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. 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	Wai-Ming Wong
Project title	Sun bears in human-dominated landscapes: Population trends, distribution and conflicts in Kerinci Seblat National Park, Sumatra.
RSG reference	33.05.09
Reporting period	November 2009 – November 2010
Amount of grant	£6000
Your email address	Wai.m.wong1@gmail.com
Date of this report	28/03/2011

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. Determine population trends and distribution of sun bears through changes in occupancy in the Kerinci Seblat region, Sumatra.			x	Occupancy analysis has been completed for all three study areas. Estimating occupancy between years will yield information on the population trends of sun bears in Kerinci Seblat National Park. Sun bear population trends can therefore be determined by comparing occupancy results from this present study and previous sun bear occupancy work carried out at the same study areas by Linkie *et al.*, 2007 (Estimating occupancy of a data deficient mammalian species living in tropical rainforests: sun bears in Kerinci Seblat region, Sumatra. Biological Conservation).
2. Investigate spatial and temporal factors that best explain their population trends and distribution, including habitat suitability and resource use.		x		This objective has been incorporated with objective #4. See comments below
3. Determine how sun bears adapt to facilitate co-existence in human/commercial landscapes.	x			This objective was not investigated due to time limitations
4. Construct a Spatially Explicit Habitat Model from habitat suitability, resource use and occupancy data to identify key conservation areas for future protection for sun bears		x		At each of the three study areas, sun bear habitat use, defined as the probability of a sun bear using a particular sampling site, was estimated using a likelihood-based method (MacKenzie *et al.*, 2002). At each sampling site (camera trap location), habitat and landscape factors (covariates) such as habitat type, elevation, slope, distance to forest edge, roads, logging roads, rivers, villages, and fruit availability were recorded. A logistic regression style analysis was performed to determine the covariates that best explain overall sun bear occupancy for each of the four study areas. This information now needs to be mapped out using GIS to derive a Habitat Suitability Model from which core protection conservation areas

				can be identified. In addition to this, by looking at deforestation maps we can see whether ideal sun bear habitats are being cleared and use this information for deforestation mitigation.
5. Investigate human-sun bear conflicts and spatial-temporal analysis of human-sun bear conflict incidents			x	30 interviews were carried out at each of the three study areas (Sipurak, Bungo, RKE) plus an additional area (Permatang Lingkung) chosen for conflict monitoring, resulting in a total of 150 respondents. Topics revolved around the local peoples' attitudes, perceptions and tolerance towards sun bears as well as mitigation/guarding practices they used. Conflicts varied between sites ranging from no conflicts, crop damage, property damage, livestock depredation. Areas that had livestock depredation, local people had very low tolerance towards sun bears and negative attitudes. This may be due to the fact that livestock have significant value for the farmers as livestock (mainly chickens and goats) providing a source of regular food and income. Permatang Lingkung was chosen to be monitored for a period of 12 months as this area was classified by the Department of national Parks as a high conflict area. It is important to correctly identify those species responsible for conflict. Conflicts in this area were monitored for 12 months and therefore covered both the wet and dry seasons. By using GIS, distances of farmlands to forest borders were measured. From this study we identified that macaques, wild boar and sun bears were the most frequent visitors to the farmlands. Sun bears usually only ate ripe fruit and did not cause damage to the actual crops (whereas wild boar and macaques would eat saplings and dig up roots). Livestock depredation was present in this area whereby chicken coops were often raided. Goats were also reported to be eaten. The majority of conflicts occurred during the wet/rainy season as this is when fruit productivity is at its peak. Farmlands that grew crops such as jackfruit, corn, and bananas where most susceptible to sun bear conflicts.
6. Use findings to propose management		x		Information needs to be presented to the KSNP management. This will be done so at the end of

recommendations specifically for sun bear in Sumatra and determine appropriate mitigation strategies for reducing habitat loss, forest degradation and conversion.				the project in June 2011. The information gathered from this project is vital to establish effective conservation strategies, especially the use of the Habitat Suitability Model and identification of core sun bear protection areas within the National Park.

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

As with any project involving field work, problems and difficulties are almost certain to occur. Fortunately, this project only experienced minor setbacks as well as hazards that are associated with working in rainforests that cannot be avoided.

During the course of field work only three camera traps were permanently damaged (two stolen and one damaged by ants). It is difficult to prevent cameras being stolen, especially in areas of high human disturbance (forest areas bordering agricultural farmlands or high poaching intensity).

Cameras look expensive and so farmers may feel they have value. Poachers may also fear that the cameras take pictures of them conducting illegal activities and therefore they are destroyed.

To overcome these problems, most cameras are fitted with locks. We also carry spare cameras on field trips, so that if some are missing, they can be replaced and also located in a nearby, safer place out of the way of human trails.

Another problem we found was that sometimes ants would interfere with the electric circuits inside the camera causing it to fail. To solve this problem, silicon sealant was used around the edges or any openings in the camera to prevent entry.
Fieldwork was slightly delayed due to the Islamic holiday of Ramadan and Idul Fitri. This meant that the cameras were left out in the forest for a slightly longer period of time than planned. Consequently, some data was lost as either the film or batteries had run out, but fortunately this happened for only a few cameras and the batteries and film ran out just short of us replacing them.

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

The focus of this research project was to learn more about the endangered Malayan sun bear, which has been classified as a priority for bear research by the IUCN/SSC Bear Specialist Group. The aims of this project were to fill in important information gaps about their basic ecology and then be used to establish effective conservation management plans and increase protection of the species.

The project had multiple aims and objectives out of which the three most important where determining: 1). Estimates of abundance; 2). Population trends; and 3). Identifying habitat suitability and core protection areas for sun bears.

By applying a detection/non-detection sampling technique using camera trap data with environmental covariates, I was able to estimate an index of abundance (using Royle & Nichols

estimating abundance technique, 2003) and sun bear occupancy (MacKenzie *et al.*, 2002) from three tropical forest study areas with different levels of protection and degradation status in Kerinci Seblat National Park, Sumatra. By pooling the data from all study areas, I was also able to derive estimates of abundance and occupancy for the whole National Park.

Estimating sun bear occupancy between years will yield information on the population trends of sun bears. Therefore, by comparing this present data with previous data collected in 2007 (Linkie *et al.,* 2007 – Estimating occupancy of a data deficient mammalian species living in tropical rainforests: Sun bears in the Kerinci Seblat region, Sumatra), this has been achieved. Two out of the three study areas have stable sun bear populations whereas the other had a significant decrease in population. The areas that have been experiencing population decreases are areas that are currently undergoing serious threat of forest conversion into industrial farmlands such as palm oil and rubber plantations.

In these areas, that often cover lowland primary rainforest (ideal habitat for sun bears), huge areas are being cleared to make way for this type of agriculture and therefore reducing the available habitat available for sun bears to survive in.

Occupancy modelling also requires the incorporation of habitat covariates, i.e. landscape and habitat factors that may explain sun bear occupancy. At each study area landscape and habitat covariates such as habitat type, distance to human related factors (roads, logging roads, and villages), distance to rivers, elevation, vegetation type, and distance to forest edge were measured and recorded. By using these covariates with occupancy modelling, it is possible to determine habitat preference used by sun bears and produce a Habitat Suitability Model. The Habitat Suitability Model identifies areas within the National Park that are important to sun bears and thus identify core protection zones. By looking at satellite deforestation maps, it will be possible to see whether "good" sun bear habitats are being cleared and conservation managers will be able to focus their attentions to those specific areas. Consequently, sun bear populations will be better protected and deforestation greatly reduced.

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

In order to carry out fieldwork efficiently we use local field guides from the local villages that often boarder the national park. Their knowledge of the forest is vast. This improves the accuracy and efficiency of the project as they are able to create routes through the forest quickly and identify good areas to place camera traps. In return then become more aware of conservation issues and learn the importance of the endangered species that inhabit their neighbouring forested areas. They learn important conservation field work skills, such as the use and setting up camera traps, GPS and also data input.

As part of the human-sun bear conflicts research, the team and I trained members of the local communities to collect and record conflict data, not only for sun bears but also tigers, wild boar, etc. These are important skills as this information (collected by them) will lead to a reduction in wildlife conflicts in their farmlands and thus benefit them economically in the long run. It also benefits the animals as farmers will learn effective and non-lethal ways of dealing with conflict animals. Most of the conflict data can be reported to specialised teams within the National Parks department who then resolves the problem.

My team also works closely with a local nature club called the "Kerinci Nature Lovers". The members are predominantly university students or young professionals who have an interest in nature and environment. They often join us on field trips and learn conservation techniques such as GPS, transects, animal identification, and data input and basic GIS (Geographic Information Systems).

5. Are there any plans to continue this work?

Currently, the project has been expanded to another study area which is a lowland secondary tropical forest that is under serious threat of forest conversion to palm oil. We have plans to expand to other study areas both inside and outside the National Park itself as well as expand to other regions in Sumatra and produce a Sumatra-wide database of sun bear information. It is also important to investigate sun bears outside the national park and understand how they have adapted to human-dominated landscapes such as industrial farmlands and thus complete objective #3.

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

Results from this research will be shared in the form of published scientific articles in peer reviewed journals that will be made throughout the year (2011 – 2012). As protocol for carrying out research in Kerinci Seblat National Park, a copy of the data must be supplied to the National Park headquarters and information on the project will be made available through them.

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

RSG was used for a period of one year from November 2009 – November 2010. The project over ran by another 6months due to the addition of another study area. Due to the addition of a fourth study area, the project time schedule has been extended by a further five months.

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
Field guide salaries/community scouts	2880	3240	+360	This RSG budget was based on a previous project carried out in KSNP in 2007. Consequently, field guide salaries were increase from £40/month to £45/month. The project recruited six local field guides therefore cost calculation is: (£45 x 12)6 = 3240
Food for field work	1800	1680	-120	Food for fieldwork was budgeted per field trip (originally budgeted per day in RSG proposal). Per field trip food cost £112. Therefore, over five field

				trips for each study area (3) the cost calculation is: (£112 x 5) x 3 = 1680
Lodging	480	490	+10	12 months rent at 7500'000Rp at exchange rate of 15'300Rp to £1.
Communications/internet/phone	215	360	+145	Collectively, both phone and internet costs per month amounted to £30/month. The cost calculation therefore came to £30 x 12 = £360
Film processing	170	150	-20	Film from camera traps was collected after each field trip (5) for each study area (3). Film development cost £10 in total for all film processing. Cost calculation: (£10 x 5) x 3 = £150
Stationary	50	15	-35	Stationary purchased were paper and pens, used by farmers to record human-wildlife conflicts.
GPS unit	200	0	-200	GPS units were borrowed from other research teams who were currently inactive in the field.
Data analysis/reporting	180	60	-120	Printing maintenance (ink cartridges and repairs). Software purchased for data analysis such as SPSS, PRESENCE, CAPTURE
Total	5975	**5995**	+20	

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

The next important steps would be to forward information from this project to the Kerinci Seblat National Park headquarters so that they can use this to establish effective conservation strategies. The Malayan sun bear is an umbrella species and therefore safe guarding this species will also lead to the protection and conservation of other species of conservation significance, for example clouded leopards, tapirs, siamang, and Asian golden cats, all of which little research has been conducted on their conservation.

For the national park headquarters the most important area of this research is the habitat Suitability Model and identification of core conservation priority areas/units for sun bears. By looking at deforestation maps and were the sun bear core protection units lie within these maps, the National Park headquarters can see if deforestation or forest conversion is encroaching into these protection areas and therefore mitigate forest clearance.

Previous sun bear research has shown that sun bears prefer to inhabit primary lowland tropical forests. This research shows that not only do sun bears live in primary forested areas but also secondary forests. Therefore, these areas should not be classed as low conservation value and their protection status increased.

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?

The RSGF logo was used in all presentations made by myself and my team to KSNP as well as my institution, Durrell Institute of Conservation & Ecology, University of Kent, UK.

11. Any other comments?

Additional work.

Tiger monitoring programme:
An additional study on endangered species has been conducted during this period. These study areas had been previously used by Linkie *et al.* (2005-2008) to assess the conservation status of the critically endangered Sumatran tiger. This work led to the establishment of Tiger Conservation Protection Units (TCPUs) – a law enforcement team that patrols Kerinci Seblat National Park to help mitigate poaching and human-tiger conflicts in the surrounding farmlands. A significant amount of investment has allowed the operation of this team to carry out their work, however, there has been no effort to determine whether this conservation initiative has been effective.

Tiger data from this project's camera trap placements can be used to estimate tiger abundance and compare this with previous work carried out by Linkie *et al.* thus producing reliable estimates of population trends of tigers in KSNP. This information can then be used to assess the effectiveness of existing conservation strategies (TCPUs). An increasing or stable tiger population would indicate a success.

Field training KSNP staff in camera trapping techniques:
Due to a recent development within the Kerinci Seblat National Park management of implementing a biodiversity survey, they have requested that we train them in field survey techniques, specifically camera trapping. This training consists of two components: 1) Workshop and training in the theory of camera trapping; and 2) Practical fieldwork. The workshop involved a day's training in the national park office with a presentation in the morning and then a brief practical workshop in the afternoon explaining how to use the different types of camera traps available and using different functions on GPS such as marking points and track-logs. KSNP field rangers have now joined our team in the field to learn about camera trap set-up, why particular sites are chosen and how to use GPS equipment. On the analytical side, KSNP rangers are taught how to use GPS data using a Geographical Information System (GIS). They will be joining this project for a period of four months covering two different study sites.

Ungulate data used by TNKS as part of their biodiversity surveys:
TNKS (Kerinci Seblat Management) are currently embarking on a biodiversity survey with a specific focus on ungulate data (Tiger prey). This project captures many photographs and video of ungulate species and will be used as part of their biodiversity survey to gain a better understanding of the status of these species within the national park.

Publications and dissemination of results will be made throughout 2011 and 2012 in peer reviewed scientific journals.