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	Mr. Sachin Vijay Chorge
Project title	A study of the Scarabaeid beetles (Coleoptera: Scarabaeidae) and economic importance in Sindhudurg district of Konkan region in Maharashtra.
RSG reference	13243-1
Reporting period	May 2013-May 2015
Amount of grant	£6000
Your email address	sachinvch@gmail.com
Date of this report	8 July 2015

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
To know the species diversity of Scarabeaid beetles in Konkan Sindhudurg district		✓		It would take about 3-4 years to know more than 80% diversity of these insects. So, more such studies are required.
Distribution status will reveal the relation of the beetles to their environment.			✓	The distribution status is studied for selected study regions and Scarabaeid beetle species collected during field visits. The relation of types of farming practices in study region with species diversity is compared.
The occurrence of beneficial and harmful Scarabaeid beetles to agriculture will become known			✓	The collected beetle species were identified, and their economic significance was recorded through field observations and available literature.
Correlation between species diversity and community structure of Scarabaeid in Sindhudurg region will be established		✓		The complete knowledge of community structure will take further few phases of study.
Agricultural practices favouring beneficial beetle species will get identified			✓	The studies and observations of endocoprid and telocoprid beetles revealed that use of larvae and adults in cow dung help in efficient mixing and release of nutrients.
The awareness of people about advanced skills of sustainable farming will be achieved		✓		The complete awareness about this insect group will take further few phases of study and community interaction.
Involvement of the local people in the diversity studies through awareness			✓	The local people were consulted for best locations to set up traps. Also, few were trained to identify and collect Scarabaeid beetles.
The awareness will be created amongst students for their local environment		✓		The complete awareness about this insect group will take further few phases of study and community interaction.
A documentary film of project in local and national language will be made		✓		The basic version of film is ready. The data mining and shooting of scenes is still going on to make the film more presentable.

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

Fortunately, our team never met any unforeseen difficulty. Many of the issues such as power shortage in study areas, public support in remote areas etc. were tackled through pre-planning.

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

The most important outcomes of this project are as follows,

1) Knowledge of diversity of Scarabaeidae beetles: The study has given the basic idea of the Scarabaeid beetle diversity and their abundance with respect to different regions and the agricultural practices. The outcomes of the study have given the way of approach for the further studies.

The diversity data is as shown in the table number I.
2) Knowledge of distribution of species throughout study areas:

Table I. Recorded species of Scarabaeid beetles from study sites and presence data.

Sr.	Species Name	Study Areas				
		SW	KU	MA	DE	VA
	Sub family: Scarabaeinae					
	Tribe Coprini					
1	*Copris davisoni* Waterhouse		✓	✓		
2	*Copris signatus* Walker				✓	✓
3	*Copris repertus* Walker				✓	✓
4	*Onitis subopacus* Arrow		✓			
5	*Helicopris bucephalus*	✓	✓			✓
6	*Catharsius molossus* Linnaeus	✓	✓	✓	✓	
	Sub family: Scarabaeinae					
	Tribe Onthophagini					
1	*Onthophagus catta* Arrow		✓			
2	*Onthophagus dama* Fabricius		✓			
3	*Onthophagus cervus* Fabricius		✓			
4	*Onthophagus spinifex* Fabricius		✓			
5	*Onthophagus unifasciatus* Schall.	✓	✓	✓	✓	
6	*Digitonthophagus gazella* Fabricius		✓			
	Subfamily: Rutelinae					
	Tribe: Anomalini					
	Subtribe: Anomalina					
1	*Anomala bengalensis* Blanchard		✓			
2	*Anomala chloropus* Arrow		✓			
3	*Anomala marginipennis* Arrow		✓	✓		✓
4	*Anomala comma* Arrow	✓	✓	✓	✓	

	Subfamily: Cetoniinae					
	Tribe: Cetoniini					
	Subtribe: Cetoniina					
1	*Chiloloba acuta* G. & P.	✓	✓	✓		
2	*Clinteria klugi* Hope		✓	✓		
3	*Oxycetonia versicolor* Fabricius		✓			
4	*Heterorrhina micans*				✓	✓
	Subfamily: Melolonthinae					
1	*Holotrichia seticollis* Moser	✓	✓	✓	✓	✓
2	*Sophrops sp.*	✓	✓	✓	✓	✓
3	*Lepidiota albistigma* Burmeister		✓			
	Subfamily: Dynastinae					
	Tribe: Dynastini					
1	*Xylotrupes gideon* Linnaeus	✓	✓	✓	✓	✓
2	*Oryctes rhinoceros* Linnaeus	✓	✓	✓	✓	✓

* SW- Sawantwadi, Ku- Kudal, Ma- Malvan, DE- Devgad, VA- Vaibhavwadi.

Table II. Number of specimens per species for each site.

Sr.	Species Name	Specimen numbers in Study Areas					Total	Percentage (%) Composition
		KU	SW	MA	DE	VA		
1	*Copris davisoni* Waterhouse	11	-	9	-	-	20	1.68067227
2	*Copris signatus* Walker	-	-	-	3	5	8	0.67226891
3	*Copris repertus* Walker	-	-	-	4	3	7	0.58823529
4	*Onitis subopacus* Arrow	63	-	-	-	-	63	5.29411765
5	*Helicopris bucephalus* Fabricius	1	1	-	-	1	3	0.25210084
6	*Catharsius molossus* Linnaeus	4	1	2	2	-	9	0.75630252
7	*Onthophagus catta* Arrow	8	-	-	-	-	8	0.67226891
8	*Onthophagus dama* Fabricius	5	-	-	-	-	5	0.42016807
9	*Onthophagus cervus* Fabricius	7	-	-	-	-	7	0.58823529
1	*Onthophagus spinifex* Fabricius	3	-	-	-	-	3	0.25210084
1	*Onthophagus unifasciatus* Schall.	26	18	8	10	-	62	5.21008403
1	*Digitonthophagus gazella* Fabricius	11	-	-	-	-	11	0.92436975
1	*Anomala bengalensis* Blanchard	67	-	-	-	-	67	5.6302521
1	*Anomala chloropus* Arrow	26	-	-	-	-	26	2.18487395
1	*Anomala marginipennis* Arrow	41	-	23	-	28	92	7.73109244
1	*Anomala comma* Arrow	75	52	37	43	-	207	17.394958
1	*Chiloloba acuta* G. & P.	7	2	1	-	-	10	0.84033613
1	*Clinteria klugi* Hope	1	-	1	-	-	2	0.16806723
1	*Oxycetonia versicolor* Fabricius	1	1	-	-	-	2	0.16806723
2	*Heterorrhina micans* Guérin-Méneville	-	-	-	5	3	8	0.67226891

2	*Holotrichia seticollis* Moser	53	39	41	30	45	208	17.4789916
2	*Sophrops sp.*	71	30	52	32	38	223	18.7394958
2	*Lepidiota albistigma* Burmeister	4	-	-	-	-	4	0.33613445
2	*Xylotrupes gideon* Linnaeus	4	2	1	2	1	10	0.84033613
2	*Oryctes rhinoceros* Linnaeus	78	5	12	21	9	125	10.5042017
	Total number of individuals per site	**567**	**151**	**187**	**152**	**133**	**1190**	
	Number of species per site	**22**	**10**	**11**	**10**	**9**	**25**	

*Area name colour suggests: **Green** – Organic farming, **Red**- Chemical Farming, **Orange** – Mix type of farming (both chemical and organic).

Table III. Menhininck's index (D) and Shannon index (H) for data in table II.

Sr.	Study Area	Species Richness Index (D)	Species Diversity Index (H)
1	Kudal (KU)	0.92390	2.52073
2	Sawantwadi (SW)	0.83788	1.58521
3	Malwan (MA)	0.80439	1.85647
4	Devgad (DE)	0.81110	1.85748
5	Vaibhavwadi (VA)	0.78039	1.60280

3) Basic idea about relation of species richness and agriculture practice type in study region (Table I, II and III) shows that there may be a relation between agriculture practices and species richness in particular area. The most species rich area is Kudal where organic practices are used and very less in Sawantwadi, Malwan, Devgad and Vaibhavwadi where chemical farming or mixed type farming is in practice. Table III shows that The Vaibhavwadi shows slightly higher H index than that of Sawantwadi region due to difference in forest cover. Vaibhavwadi has higher forest cover around farm fields as compare to Sawantwadi due to which though there are less number of species in record, the distribution of available types may be slightly even as compare to Sawantwadi region.

4) The community awareness (point of initiation): This project has turned a point of initiation in public awareness about importance of Scarabaeidae beetles and sustainable practices in farming. The workshops were conducted in study areas to introduce people with sustainable agricultural practices and model plots of farms were developed to prove the actual results of such practices. Experts from Agricultural Department of Government and Lupin foundation India (NGO) regional office were invited to give guidance on organic farming. We also invited successful organic farmers to share their success stories with farmers. The hands-on training programmes for learning methods in organic farming were organised wherein, experts taught how to prepare organic fertilisers, sprays and infield techniques for better crop production. They also promised to extend the required support whenever required.

5) Knowledge of distribution of pest: In this study it is observed that common pest species from family namely Rutelinae, Melolonthinae, Citoniinae and Dynastinae are quite abundant. Mojor pest species group's rutelinae and Melolonthinae are highly concentrated in areas where more or less chemical farming is practiced.

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

The awareness programme about the Scarabaeid beetles enhance the understanding of local people about harmful species to local trees like coconut, cashew and mango. People have learned effective management of these harmful species without causing large damage to local environment due to harmful pesticides. The adult beetle could be captured by light trapping or pheromone trapping method. The grubs (larvae) of these beetles could be captured by excavating dung piles. The people have also understood that the dung beetles are useful for agriculture as these can mix nutrients very well in the soil and increase the rate of nutrient release. People have learned to identify Scarabaeid beetles by their appearance.

5. Are there any plans to continue this work?

Yes. The project work has already taken forth and application of these Scarabaeid beetles in agriculture is under study. While working on this project we came across the fact that grubs of some dung beetle (*Oryctes rhinoceros*) remain in dung for large period and feed on it. While feeding it converts dung into pallets and make dung texture uniform. We tried to rear these grubs to get the processed dung. We lab tested the product and found that the product is high in nutrient content. The further study may include the captive rearing and breeding of these beetles to get fertiliser like product as in vermicompost. We named it as "Grub Compost". Recording remaining species and study of the community structure of Scarabaeid beetles by studying population dynamics will also be the next phase of the project.

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

The results will be published in periodicals and research journals. As well as the local newspapers will be informed about the success of this project.

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 actual grant was used for 1 year from the commencement of the project. But due to some technical problems in insect identification and confirmation, the project was extended for another year. The major work of field visits and data collection was completed in first annum of the project. The remaining lab work and some season specific data collection were done during extended period.

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
Light trap (2 items): Rescolar insect light trap with different light sources and powerpack.	171	171.29	-0.29	The difference is due to change in exchange rate at the time of fund receiving. (-do-)
Pitfall traps	171	171.29	-0.29	-do-
Insect Killing Jar	7	7.51	-0.51	-do-

Storage boxes	205	220.14	-15.14	-do-
Insect pins	46	42.82	3.18	Quantity was adjusted
Preservatives and Consumables	114	113.12	0.88	Quantity was adjusted
Field Gears	171	174.72	-3.72	-do-
GPS: Garmin Etrax	228	244.88	-16.88	-do-
DSLR camera with Macro lens and Accessories	854	783.06	70.94	Instrument of lower cost was selected so as to cop up with other budget costs.
DTP work: Banner and posters for awareness campaign	137	139.99	-2.99	-do-
Public Meetings	114	99.75	14.25	Some costs were managed locally by public participation
Programmes in Schools and Colleges	57	59.95	-2.95	-do-
Workshop on sustainable farming	456	483.78	-27.78	Logistic arrangements including seating arrangements, travel and food were arranged. The expert charges for each workshop are included.
Field assistant	456	489.41	-33.41	-do-
Expert Charges	342	342.59	-0.59	-do-
Travelling	1139	1129.94	9.06	Travelling mode and visit days were adjusted.
Lodging and Boarding	912	916.30	-4.30	-do-
Printing	114	112.00	2.00	Print quantity was adjusted.
Stationery	114	116.48	-2.48	-do-
Miscellaneous	192	187.20	4.80	We had to buy some extra equipment (farm equipments) and consumables (seeds and material organic manure and sprays) for workshop also permanent structures of fertilizer making models were built.
Total	6000	6006.22	-5.22	The difference in budget was adjusted by other means.

*Note

Budgeted Amount: Exchange Rate: 1 British Sterling Pound = 87.78 Indian Rupees as on 15 January 2013

Actual Amount: Exchange Rate: 1 British Sterling Pound = 81.73 Indian Rupees as on 7 May 2013

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

We would be applying for next phase of the RSGF to continue project with following objectives:

1. To record maximum of remaining Scarabaeid beetle species.

2. To carry out comparative study of beetle grubs in natural and captive conditions to get clear understanding of their role in nature.
3. To rare different Scarabaeid beetles to improve the process of Grub compost production and study its characters.
4. To spread awareness about sustainable practices and importance of insect fauna to environment and human.

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. The logo was used on banners, certificates and power point presentations. The banners were displayed during competitions and workshops. The certificates were distributed to the participants of poster competitions. Also, during public meetings, workshops and competitions the name of funding agency i.e. Rufford Foundation was announced.

11. Any other comments?

I am thankful to my referees, Dr V. P. Uniyal, Wildlife institute of India; Mr Thomas Johannes Simonsen, Department of Life Sicences, Natural History Museum, UK and Mr Savio Silveira, GreenLine, India.

I thank my guides and team members Dr Raghunandan Athalye and Dr Amol Patwardhan who guided me during my project.

I thank my friend Mr Rahul Khot from Bombay Natural History Society for providing laboratory facilities and related help.

Especial regards to my family, friends, villagers from Sindhudurg, school and college officials for rendering me with their precious support throughout the project period.

I would like to thank RSG for giving me big opportunity to launch my research project. It nurtured my dream to do something good for science and society especially for my native region which is a rural agro-village.