native moth populations			X	
Determine the relationship between local moths, birds and bats and whether they are affected by the same environmental variables	X			There was not enough time to achieve this objective, and access to data on birds and bats was not acquired as easily as previously thought.
Identify focal species that serve as viable moth bioindicators		X		Species with high indicator potential were identified but their use as bioindicators was not properly validated in the field.
Develop a user friendly guide for ecological monitoring using moths as bioindicators		X		We developed a moth identification guide that included 40 species with high indicator potential, but we did not develop a validated bioindicator guide <i>per se</i> .
Perform a workshop with local farmers and community members to explain the importance of moth diversity and distribute the species guide			X	

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

There were several unforeseen difficulties that arose during the project, which are common in ecological field work. Some of the most important are the following:

- One of the oil palm farmers did not grant us access to his plantation, so we had to select a different plantation which was a little smaller than what we preferred.
- There were no extensive secondary forest strands in the landscape, so we had to select young secondary forest sites that were very variable in regeneration histories and stages of succession. We evaluated vegetation in each land use, so this was considered in the analyses.
- There were a small amount of moths that were damaged due to the trap method used, which were not taken into account in the analyses due to their poor condition.
- Some nights it was not possible to visit four sites, due to weather conditions or a malfunctioning light trap. Our analyses show that this did not affect the final results.

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

This is the first study in the Neotropical region to concentrate on the impact of oil palm plantations on moth assemblages. The three most important outcomes are the following:

- Surveys of geometrid and arctiine moths from La Gamba indicate that oil palm plantations are not a suitable habitat for the majority of moth species, showing a severely impoverished fauna with very distinct species composition when compared to other less disturbed forest habitats.
- The interior of old-growth forest did not show higher richness or diversity of moths when compared to young secondary forest or the margin of old-growth forest, but did possess a distinct community composition. Although both moth groups show similar patterns in their response to habitat disturbance, geometrids revealed a higher dependence on old-growth forests, with many species that are characteristic of this habitat and may potentially serve as bioindicators of habitat disturbance.
- The vegetation composition and structure of the habitat, rather than microclimate, was mostly responsible for the observed patterns of moth assemblages in this landscape.

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

Local communities were involved since the beginning of the project, since many of the moth sampling sites were inside of private farms. Also, three members of the community were hired as field assistants and were trained in the use of automatic light traps and handling of moth specimens. On April 12<sup>th</sup> 2014, a talk and workshop was offered in La Gamba, where landowners and members of the community were invited. Approximately 50 people attended the activity, mostly community leaders and members of several local organisations, such as the oil palm farmers, the church, the elementary school, the aqueduct association, the police, the La Gamba Tropical Station and park rangers from the Osa Conservation Area (also members of the Ministry of Environment, Energy and Telecommunications (MINAET) of Costa Rica). The talk included general information about moth biodiversity, land use change, oil palm plantations and the importance of biological conservation and

environmental awareness; it also included the objectives, methodology and general results and conservation implications of the study. Each attendee received an exemplar of the moth species guide that was created from the results of this study, and there was an activity for them to study the guide in detail to identify species they had seen before or liked the best. They were encouraged to use the moth species guide in their lands to evaluate the habitat quality of their land use practices and try to conserve moth diversity as best they can.

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

The field work intended to answer the specific questions of this study has been concluded. However, the sampling sites where this study was conducted have been used by other students to evaluate how other taxonomic groups are affected by land use change and oil palm expansion. Some of these groups are bats, birds, frogs and plants. There is a plan to consolidate the results of all of these studies in one scientific article, for a multi-taxon evaluation of the effects of land use change and oil palm expansion of biodiversity in La Gamba.

Even though this study served to identify several geometrid and arctiine moths as biological indicators, we did not perform a test for the validity of these indicators for actual ecological monitoring in the field. I am interested in eventually developing a follow up project, to assess if they may truly be used as biological indicators and suggest specific protocols to do so.

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

The results of the project were already shared in several activities. One of these is the talk and workshop that was offered in April 2014 for the La Gamba community, where the results of the study and implications for moth conservation were shared with several community leaders and organisations.

Two moth exhibitions were conducted in Turrialba, Costa Rica; one in the Tropical Agricultural Research and Higher Education Centre (CATIE) and one in a local elementary school. Approximately 4,000 moth specimens were exhibited and more than 200 people attended these activities. Information on moth biology and ecological functions as well as details about the development of the study was also offered during the course of the exhibitions.

A moth species guide was prepared and distributed throughout several interested parties. This includes the community at La Gamba, the La Gamba Tropical Station, the Ministry of Environment, Energy and Telecommunications (MINAET) of Costa Rica, several departments and the library at the Tropical Agriculture Research and Higher Education Centre (CATIE), the zoology museums at the University of Costa Rica (both at San José and Turrialba campuses), the National Institute of Biodiversity (INBio) of Costa Rica, and multiple interested professors and graduate students.

Finally, the results of this study will be shared in two scientific articles, which will be published in peer-reviewed international journals.

**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 grant was used from February 2013 to May 2014. Even though the actual grant was received in May 2013, field work started in February as planned, so money was used retroactively to cover costs of previous months of work. The anticipated length of the project was until December 2013, but the timeline was delayed due to the difficulty of sorting, mounting and identifying approximately 4,000 moth specimens. Thus, the workshop with the community and production of the moth species guide was conducted in April 2014, while the final thesis defence was held in May 2014, when the project was finally concluded.

**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
Housing and Alimentation	2133	2125	8	
Transportation and Fuel	636	588	48	
Manpower-Parataxonomists	1237	1204	33	
Manpower- Scaler	307	250	57	
Manpower- Field Assistants	468	450	18	
Manpower-Taxonomist	312	310	2	
Entomological collection and sample processing consumables	187	138	49	This was used to buy forceps, boxes to store the moths and other
Data loggers for temperature and humidity	0	95	-95	Two of the donated data loggers were damaged, so we had to buy an additional two data loggers
Office supplies and photocopies	0	28	-28	This was mainly used to photocopy labels for the moths and to buy office materials.
Incidentals	229	203	26	
Moth species guide	475	330	145	The guide was slightly cheaper to produce because of the chosen materials used.
Workshop	0	404	-404	Money that was left over from other Items was used to cover the costs of the workshop in La Gamba, which was not included in the original budget.
<b>Total</b>	<b>5984</b>	<b>6125</b>	<b>-141</b>	Extra expenses were covered by personal funds

\*\*\*Local exchange rate used: The highest currency exchange rate for the year 2013, according to the following website: <http://usd.fxexchangerate.com/crc-exchange-rates-history.html>

1 USD = 0.66 GBP

926.06 CRC = 1 GBP

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

The most important next steps are:

- Validate the use of moth assemblages, specifically the Geometridae family, as indicators of habitat disturbance and tropical human dominated landscapes.
- Evaluate the effects of land use change on other moth families than were not taken into account in this study, such as Saturniidae, Sphingidae and Noctuidae.
- Continue to educate the local community on the threats to biodiversity brought on by oil palm expansion and how to minimise their negative impacts on their surrounding environment.
- Publish the results of this study, as well as the comparison with other taxonomic groups evaluated in the same study sites, in peer-reviewed international journals.
- Monitor the accelerated expansion of oil palm in the area and develop ecological monitoring and conservation strategies to reduce biodiversity loss.

#### **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 Rufford Foundation logo was used in all public presentations on the results of this project, including the thesis defense, the moth exhibitions and the workshop in La Gamba. It was also used in the moth species guide that was prepared and distributed throughout several interested parties and in the community. The RSGF received publicity during the course of my work in this way, and I also notified several other students about this opportunity; at least two people that I know applied for the grant after I talked to them about it. There were also several news articles about my project, where the name of Rufford Foundation appeared as the primary financier of the study.

#### **11. Any other comments?**

The funds provided by the Rufford Foundation were invaluable for this project and we hope to continue this collaboration in the future.