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	Dr. Juliet Vanitharani
Project title	Conservation status of bats of southern Western Ghats, India, with particular reference to Salim Ali's fruit bat (*Latidens salimali*).
RSG reference	1080-C
Reporting period	within 2 years
Amount of grant	£25,000
Your email address	jvanitharani@gmail.com
Date of this report	13st.Septmber 2016-09-12

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. Continue bat survey in southern India including Western Ghats to evaluate habitat quality and climatic changes through bat's bio-indications.		YES		Being one of the hot spots for biodiversity southern Western Ghats provided an un-commendable exposure to bat survey. Each fieldwork was unique. Created database for Indian bat species diversity and estimation of ecosystem services through acoustics impact. Data procured helped to link bio-indications from bat species diversity to the climate change effect in the habitats of forest and agricultural areas. These facts enhanced 'value' to bat species!!
2. Database creation on species diversity, distribution, richness and assessment of threats and anthropogenic impact in each eco-tone. **(Plate1a-e)1080-C**		YES		Developed conservation and status assessment on bat species in Agasthiyamalai Landscape Tamil Nadu part. Created awareness through publication published (disseminated the data) about species diversity, distribution, richness and assessment of threats and anthropogenic impact in each ecotone.
3. Conduct detailed investigation on the status of endemic Salim Ali's fruit bat (Distribution, Population, and Roosting). **(Plate2)1080-C**			YES	Documented the impact assessment of fruit bats with special reference to *Latidens salimalii.* Estimated (to some extent only from the known day roosts) population, distribution and survival threat status for endemic *Latidens salimalii* and its ecosystem services. Published (disseminated the data) about the ecosystem services of *Latidens salimalii*

4. As the Tamil Nadu State Biodiversity Member address the policy makers and demand Ministry of Environment and Forests, Govt. of India to revise the Indian Wildlife Protection Act to remove fruit bats from Schedule V (vermin category).		YES		Kept as an agenda in the biodiversity board saying *Can the Indian Constitutional Provisions Protect our Biodiversity*? **Request for Revision In IWPA** Schedule V of the Indian Wildlife Protection Act 1972 treats fruit bats as VERMIN. Tamil Nadu State Biodiversity Board passed recommendations to the Ministry of Environment and forests to shift fruit bats to Schedule III under IWPA
5. Estimation of ecosystem services through acoustics impact. Link this species information as bio-indication on habitat quality			YES	Used the bat species richness and activity richness data from the study site to prove bats are the bio indicators. Study area being one among the hotspots for biodiversity of the world holds enormous endemic endangered species and most of them are nocturnal and use the same habitat of bat species. **A Sample of Bat's Bio-indications** 1. Bats are the indicator of anthropogenic impact on ecosystem, climatic changes and seasonal variations in the habitat. 2. Even a small change of habitat quality – especially through anthropogenic activities - had a significant effect on bat assemblages as well as their interactive activities. The said bio-indications are applicable to all the nocturnal endemic species of the habitat including the tiger, slender loris etc.
6. Used echo-call information to estimate ecosystem services and		YES		**Bats are the key stone species.** Echo-call information from the forest and agro ecosystem provided enormous information about bat species activity patterns, species assemblage and species

emphasise bats as key stone species both locally and nationally through awareness programmes and academic workshops **(Plate3a-b)1080-C.**				richness (if these three factors are positive that is an indication for a healthy ecosystem with good community assemblage of species diversity). Combination study of bat species wing morphology, aerodynamic predictions on flight performance with the species specific bat calls helped to pinpoint the ecosystem services of bat species in the ecosystem.
7. Bat species awareness programmes and academic workshops **(Plate4a-b)1080-C.**			YES	Convened awareness programmes to college students by presenting special lectures and workshops. Created awareness to the forest department field staff and local public through awareness workshops Disseminated bat diversity conservation through publication with field proof data on their ecosystem services.
Publications: International research publications 9.chapters in books 4 and 1 articles in newsletter and created awareness through media news channels, magazines daily news papers etc. **Workshops:** Conducted 18 interactive workshops, and created awareness to the students of foot hill colleges and schools; forest dwelling kani tribes in their settlement area and to the forest department field staff.				
8. Assessment of threats to bat's survival and identification of threat prone areas, with particular reference to rare and endemic species conservation **(Plate5)1080-C**		YES		**Major threat for forest bats:** Predominant forest bats use caves as their day roost, the tribes who has settled in the forest landscape go for honey collection to bat caves.(Note: Forest honey bees use the wide opened cave mouths to build their huge hives). Tribes use fire torches to chase the bees from hive. Some tribes use the cave roost of bats for night halts and they burn fire for cooking and warm up the halting place. This creates suffocation death to cave bats. **Bats of the Plain:** Most of the bat species of

				the agro-ecosystem use the abandoned buildings and temple towers. They are mass killed during building renovation Along with the common species the rare endemic bat species roosts were also affected
9.Disseminate the research outcome information to the Tamil Nadu Forest Department and Ministry of Environment and Forests, emphasising both the biodiversity value and the commercial value of the ecosystem services of bats		YES		Disseminate the research outcome information to the Tamil Nadu Forest Department. The Tamil Nadu Forest Department through Biodiversity Board, recommended the Indian Government to revise the status of fruit bats from "vermin" category under Schedule 5 of the Indian Wildlife (Protection) Act, 1972.

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

Unforeseen difficulties: Major threats for forest bats in southern Western Ghats (day roost anthropogenic disturbances) really kindle my thoughts for the apiary introduction (keeping apiary at home make all the family members involved in income generation without much financial investment). I interacted more with the tribal people who have the forest settlement. This interactions and sharing of ideas to uplift their lively hood impressed them a lot (they even think killing bats are really harming me (their trust worthy friend). When I do bat survey work in the forest interiors I hire them for field assistance and i trust them more than the forest field staff. This interaction really created great awareness among them.

I tackled the honey collection problem by suggesting them with '*apiary at home'*. Instead of going to the forest interiors and staying in caves and collecting honey they can have apiary at home and round the year they can harvest honey at home. This suggestion was viewed by the Tamil Nadu forest department as '*alternative income generation*' for the tribal (forest settlement) as well as the people settled in the fringe margin villages of the southern Western Ghats. The Forest department believe the income from apiary at home can bring income to the family without any investment and may stop public going in to forest for head load collection and other forest produce (which really affect the biodiversity). In addition bees are the champion pollinators. Cross pollination enhance natural breeds with

high vigour as well as hybrid formation the basics for the formation of new species. The true investment for the biodiversity enhancement. **(Plate 5)**

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

1. Enabled acoustic data collection to continue in Western Ghats to build a comprehensive bat call library database for Indian bats, which can be used to carry out non-invasive bat monitoring in protected areas throughout India.
2. Documented the identified key conservation areas for bats in Western Ghats. Recorded assessments of threats to the bat population within protected areas. Innovated solution to reduce roost disturbance through the introduction of 'apiary' as an alternative income generation.
3. Disseminated the research outcome information to the Tamil Nadu Forest Department and Ministry of Environment and Forests, Government of India emphasising both the biodiversity value and the commercial value of the ecosystem services of the bats. Recommend the Indian Government to revise/shift the status of fruit bats as "vermin" under Schedule 5 of the Indian Wildlife (Protection) Act, 1972 to schedule three.

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

Researchers and foot hill college students developed capacity building, locals and tribal community live in forest settlements acquired awareness about bats as bio-agents and developed the skill on apiary as an alternative income generation.
Workshops trained the forest department field workers to understand the bio-indications through bats and enabled them drafting conservation management action plan to protect the habitat

5. Are there any plans to continue this work?

Yes, plan to continue bat conservation work without any gap to the field work.
Last meeting with my collaborators (Harrison Institute UK) at Durban gave me following new objectives to the continuation of the bat study

1. Planning to have genetic identity for the bat species diversity of Southern Western Ghats. Got the laboratory support assurance from polish academic of science – Prof Dr Wiesław Bogdanowicz, Museum and Institute of Zoology PAS, Poland

2. Planning to do Radiographic and CT image comparative studies (too small morphological differences in their osteological characters can be detected)

among the cryptic species in collaboration with the Senckenberg Research Institute and Natural Museum Germany.

3. In addition to bat diversity information the outcome of the proposed new venture will bring added light to the field of phylogeny (which is a new venture for Indian bat species)

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

1) Disseminate data to the international scientific community through publications. Publish the acoustic information on bio indication (both as local reports and a peer-review scientific publication) and make bat call library for Indian bats formulate it available online (for example on a website such as the Western Ghats Indian Biodiversity Portal).

2) Disseminate the research outcome information to the Tamil Nadu Forest Department and Ministry of Environment and Forests, emphasising both the biodiversity value and the commercial value of the ecosystem services of bats.
3) Already shared the outcome of the project through awareness programmes to public through media and planning to have more programmes with media.

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

Sl.no	Nature of major activities under project work	Timescale Work completion status
1	Fixing up of Field stations and collection of Acoustics monitoring work Purchase of acoustic equipments and field material for bat work	First 8 months 80% of work over
2	Acoustics survey in Core area, Buffer zone and Transition zones (where there is anthropogenic impact) through our regular field work except the rainy period of the month. **(Plate 1 a b c d e)**	20 months of work 80% over
3	Seasonal acoustics monitoring, collection of data on bio indication, climate change and human interference.	24 months 100% of work over
	Capacity building on wildlife management for	Completed 18

	researchers, students public and NGOs working in southern Western Ghats (bat conservation was emphasised in all programmes). Awareness to human settlements in forest area and conservation management action plan work shop to the forest department field workers (training on apiary ,establishment of 3 demonstration units) (Plate 3-4)	programmes in 24 months. Incurred extra funds from local donations 100%
	Creation of database (Seasonal, data analysis on bat diversity, richness in activity, and its impact on resource management, population status and species richness exhibit the bio-indications). Prohibition of human activity in the home range areas of 'schedule I' animals. Proper demarcation of core and buffer zone to restrict human activity Disseminate data to varied audiences. Drafting management action plan for species conservation and habitat improvement	Last 4 months -100% of work over

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. (Local exchange rate used=1UK£ = Rs.100/-

Item	Budgeted Amount	Actual Amount	Difference	Comments
4 bat detectors -1set of SM2BAT+ with accessories (999+159+150+125= $1433) **Postage and delivery charges** ($169) Total cost ($1433+169=US $ 1602) US $ 1602 = £ 960 4sets (£ 960 x 4= £3840)	**3500**	**3521.36**	**21.36**	Excess expenditure may be due to postage /transport charges for the purchase of equipment's
Sonobat software for acoustic analysis @ £200	**200**	**154.41**	**-45.59**	Most of the software of the equipments came as free therefore Utilised the balance grant amount

				under this head for procuring research permissions
Training and awareness to local tribes and forest dept field officials (£ 250/Protected Area = 250 x 5PA= £ 1250	**1250**	**935.61**	**-314.39**	Conducted more number of programmes (18) than proposed budget and met the excess expenditures through donations collected. Utilised the balance grant amount under this head for meeting the excess field cost
Production of leaflets notice boards and banners promoting bat conservation (£150/Protected Area=£150x5=£750)	**700**	**335.93**	**-364.07**	Expenditure to procure awareness supplements was more exceeded the proposed budget surplus expenditures were met through donations collected .Utilised the balance grant amount under this head for meeting the excess field cost.
Field equipment's needed (Batteries ,chargeable lights, sleeping bags, field tent, mist nets Harp traps and camera)	**3800**	**2845.68**	**-954.32**	Field equipments such as Mist nets, harp trap etc. were supplied by Harrison institute UK, During collaborator's visit to our study site. Utilised the balance grant amount under this head to meet the excess field cost
Field costs for 192 nights (8 nights at forest interior /month) @ £21.00 per night (Accommodation, subsistence and fuel costs)	**4000**	**5198.93**	**1198.93**	Executed more field visits than budgeted, The excess field cost was met through the left out balance amount from other heads
Field support worker(s) costs = £1900/ 12 months. For 24 months	**3800**	**4000.98**	**200.98**	Hiring charges exceeded the proposed budget because of the more field visits than budgeted, the excess amount was met

				through the balance amount from other heads
Forest research work permission for 5 PAs, (Kanyakumari KMTR, Tirunelveli, Srivilliputhur, Megamalai, Anaimalai £50/PA/year) 5x50 =250/year For 24 months	**500**	**663.24**	**163.24**	Research permission charges exceeded the proposed budget because of the more field visits than budgeted, the excess expenditure was met through the balance amount from other heads
Literature: Reference books and reprints, Telecommunications, communication internet access (£250/12months)	**500**	**487.36**	**-12.64**	Utilised the balance grant amount under this head for procuring research permissions
Incidentals: Including photography, medicines, insurance (£500 /12 months) = £1000	**1000**	**854**	**-146**	Utilised the balance grant amount under this head for the excess field cost incurred than the proposed budget
Office management, data processing Dissemination costs (publications),Professional Services, Maintenance of equipment, Meetings & Events -organisation charges (15 % of total project cost)	**3750**	**3676.3**	**-73.7**	Utilised the balance grant amount under this head for the excess hire charges incurred than the proposed budget
Lively hood improvement (tribals and foot hill finge village locals) through alternative income generation programme-Apiary. (To evade people entry to forest interiors to procure forest resources such as honey, firewood, medicinal plants etc. Apiary is suggested as alternative income generation	**2000**	**2326.2**	**326.2**	The excess expenditure under this head was met through the left out balance amount from other heads under the project.

programme). **Establishment of Apiary training centre to educate the locals. (**Anthropogenic disturbances / threats to the day roosts of bats were expected to be under controlled to some extent.) **(Plate 4)**				
Total	**25000**	**25000**		

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

Last meeting and discussion with my collaborator and Director of Harrison Institute UK, Dr Paul Bates at Durban, South Africa came out with new objectives to look ahead of the present study

Step I Planning to have genetic identity for the bat species diversity of Southern Western Ghats. Got laboratory support assurance, from polish academic of science. –Through Prof Dr Wiesław Bogdanowicz, Museum and Institute of Zoology PAS, Poland.

Step II Planning to do Radiographic and CT image comparative studies (too small morphological differences in their osteological characters can be detected) among the existing cryptic species. Collaboration with the Senckenberg Research Institute and Natural Museum Germany, the study has been planned to be Mikro- and Nano CT (computed tomography). The agreement has been made with Dr Jörg Habersetzer, Radiologie / Paläobiologie of Senckenberg Forschungsinstitut ,Senckenberganlage Frankfurt

Step III Planning to document bat diversity information with genetic and acoustic background. This proposed new CT imaginary venture will add light to the field of phylogeny (which is a new venture for Indian bat species)

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 used the Rufford Foundation logo in all the materials and outcome results produced and published under the project.
Yes RSGF receive publicity from acknowledgements about the research support from Rufford Foundation in all the research publications and presentations of the project out comes

11. Any other comments?

IN INDIA: Detailed information about the bat distribution and their impact in the forest and agro-ecosystem is essential for implementing bat conservation strategy.

Note: In India, there is a need to prove to the government and public why bats have to be cared for and conserved

To tell the reality:

1. There would have been no diversity data about the bats of southern Western Ghats if Rufford Foundation failed to support our field work from 2002 onwards.
2. Only because of the financial assistance from Rufford Foundation all the field works based on bat have been carried out in one of the hotspots of the world.
3. There would have been no study on *Latidens salimalii* (endemic endangered Fruit bat of Southern Western Ghats)without the immense help from Rufford foundation;
4. If it was failed by Rufford foundation, till today *Latidens salimalii* might have been described as 'UN KNOWN' by IUCN. **(Plate 5)**

The Entire study on bat species diversity and conservation in India is purely based on the support from Rufford Foundation.

List of publication between 2014 and 2016

Sl. No	Authors and title of the paper	Publication details
1	**Juliet Vanitharan**i, Paul Bates J,Tanja Straka, Petchiammal G and Mercy C **2016** Habitat use of Bat Community on the Trail of River Thamiraparani, Agasthyamalai Biosphere Reserve, Southern Western Ghats, India	17th International Bat Research Conference, Durban, South Africa August 1st - 6th 2016
2	**Juliet Vanitharani**, Mercy, Selva Ponmalar and Petchiammal **2015** Indian False Vampire Bats (Carnivore), the Health Managers of Forest and Agroecosystems Juliet	SIRJ-BES Scrutiny International Research Journal of Biological and Environmental Science Volume 2 Issue 8 (August 2015) 28-41Pp ISSN 2348 - 5787 www.scrutinyjournals.com
3	**Juliet Vanitharani 2015** *Latidens salimalii* (Endemic, Endanger Fruit Bat) A Reliable Propagator of Endemic Trees of Southern Western Ghats	Journal of Life Sciences 9 (2015) 423-435 doi: 10.17265/1934-7391/2015.09.004
4	**Juliet Vanitharani 2014** Sustainable Management of Forest through Ecosystem Services of Bats.	Scrutiny International Research Journal of Biological and Environmental Science SIRJ-BES Volume 1 Issue 6 2014.Pp. 40-47 ISSN 2348 - 5787
Sl. No	**Authors and title of the paper**	**Publication details**
5	Selva Ponmalar, S. and **Juliet Vanitharani, 2014** Insect Pest Management by Horseshoe Bats of Kalakad Mundanthurai Tiger Reserve, Tamil Nadu,	Small Mammal Mail - Bi-Annual Newsletter of CCINSA & RISCINSA Volume 6 Number 1September 2014 Pp 40-47. ISSN 2230-7087
6	Selva Ponmalar S and **Juliet Vanitharani 2014** Insect pest management by the horse shoe bats (Rhinolophus species) in the forest ecosystem of Kalakad Mundanthurai Tiger Reserve, India	Scrutiny International Research Journal of Biological and Environmental Science SIRJ-BES SIRJ-BES Volume 1 Issue 5 2014. ISSN 2348 - 5787 www.scrutinyjournals.com
7	Gladrene Sheena Basil, **Juliet Vanitharani,** and and Jayapriya K **2014** Bat Classification based on Perceptual, Spectrum and Cepstral Features in Kalakad Mundanthurai Tiger Reserve	International Journal of Innovative Research in Advanced Engineering (IJIRAE) Volume 1 Issue 1 (March 2014) Bat Classification based on Perceptu

8	Gladrene Sheena Basil, **Juliet Vanitharani,** and Jayapriya K **2014** An Extensive Review of Methods of Identification of Bat Species through Acoustics.	International Journal of Computer Applications Technology and Research,Volume 3– Issue 4, 186 - 192, 2014 www.ijcat.com ISSN 0952-8091
9	Gladrene Sheena Basil, **Juliet Vanitharani**, and Antonysamy A and Jayapriya K4 **2014** An analytical report of Perceptual, Spectrum and Cepstral Feature-based Bat Classification in Kalakad Mundanthurai Tiger Reserve with K-NN and Bayes Classifiers.	International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 3, March 2014

PUBLICATION of CHAPTERS IN BOOKS (Authored chapter)

2014-2015	**Chapter Title :** *High levels of faunal and floral endemism* **In Book Title :** *A Journey of 25 years in Conservation Publisher* : **Tamil Nadu Forest Department Kalakad Mundanthurai Tiger Reserve Tirunelveli.(State Govt.of India)**
	Chapter Title : *The Night Flying Goblins of KMTR* **In Book Title :***Florilegium of research studies on KMTR* Publisher : **Tamil Nadu Forest Department Kalakad Mundanthurai Tiger Reserve Tirunelveli.(State Govt.of India)**
	Co authered : Christian C. Voigt, Luis Aguirre,*, M. Corrie Schoeman,***, Juliet Vanitharani,*,** Akbar Zubaid5,***** Book Title: *Bats and buildings: The conservation of synanthropic bats* 2015 **ISBN NO : 01092014**

Plates below:

Plate 1(a, b, c, d & e)

First Sighting of Endemic Endangered Fruit Bat *Latidens salimalii* from Agasthiyamali hill complex Won the Appreciation of IUCN (International Union for Conservation of Nature)

Plate 2

Plate 3 (a & b)


Plate 4 (a & B)

Plate 5 (Apiary - honey extraction demonstration)