

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 | Dominique Bertrand | | | |
| Project title | The stress factor: Anthropogenic sources of stress in an eco- | | | |
| | tourist location containing wild <i>M. nigra</i> | | | |
| RSG reference | 14570 | | | |
| Reporting period | April 2014 – August 2016 | | | |
| Amount of grant | £5946 | | | |
| Your email address | dabertra@buffalo.edu | | | |
| Date of this report | 09/01/2016 | | | |



1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

| Objective | Not | Partially | Fully | Comments | |
|--------------------|----------|--------------|----------|---------------------------------|--|
| | achieved | achieved | achieved | | |
| Determine | | \checkmark | | Preliminary analyses exploring | |
| whether the | | | | tourism and macaque | |
| presence of | | | | behaviour have been | |
| tourism/crop | | | | performed using ANOVAs. | |
| guarding is | | | | These will be expanded into | |
| related to | | | | GLMMs this year and we will | |
| increases in | | | | add in crop guarding data. | |
| Macaca nigra | | | | Refer to question #3 for more | |
| stress | | | | details. | |
| responsiveness | | | | | |
| Identify which | | \checkmark | | While all of our behavioural | |
| aspects of | | | | data is collected, we have | |
| tourism and | | | | only run ANOVAs on some of | |
| which means of | | | | it. We are currently working | |
| crop guarding | | | | through GLMM analyses. | |
| are most stressful | | | | GLMMs will allow us to pull out | |
| | | | | specific anthropogenic | |
| | | | | characteristics that maybe | |
| | | | | more related to behavioural | |
| | | | | responses. | |
| Determine | | \checkmark | | While all of our physiological | |
| whether the | | | | samples are collected, we | |
| physiological | | | | need a permit extension that | |
| responses to | | | | has not been obtained yet. | |
| stress are acute | | | | (See #2) | |
| or chronic. | | | | | |

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

There were a few difficulties throughout the course of the project, most of which were overcome. At the beginning of the study, one of our assistants did not pass inter-observer-reliability with data collection. The PI of the project, Dominique Bertrand, gave her an additional 3 weeks of one-on-one training, during which they collected mock focal data together, pausing often to discuss each behaviour witnessed. Dominique also had our lead assistant participate in this extra training period to see if a fresh teaching style would be helpful. Unfortunately, the assistant



could not grasp the nuances of primate facial cues and decided to seek employment elsewhere. She was replaced April 15th 2015. Also, we experienced a problem with our physiological collection protocol, specifically saliva. Although some macaques in these groups chewed our mango soaked saliva swabs during preliminary trips, they rejected them during the primary project. To find a solution, we tested four new syrups. Grape/black currant was the new favourite amongst macaques. In hindsight, this was a fortuitous setback for two reasons. First, likely due to the syrup change, we successfully collected from both males and females (females were a problem during preliminary testing). Second, the shift to a noncitrus syrup eliminates our concern about the citrus content of mango-flavoured swabs possibly interfering with our cortisol assays. There was one additional problem with data collection. We determined that one of our collection methods (collecting behaviour from all monkeys when tourists are present or after crop guarding) would be more effective if we switched from all occurrence to 1min scan sampling. We started training this method May 1st 2015. However, our data collection app for this sampling method was not working successfully. We hired a coder to repair it; unfortunately, we were not able to start collecting until August 1st 2015. Overall, this was the least successful behavioural data collection method, and we only have a few hours in total. This data collection method would have yielded finer tuned macaque behavioral responses to specific tourist demographics/behaviors and specific crop-guarding characteristics. The loss is disappointing, but does not detract from our ability to empirically assess the effects of tourism or crop guarding on macaque behaviour.

We also experienced problems of a more unusual nature. First, in July, two large trees fell on the team's field house. It destroyed the building. Dominique and some of our assistants had to relocate into the village directly adjacent to Tangkoko Nature Reserve, Batu Putih. Our assistants were able to return to the field site after only a week, while Dominique could not return until August. Shortly after her return, Dominique had to leave the field site due to an illness. This was debilitating and, despite several trips to an Indonesian hospital, was not accurately diagnosed until she returned home to the US in Jan 2016. The rest of our team remained behind to continue collecting data and samples while Dominique relocated to the closest large city of Manado. She continued to manage the project from afar and spoke with the team on a daily basis. While away from Tangkoko, she took the time to improve her knowledge of Bahasa Indonesia, partnered with Tangkoko Conservation Education to help teach school children about ecology and primatology, and continued to teach guides English when they came to the city. She also began English lessons for the Tangkoko Conservation Education staff and hopes to find a way to continue these in the future.



Finally, we are currently experiencing problems with our physiological sample permit. We need a permit to allow us to export samples from Indonesia to the German Primate Center, Gottingen, Germany for assaying. The plan was to fly our samples to Germany with our Indonesian student counterpart, Uni Sutiah. She was to be responsible for transport of all samples and the assaying of saliva. To this end, we attained a permit in February 2015 and were told the permit was good for 1 year. Unfortunately, this was not the case; it expired August 2015. Since January 2016, we have been working with our host affiliate, Dr Muhamad Agil at the Bogor Agricultural University, Bogor, Java to renew it. The most recent update informed us to expect it to be completed by October 2016. This completion date made it impossible to send Uni to Germany, as she will be taking classes at that time. However, we have an Indonesian PhD student who may be able to travel to Germany, receive valuable training, and subsequently, assay our samples.

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

First and foremost, our preliminary analysis shows that the presence (vs. absence) of tourists is related to changes in some stress indicative behaviours in some conditions. We explored data both among the three groups with varying degrees of anthropogenic pressures (PB1 experiences research only, R1 experiences research and moderate exposure to tourism, while R2 experiences research, heavy exposure tourism, and crop-guarding) and within the two groups experiencing tourism.

One-way ANOVAs indicated no significant differences between groups in affiliative behaviours, vocalisations, or self-directed behaviour, regardless of whether a month had a high number or a low number of tourists. This suggests that in general, the groups behaved similarly when no tourists were present. However, aggression was the exception. R1 displayed significantly higher levels of aggression in the absence of tourists than PB1, but this was only in months with high tourist volumes (F (2, 30) =7.59, p=0.004). When comparing only the groups that experienced tourism, repeated measures ANOVAs indicated that both groups that were exposed to tourists displayed higher rates of aggression (F(1,21)=9.81, p=0.005) when tourists were present than when absent. This was the case both in high and low tourist months. Both groups also vocalised less (F (1, 20) =4.35, p=0.05) when tourists were present than when absent, but only in months with lower tourist numbers. Also, both groups had lower percentages of focal sessions with affiliative behaviour (F (1,21)=13.49,p=0.005) when tourists were present than when absent, and this was the case regardless of the number of tourists per month. Finally, contrary to our predictions, both groups displayed higher rates of self-directed behaviours (SDBs) when tourists were absent than present, and in months with lower tourist numbers (F (1, 21) =8.54, p=0.008). The findings connected to self-directed behaviours are surprising; however, we recognise that these results are preliminary and incomplete.



We expect to elucidate the SDB results when data are analysed using General Linear Mixed Models later this year. This analysis can control for more, possibly confounding variables such as but not limited to, fruit availability, number of researchers, size of tourist groups, crop guarding events, and total tourist viewing time. In order to fully evaluate the risk of tourism to these groups we will be pairing our behavioral data with the findings from our fecal and salivary stress hormone sample analyses later this year.

Additionally, we contributed to the growing body of methods to collect saliva noninvasively from primates. Stress in wild primates can be monitored using faeces, blood, or saliva. Faecal sampling is the most common non-invasive method to collect stress hormones in wild primates. However, this method is limiting as faecal glucocorticoid metabolites represent only an average daily stress level and thus it may be difficult to associate them definitively with particular stressful events during the previous day, particularly if more than one stressful event has taken place. In contrast, the timing between the start of a physiological stress reaction and the rise of cortisol level in the blood occurs rapidly, within 2-5 minutes. Thus, sampling blood can provide an accurate response to an immediate stressor. However, blood sampling is expensive and invasive. Similar to blood, cortisol appears in saliva quickly after a stressor (~20 - 30 mins), and fortunately, saliva can be collected from wild primates with minimal disruption. But methods are in their infancy. Our protocol to non-invasively collect saliva samples from these wild, habituated macaque groups opens a new path to the noninvasive collection of saliva from primates, potentially allowing for the measurement of immediate stress responses in wild primates.

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

Early into the project, Dominique met with Harry Hilser (program manager of Selamatkan Yaki (SY) - <u>http://selamatkanyaki.com</u>) and discussed his plans for SY's Tangkoko Guide Training Workshop to be held in Batu Putih. This workshop was intended to help guides understand the economic power behind Tangkoko tourism and how they and the Indonesian government can ensure a steady income, while still protecting the ecology. SY held two workshop-planning seminars in February 2015 and March 2015. Dominique attended the first seminar and two of our assistants (Mary Zuromskis and Uni Sutiah) attended the second. During these planning seminars, Dominique had several discussions with the local guides about improving their English skills. They were extremely receptive to the idea of free lessons. Thus, she held her first English language class on April 4th 2015 and continued to do so once a week for the remainder of her time in Tangkoko. The workshop itself was held April 14th -16th 2015, and Dominique participated via a group presentation with MNP.



Later in 2015, Macaca Nigra Project held a 2-day workshop for Tangkoko guides to help improve their knowledge of *Macaca nigra* and the ecology in general. Our team played an instrumental role in this workshop by giving a presentation on how to read monkey facial expressions. Dominique contributed a presentation on basic primatology. Additionally, we had role-playing skits aimed at educating guides on good vs. bad tourist behaviours. The output of this workshop will be translated into a booklet of important ecological information relevant to Tangkoko. Additionally, Dominique intends to continue helping Tangkoko Conservation Education (TCE). Not only does she hope to fund the education of one of their key staff members, but she also intends to help TCE with future grant writing. Finally, Uni will begin her graduate programme of study (Masters of Biology) in September 2016 at the University of Gadja Mada in Jogjakarta, Java.

5. Are there any plans to continue this work?

We are still working on processing our physiological samples. Once this is achieved, we intend to disseminate the information to all stakeholders involved and hope that it can be useful in managing the tourism and research at the field site. Please see #4

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

We plan to share the results of our work with others via oral presentations and posters at academic conferences and publications in peer reviewed 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 funding for the grant was used by March of 2016. This required an extension on the part of Rufford and was due to the timing of our payment towards Uni Sutiah's education. However, the data collection portion of the project itself ended in January 2016. We intended to have our samples exported at this time and assayed by March. Unfortunately, due to permit problems, this was not possible. Please see #2 for more information.



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 | Actual | Difference | Comments |
|----------------------------------|----------|--------|------------|----------|
| | Amount | Amount | | |
| Will be sent separately by the | | | | |
| Sponsored Projects Office of the | | | | |
| University at Buffalo | | | | |
| Total | | | | |
| | | | | |

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

We are committed to analysing all data quickly so that publication can begin. Also, we recognise that without our physiological samples, any results will be incomplete. Therefore, we are doing everything we can to ensure that the permit renewal is obtained and our samples are assayed. We will continue to present at conferences, submit updates to Macaca Nigra Project, and disseminate results as often as possible.

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 have presented to RISTEK (Indonesian Foreign Research Agency), BKSDA (Indonesian Forestry Department), Fulbright, and at International Primatological Society/American Society of Primatologists Chicago 2016. Rufford was thanked and the logo was used in each presentation. We have future presentations and publications planned for 2017 (i.e. American Association of Physical Anthropologists, American Society of Primatologists, & Animal Behaviour Society) and will ensure that the Rufford name (and logo where appropriate) is used.