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	Rajeev Pillay
Project title	Mammals on the margin: Documenting recent changes to large mammal distributions in a densely populated biodiversity hotspot
RSG reference	29.09.09
Reporting period	March 2010 – October 2011
Amount of grant	£6000
Your email address	rajeev@conservation.in
Date of this report	20 November 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
Assess changes in the distribution of large mammals across the Western Ghats over the last 30 years			✓	In our project, we covered all 394 ranges (119 previously, 275 on this RSGF-funded project) of the c. 160,000 sq. km. Western Ghats landscape and surveyed more than 4,000 people drawn from local communities, Forest Department field staff and experts to obtain information on the distribution of 21 species of large mammals. Our interviews were tightly integrated with the rigorous occupancy analysis framework, and provided us detection histories for each range at two points in time (c. 30 years ago and present) for all the mammal species. These comprise the first ever data on large mammal distribution in the Western Ghats biodiversity hotspot, and cover an important time period of three decades. We then estimated the occupancy or proportion of area occupied by each species 30 years ago and at present using the software PRESENCE. By using multiple season occupancy models, we explicitly estimated extinction and colonisation rates and comprehensively assessed changes in occupancy over 30 years across all 394 forest ranges in the Western Ghats.
Use changes in detection probability over time as an index of change in abundance			✓	In addition to estimating changes in occupancy or distribution, we estimated the probability of detection of each species at each point in time. The detectability of a species is one of the indicators of abundance and may therefore be used as a surrogate for the same. We successfully defended this idea in the process of peer review and our pilot study in the southern Western Ghats has been published in *Biological Conservation*, a leading journal in the field of conservation biology. We can therefore use changes in detectability as in index of change in abundance comprehensively across the Western Ghats.
Assess the prevalence of anthropogenic threats across the Western Ghats			✓	We have collected data on the presence/absence of 26 anthropogenic threat variables in each of the 394 ranges across the Western Ghats. This has enabled us to assess how widespread each threat is across this region. We will be able to model the current distribution of species as a function of threats.

Establish a reliable baseline for subsequent monitoring efforts			✓	The data we have collected is extensive both spatially and temporally. It covers the entire Western Ghats biodiversity hotspot across a period of 30 years. It can serve as a reliable baseline for monitoring trends in occupancy and abundance in the future.

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

Funding was received from RSGF in January 2010. Fieldwork commenced in March 2010 since it took more time than anticipated to locate a suitable field assistant with a fair knowledge of the region, conversant in several languages and adequate driving skills. The fact that the survey commenced later than anticipated forced us to complete the last phase of fieldwork during the monsoon, which delayed the completion of field interviews to September 2010. Experts were not always available for being interviewed at field sites and we had to send email questionnaires to many of them. The final dataset was ready for analysis in October 2011.

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

a. We have been able to bridge a significant gap in our understanding of the regional distribution of large mammals across the Western Ghats biodiversity hotspot and how their distribution has changed in the recent past. Using the data generated from key informant surveys, we have been able to estimate local extinction and colonisation rates. The results reveal declines in distribution for 15 out of the 21 species (Fig. 1 A, B, C), which is disturbing considering that many generalist species such as the golden jackal, which would be expected to be fairly robust to environmental change and anthropogenic threats, also show a decline in distribution. Preliminary trends also reveal that the situation in protected areas across the Western Ghats is not much better than in Reserved Forests, which do not have a protected status.

b. In addition to using change in occupancy as a direct measure of change in distribution, we were able to use change in detectability as a surrogate for change in abundance. Changes in occupancy and therefore, distribution, may occur due to the redistribution of individuals across the surveyed area of interest. However, analysis of the data reveals that there is no significant variation in the detection capabilities of each key informant group (local communities, Forest Department field personnel and experts) within a specified time period (c. 30 years ago and present). However, each group is consistently detecting less between the two periods which points to the fact that there have been declines in abundance, which have been manifested as declines in occupancy. Detection probabilities have declined for all 21 species (Fig. 2 A, B, C).

c. We have generated maps of the distribution of species 30 years ago and at present, which are based on reporting rates of key informants (Maps attached as Appendix). However, we now have a spatially extensive dataset of 26 anthropogenic threats to large mammals in the Western Ghats. These threats have been classified into groups such as Agriculture, Linear Intrusions, Forest Biomass Extraction, Ecosystem Modification, Invasive Species, Human-Wildlife Conflict and Other Human Disturbances. Using these threat variables as covariates, we anticipate being able to generate much more precise maps of occupancy of species which have been corrected for detectability.

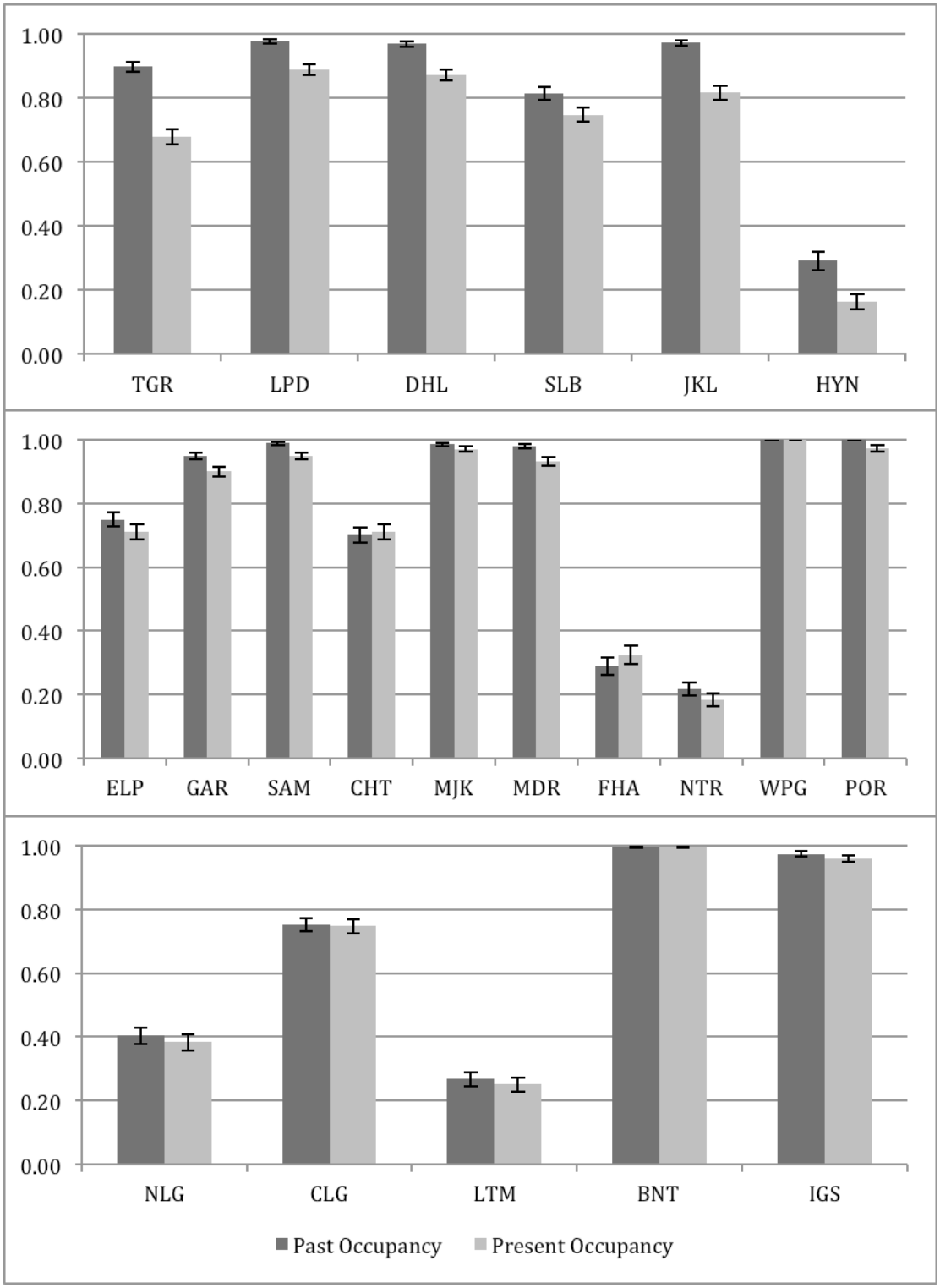

Fig. 1. Change in distribution for **(A) carnivores** TGR-Tiger, LPD-Leopard, DHL-Dhole, SLB-Sloth Bear, JKL-Golden Jackal, HYN-Striped Hyena, **(B) herbivores** ELP-Elephant, GAR-Gaur, SAM-Sambar, CHT-Chital, MJK-Barking Deer, MDR-Mouse Deer, FHA-Four-horned Antelope, NTR-Nilgiri Tahr, WPG-Wild Pig, POR-Porcupine, and **(C) arboreal mammals** NLG-Nilgiri Langur, CLG-Common Langur, LTM-Lion-tailed Macaque, BNT-Bonnet Macaque, IGS-Indian Giant Squirrel across the Western Ghats from 30 years ago (past) to present. Y-axis denotes occupancy from 0-100%

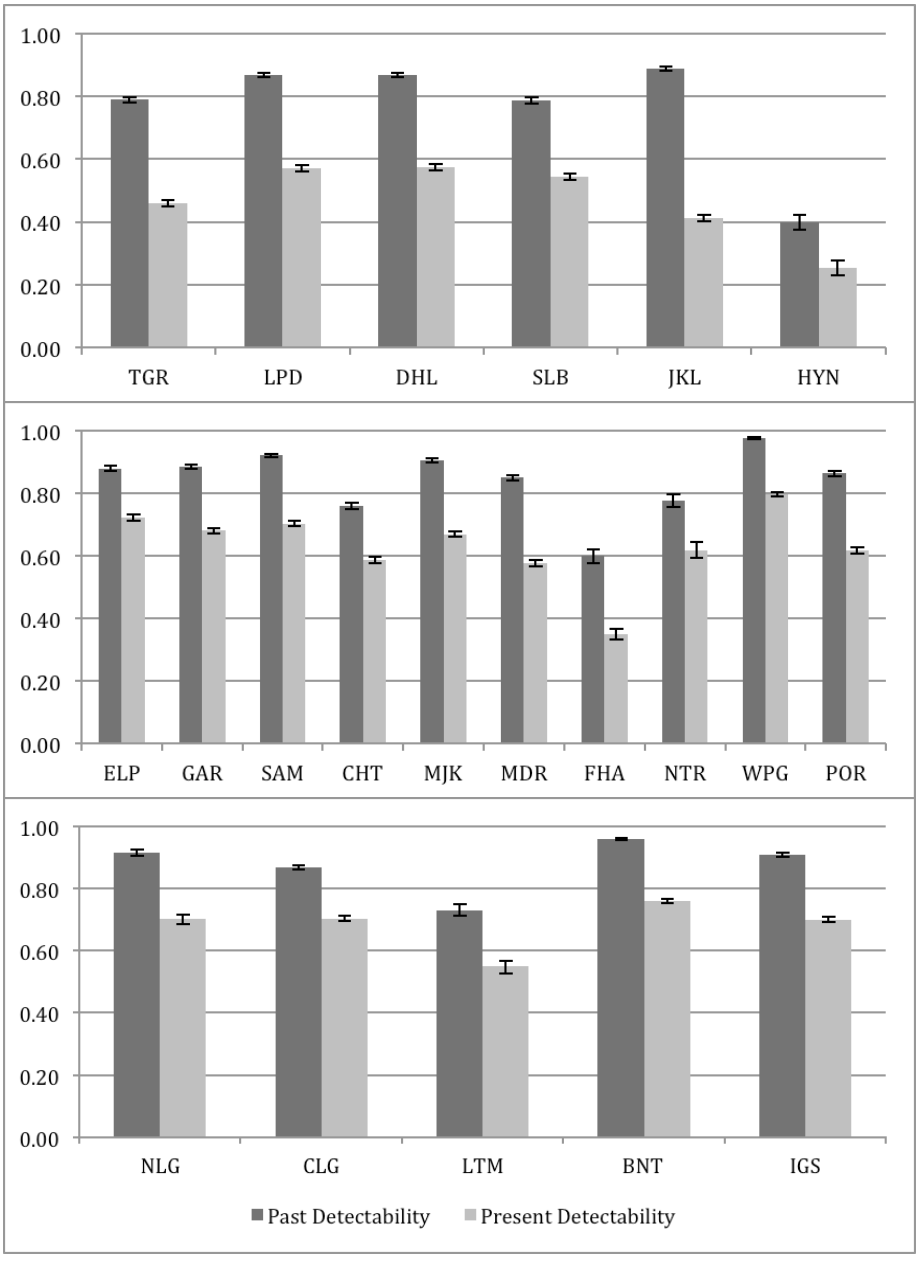

Fig. 2. Change in detectability for **(A) carnivores**, **(B) herbivores** and **(C) arboreal mammals** across the Western Ghats from 30 years ago (past) to present.

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

During the survey we carefully identified and selected people from local communities as key informants. The Forest Department also frequently recruits field personnel from local communities. These key informants provided us with their own observations of wildlife and/or their signs, which were then used to construct detection histories for each species. Local communities therefore, have been the backbone of this project in terms of sharing what they know about local fauna and the threats they face.

5. Are there any plans to continue this work?

While we have detected important patterns in the distribution and abundance of large mammals over time in the Western Ghats, there is still much to understand in terms of the processes that are likely driving these patterns. Modelling occupancy of species as a function of biologically meaningful anthropogenic threats and environmental predictors will help gain a better understanding of the drivers of large mammal distributions. This in turn will help better inform conservation and management efforts for threatened species of large mammals in this important biological region of the world.

To this effect, we intend to actively continue this project by utilising the data we have collected in further analyses to try to comprehend the processes behind the observed patterns. We also anticipate the possibility of having to undertake further fieldwork to collect additional data on anthropogenic, environmental and biological predictors to achieve some of these goals.

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

We are in the process of writing manuscripts for peer-reviewed journals that address patterns and processes behind large mammal distributions in the Western Ghats. One paper on the pilot study in the southern Western Ghats has already been published in *Biological Conservation*, a leading peer-reviewed journal in the field of conservation biology. This represents an important step forward in establishing our method of leveraging detection histories from field interviews as an important monitoring tool to assess changes in distribution and abundance of species across large spatial scales over time.

We published a short article titled "The Todas: A Vanishing Pastoral Community of the Western Ghats" in the Monsoon 2010 issue of *Bushchat*, the newsletter of the Nature Conservation Foundation. In addition, we are in the process of writing a popular article highlighting the dangers to large mammals in the Western Ghats. This will be followed by a series of blog posts highlighting issues specific to various sub-regions in the Western Ghats.

Since the core data collection phase is over, we will also submit reports to the Forest Departments of the five states over which the Western Ghats is spread – Kerala, Tamil Nadu, Karnataka, Goa and Maharashtra. Reports will also be submitted to the Ministry of Environment and Forests, Government of India, which has partly funded the overall project in the Western Ghats.

The results of the study, especially the maps generated that describe the changes in species distributions over time using reporting rates from this study, are now part of NCF's EcoQuest Nature Discovery Centres in Mysore and Ooty, and are likely to be added to a centre in Valparai and an upcoming one in Coimbatore. EcoQuest centres receive nearly 10,000 visitors each year. We also have plans to extend these exhibits to a virtual EcoQuest on the web.

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

The funds were used from March 2010 – April 2011. We were able to use the funds for the duration of the project as anticipated.

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
Per diem and wages	2269	2457	+188	Due to a later than anticipated start and delays from the monsoon, we had to extend the field survey for two months more than anticipated. As a result we had to pay 2 months extra salary for a field assistant in the northern Western Ghats.
Equipment	0	0	0	Equipment was purchased with previous funds available to NCF.
Expendables (Office & field consumables)	504	85	-419	Datasheets were printed in bulk, which reduced costs. Field expendables such as dry cells were less expensive than anticipated.
Travel (Vehicle fuel & maintenance)	2025	2241	+216	Part of this grant was used to pay maintenance costs for a second vehicle used in the northern Western Ghats.
Accommodation & Rations	1127	1112	-15	Expenses for accommodation and rations were largely as expected
Communication	75	105	+30	Part of this grant was used for communication with forest officials and other staff in the northern Western Ghats.
Total @ exchange rate of £ 1 = ` 80	**6000**	**6000**		

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

The forests and wildlife of the Western Ghats are under constant anthropogenic threat. Understanding the anthropogenic drivers of large mammal distributions will be a critical next step, which will enable us to inform management agencies about the prevalence and significance of such threats and outline the steps necessary to mitigate them. Therefore, one of our priorities is to model occupancy of the 21 species as a function of anthropogenic correlates.

This project is part of a long-term conservation initiative in the Western Ghats begun by NCF in 2007. The Western Ghats is encompasses a vast area and is administratively shared between five states. We anticipate that the project will lead to the formulation of a regional conservation plan which will enable concerted conservation efforts across the states of Kerala, Tamil Nadu, Karnataka, Goa and Maharashtra. We are working closely with colleagues within NCF and other conservation groups to utilise these data, especially the distribution maps, to constructively inform better land-use planning and further strengthening of the protected area network in the Western Ghats.

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?

We have used the RSGF logo in a presentation on the conservation status of Gaur (*Bos gaurus*) in the Western Ghats. All our future presentations and reports pertaining to this project will also carry the RSGF logo and the contribution of RSGF will be duly acknowledged in all publications and reports.