

## 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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<b>Grant Recipient Details</b>	
<b>Your name</b>	Kylie Michelle Butler
<b>Project title</b>	Behaviour and social dynamics of crop-raiding in Asian elephants: can beehive fencing mitigate human-elephant conflict in a highly crop-raided region of Sri Lanka?
<b>RSG reference</b>	15460-1
<b>Reporting period</b>	28 <sup>th</sup> July 2014 – July 2015
<b>Amount of grant</b>	£ 6000
<b>Your email address</b>	Kylie.M.Butler@uon.edu.au
<b>Date of this report</b>	25 <sup>th</sup> June 2015

Below I have completed the RSG Final Report as requested. Please note that this grant supported the first phase of a 3 year project. The objectives, issues, and achievements reflect the first phase of the project only (beehive fence research site set-up and beginnings of elephant behaviour data collection).

**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
This project has two major but complimentary components: 1) to test the effectiveness of beehive fencing as an Asian elephant deterrent; and 2) to investigate the risk-taking behaviour and characteristics of the local elephant population. First, I address the ‘beehive fence’ objectives:				
To establish a beehive fence research site of 10 beehive fences		X		We have built eight beehive fences in Dewagiriya Village (a high HEC zone of Central SL). Originally, we planned to work with 10 beehive fenced farms (experimental) and 10 non-beehive fenced farms (control). We decided to expand this to work with 24 farms, and build eight beehive fences during the first phase; eight beehive fences 1 year later; and have eight farms which are control farms for the entire project duration. The first eight beehive fences are complete, and bee colonies have been introduced to up to five hives per fence.
To teach farmers how to build and maintain beehive fences, and basic beekeeping skills		X		All farmers, plus local field assistants and research staff, plus several other community members, are competently trained in building and maintaining beehive fences. All beehive fence farmers and local field assistants are also trained in basic bee hive/colony inspections and transferring colonies to fence hives. Beekeeping training began in May 2015 (as this is when our first colonies were delivered). Further training on basic beekeeping and honey harvesting will continue, and

				workshops/individual training sessions will be held twice per field season.
To evaluate the effectiveness of beehive fences as an Asian elephant crop-raiding deterrent		X		<p>This is an ongoing goal. As detailed above, the first phase of the research site set-up is complete. We are now collecting data from farmers about crop-raiding events and/or elephant sightings near their farms; elephant behavioural data to profile the local elephant population.</p> <p>To date, farmers have reported 141 elephant events on or near their homes, with damage occurring 63% of the time.</p> <p>This data collection will continue until late 2016, with analysis performed annually (end of 2015/end of 2016).</p>
<p>We are also investigating the demographic characteristics, behaviour (including personality), and social patterns of elephants inhabiting Dewagiriya Village and nearby habitat including Wasgamuwa National Park, and peripheral village areas. Understanding characteristics of the local elephant population will provide insight into common characteristics of crop-raiding (high risk-taking) individuals, and will also provide a platform for comparison with other HEC sites. This is very important if findings from here are to be extrapolated to other sites. Elephant behaviour and social data collection began early 2015 and will continue until Dec 2016, however data will be analysed annually to enable early identification of patterns/information that might help strengthen and develop beehive fencing. Below. I outline our elephant behavioural data collection objectives;</p>				
To use GIS mapping to document elephant 'hotspots'		X		Elephant sightings, and presence of elephants as determined by footprints and/or dung, has been mapped along transects, on farms, and during observation sessions, since early 2015. This will continue until Dec 2016.
To identify elephant presence/age class/sex using footprints and dung		X		Elephant footprint and dung data collection began early 2015 and will continue until Dec 2015. Already this is identifying peripheral village areas between farms and forest that elephants inhabit, and showing elephants typically enter farms from water tanks, and return to water tank/forest areas following a raid.
To use camera		X		In 2014, we trialled all protocols for

traps and direct observations to investigate elephant characteristics and social patterns				<p>data collection by observations (demographic characteristics, personality assessments, association frequency patterns) and finalised protocol. We began official elephant observational data collection in Wasgamuwa NP and peripheral village areas in early 2015. Observational data collection in Dewagiriya Village will commence September 2015. Farmers are currently building observation hides (tree huts) for this purpose.</p> <p>Camera traps (two models) have been trialled and will be mounted on beehive fence posts September 2015 where they will remain until December 2016.</p>
To assess farmer perceptions of beehive fencing and co-existing with elephants		X		<p>In October 2014, social research interviews to assess farmer perceptions were conducted with 27 farmers from Dewagiriya Village (all experimental and control farmers + three additional households). Interviews lasted between 20 – 90 minutes, and early analysis indicates that most farmers are keen to try beehive fencing but unsure if it will deter elephants, and negative perceptions of living alongside elephants are common.</p> <p>A second round of interviews will be conducted in Oct 2016, to identify if perceptions have changed over time, and we will also compare results from experimental and control farmers.</p>

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

No unforeseen difficulties, as such, have arisen thus far during the project. However, this is not to say, that field work of this nature does not have its challenges.

Two things that I've found challenging while conducting field work in Sri Lanka are: a) It is difficult to keep to a timeline: the kind of timeline I am accustomed to following in Australia is not adhered to in Sri Lanka. For example: '2 weeks' can mean anything from literally '14 days' to a few months ahead; and b) People are very polite and friendly, and often seem to tell you what they think you would like to hear, rather than their honest opinion.

Neither of these things has caused major issues but it does require me to be very organised, to always re-confirm appointments or meetings a day or two prior to the event, and to always ask for specific timeframes and follow up on these. I also make a point to be a frequent presence in the village, to always ask questions, and to use my translators to explain that I am interested in people's honest thoughts and there to help if they have any issues or concerns with their fences or other project aspects. Building relationships can be a slow process, but I've noticed a positive difference over the last year in the way farmers relate to me and voice their opinions.

Finally, an extended rainy season meant transects and areas I had hoped to survey on foot for signs of elephant presence were not accessible. I had to re-design planned transects and observation points.

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

1. Establishing the beehive fence research site: With stage 1 of the beehive fence research site complete, we now have eight farmers fully trained in beehive fence maintenance and building, who have also begun to learn the basics of beekeeping. We expect, and will see in the coming months, if these beehive fences are deterring elephants from their crops/homes.

2. Introduction of beekeeping and associated benefits: Every beehive fence now has up to five colonised hives. This means farmers should harvest their first honey later this year, which will provide them with an additional source of income. It's very pleasing to see the enthusiasm farmers have for learning these skills. This outcome is not yet complete but it is coming along very nicely.

3. Recommendations for human-elephant conflict management plans: While this outcome is far from complete, we are making steady progress towards it. We have begun collecting elephant event data, elephant behaviour data collection protocols have been finalised and official data collection has recently begun, protocols for DNA analyses are being developed with experienced Professors at the University of Peradeniya, Sri Lanka, and we have completed the first round of social research interviews to assess farmer perceptions.

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

Involvement:

- Community meetings were held to introduce the beehive fence deterrent method to Dewagiriya Village. People were asked to identify the houses/farms most affected by crop-raiding and to help select specific households for participation in the research site.
- Beehive fences are built with the farmers (both owners of the farm and neighbours).
- Community members are trained in beekeeping.
- Field assistants are local community members who are trained in building beehive fences, beekeeping and data collection – building skills and economic benefits.
- Labour (fence post building) and transport (e.g. taking fence posts to farms) are sourced locally – supporting local economy.
- Materials/other purchases sourced from small local shops where possible (tools, car repairs, food etc.) – supporting local economy.

#### Major benefits:

- Experimental farmers benefit from beehive fences: this should reduce crop raiding, improving harvests and their personal safety. Honey and bee products can be sold to provide an additional income source.
- Other farmers in the community will benefit if the fence proves successful, as we will work with them to expand the research site. In the meantime, all farmers assisting with data collection receive a beehive and the opportunity to learn beekeeping skills.
- If the beehive fence is a successful deterrent, we aim to expand the project to other locations in Sri Lanka, and throughout Asia. Our in-depth knowledge of the local elephant population will enable comparison with other HEC sites, which will help to predict others sites this technique may be suitable for. Understanding characteristics of a crop-raiding population of elephants may also further knowledge on characteristics that may predispose an individual to crop-raid, enabling predictions of crop-raiding behaviour and response to mitigation techniques at other sites.

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

Definitely. As aforementioned, phase 1 of this project has just been completed, and we will continue data collection for a further 18 months.

Following on from completion of this specific project, and depending on results, we hope that we will be able to expand the beehive fencing mitigation technique to other locations across Sri Lanka and Asia. This could be by physically helping set-up beehive fence sites in other locations, developing a freely available beehive fence construction manual for Asia, and/or training other researchers/NGOs in the use of this technique.

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

Results of this work will be disseminated by the following methods:

- Publications in peer reviewed journals: this project forms my PhD project which will be submitted using the 'thesis by publication' format. A minimum of four publications covering 'demographic characteristics and personality traits of risk-taking elephants', 'social dynamics (association frequency patterns and genetic relatedness) of elephants in a high HEC population', and 'overall effectiveness of beehive fencing' will be submitted.
- Blogs: I currently write blogs for RSG, Save the Elephants, Sri Lanka Wildlife Conservation Society, Chester Zoo, and Animal Works. An overview of results will be distributed via blogs.
- I will produce a 'Beehive fence construction manual for Asia' that will be freely available on Dr Lucy King's 'Elephants and Bees' website.
- Conference presentations: I presented the project at the Sri Lankan 'Pollination Conference' in 2014, and aim to present at other conferences between now and the project end.
- A report, translated into Sinhalese that I will present to the local communities at my study site, and leave with the Sri Lanka Wildlife Conservation Society.

**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 Foundation Grant was used between August 2014 and June 2015. Although the overall project, including research site set-up, data collection and analysis is of a 3-year duration, funding was requested to support Phase 1 of the project (research site set-up and initial data collection), or estimated 12 - 18 months of the project, and expenditure is in-line with expectations.

**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.**

Figures in £ based on exchange rate 1 AUD = 0.5761 (exchange rate on date of transfer into my account: 28<sup>th</sup> July 2014).

Item	Budgeted Amount	Actual Amount	Difference	Comments
Laboratory equipment for DNA analysis	1055	890	165	Purchased Qiagen QIAamp DNA Stool Mini Kit & 3 x Finnpiquette (due to sensitive nature of dung extracted DNA, special equipment exclusively for my DNA work was required). The remaining funds will go towards lab consumables (e.g. pipette tips, collection tubes)
Personnel – local field	960	960	0	Includes: Field Assistant Wages (75 x 5 months)* <i>note wage ↑ from original</i>

assistant wages				<i>budget due to ↑ responsibilities; translator wage for farmer interviews; occasional labour wages for fence building/post building; driver wage for NP elephant observation sessions</i>
Research expenses – fuel/travel	145	145	0	Includes: transporting fence posts from field house to Dewagiriya Village & fuel for beehive delivery from Colombo to field house
Research equipment – safety/PPE	255	125	130	Includes: first aid kit top-ups, epipen, gloves for beekeeping. Budget was less than estimated as I had planned to buy face nets for beekeeping however Bob's Beekeeping (Australia) donated five of these.
Research equipment – data collection and monitoring	3585	3809	224	Includes: DSLR camera/lens for Elephant ID File and association frequency data collection; night vision binoculars for observations in Dewagiriya Village; 10 x night vision HD camera traps incl. SD cards, locks and batteries; printer & ink; beehive hanging devices/smokers/ventilation boards; tools for building beehive fences (e.g. nails/hammers/paint).
<b>Total</b>	<b>6000</b>	<b>5929</b>	<b>71</b>	

*All receipts are filed and stored safely with researcher Kylie M. Butler and are available on request.*

Items supported by the RSG have contributed significantly towards establishing the beehive fence research site, developing and finalising all elephant data collection protocols and being in a position to continue with official data collection when the next field season begins in September 2015, and supporting local wages of field assistants, labourers and drivers helping the local community economy and skills. We are most sincerely grateful for the support shown by RSG which has enabled us to successfully complete Phase 1 of the project, and to continue with the all-important data collection to accurately evaluate the effectiveness of beehive fencing for a high crop-raiding elephant population.

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

The most important next steps are to:

- Continue working with farmers on their beehive fences, specifically developing beekeeping skills, teaching honey harvesting and helping source markets for sale of honey and bee products.
- Carefully monitor frequency of crop-raiding events, extent of damage, and number of crop-raiding elephants – with the assistance of farmers – over multiple crop seasons to determine the fences deterrent effect.
- To accurately collect and analyse data on elephant demographics, behaviours and social patterns in the local elephant population to develop a comprehensive profile on characteristics of crop-raiding elephants. To use this information to help assess the long-term potential of beehive fencing, and to be able to compare with other HEC sites to assess the suitability of beehive fencing across different HEC affected areas.

**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 a presentation given at the Pollination Conference, Sri Lanka, 2014. The Rufford Foundation is acknowledged in all project publicity including blogs, and will continue to be acknowledged in all presentations/publicity for the duration of the project.

**11. Any other comments?**

I would just like to once again express my gratitude to the Rufford Foundation for supporting this project, and having faith in a relatively new researcher (albeit collaborating with Dr Lucy King who is most experienced in both beehive fencing and elephant data collection). We are very pleased with how the project is progressing – with the receptiveness of farmers to trailing this technique and the comprehensive methods we have developed and begun to use for investigating the local elephant population. This grant made a substantial contribution in enabling us to purchase all necessary equipment in a timely manner especially, and also supporting wages of local field staff, which have certainly helped our success thus far. Evidently, the Rufford Foundation has contributed significantly to our achievements, and has helped put us in strong stead for the next phases (evaluating beehive fence effectiveness over multiple crop seasons, collecting and analysing elephant behavioural data).

I will continue to provide updates on our progress, including of course the final thesis and publications but also project milestones and initial result and findings throughout the project.

**Elephant and Bees Project – Sri Lanka by Kylie M. Butler (PhD Candidate, University of Newcastle)**



**PHOTOS:** Top left: Supun and I with the Ghanawathi family at their new beehive fence. Top centre: Elephant footprints in a paddy field. Top right: Male crop raiding elephant walks in between village. Centre left: Supun transferring bees into a fence hive. Centre centre: Showing farmers how to transfer bee colonies into fence hives. Centre right: the daughter of one of our beehive fence farmers poses at her families fence. Bottom left: locals wait for an elephant to move on before passing through their village. Bottom centre: The Thilanarathne family stands by their house that was destroyed by elephants attempting to get to rice bags stored inside. Bottom right: Data collection methods – measuring footprints of a crop-raiding elephant and collecting dung samples for DNA analyses.