

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. 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. 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	Dhaval Patel
Project title	Assessing the distribution, status and conservation threats of muggers (<i>Crocodylus palustris</i>) in Charotar region, Gujarat, India
RSG reference	13224-1
Reporting period	05 th July 2013 to 15 th August 2014
Amount of grant	£4027
Your email address	dsp@vncindia.org
Date of this report	30 th August 2014.

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 the status and distribution of mugger crocodiles in Charotar region			Fully Achieved and still continuing	The mugger populations were counted throughout the study area of Charotar region. Different methods such as direct counting during day as well as night counting (eye shine count), indirect signs (pugmark, body marks, remains of egg shells, faecal matter), den presence and local people interviews were used to establish the status and distribution of crocodiles in Charotar region. More than 60 potential wetlands in the study area were surveyed for the presence of crocodiles, among which nearly 30 wetlands showed the presence of mugger. However many of the wetlands showed only seasonal presence only (especially in monsoon season). The study found the large and significant crocodile populations mainly in six areas, namely Deva, Heranj, Malataj, Traj, Marala- Nagrama and Vaso. The study concludes that these areas provide prime habitats and need urgent attentions from forest department. Additionally, We have kept monitoring the wetlands to understand their distribution.
2) Understand the socio-economic drivers of mugger distribution and prevailing threats			Fully achieved for the extent of this grant	Successfully completed over 400 interviews from 43 villages within the study area as proposed, from which only 360 could be included in the assessment. The remaining had to be excluded from the sample due to incomplete information provided by the respondents. The sampling procedure consisted of personal interviews based on the instrument developed for this project (see Annex 1). We found an overall positive attitude toward the presence of muggers in the area. 44.75 % of the total respondent reported that the mugger population has increased over the last 10 years.11.61% reported that the population has remained stable, whereas only 3.6 % of the respondent reported a decrease in

				<p>mugger numbers over these years. Education followed by age was found to be the strongest factor affecting the attitude as well as knowledge of the local communities. Another finding was media plays a major role in affecting the perception and attitude of the people. On the other hand, we will also look at the opportunities of sharing the results through participation in national/international conferences. For instance, we recently presented a paper under the title "Attitudes, Perceptions and Knowledge of the local people regarding crocodile and their conservation in Charotar region, Gujarat, India" at the IUCN SSC Crocodile Specialist Group's World Crocodile Conference in Louisiana, USA in May 2014.</p>
3) Promote public awareness and education for the conservation of muggers			Fully achieved and ongoing	<p>We carried out the crocodile awareness programme in 25 schools. A poster on the importance of crocodiles was prepared in Gujarati language and distributed widely to enhance the level of awareness. Posters were put up in village school classroom and notice board. We are hoping that the poster would inspire children and be on display for more number of years in the classrooms.</p> <p>A brochure containing information on how to co-exist with crocodiles was also prepared (in Gujarati). More than 3500 such brochures have already been distributed among school students and local communities. The study suggests the need of regular conservation education programmes to the communities and students around these mugger occupied areas.</p> <p>The participants were very happy and appreciated this opportunity of interacting with our team personnel regarding their everyday difficulties while living with wild animals.</p>
4) Fostering conservation through capacity			Fully Achieved	<p>We have completely achieved this objective through significant success. We have already conducted training programme on 14th-15th December 2013</p>

building				for the crocodile enthusiasts and interested college students. We also arranged a workshop “Rescue and Rehabilitation methods for crocodiles” on 21st February 2014 for the in service forest departmental for the forest staff, conservation NGO. Interested youths from the village harbouring the mugger occupied wetlands have also been identified and are trained in mugger monitoring, who are acting as local monitors for the project. The monitoring cum training programme was a huge success and we plan to continue this event every year. We were also been invited by Gujarat Forest Department to present our findings and train the forest department staff in rescue and rehabilitation of muggers in the region.
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

We did not find any difficulties in achieving the given objectives, except during the awareness and education programme. Few schools rejected our invitation, even after our rigorous efforts to convince them to carry out crocodile awareness programmes. Sometimes the scheduled programmes were postponed to next date to avoid periods around the examination, vacation etc. However this did not hinder us in fully achieving the second objective of the project.

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

First, to me the most important outcome of my project was the first ever comprehensive assessment of the status and distribution of crocodiles in Charotar region. This data is significantly going to assist the local forest department in management of this crocodile population. While data are still yet being analysed, it is most apparent that this region comes out as one of the finest population of crocodiles in India and that they exist primarily in extremely close proximity to residential areas. This understanding brings joy as well as worry.

Secondly, the results obtained during this project represent the first baseline of attitudes, perception and knowledge concerning the crocodile’s conservation issues in the Gujarat. This mugger population exist primarily in extremely close proximity to residential areas and therefore, the actions and decisions undertaken by the local residents play a important role in the future persistence of the mugger in this region. The support from the local community and the realisation that locals are beginning to understand the importance of crocodiles in their environment was an important outcomes of the project. People really saw crocodiles as part of their culture and religion and did not have any grudge of the occasional loss of livestock. Consequently, this baseline data will enable other crocodile researchers and wildlife managers to evaluate their progress in enhancing awareness and participation of the local community.

Third, but definitely not the last, outcome of the project was capacity building of the various stakeholders such as forest department staff, local NGO staff, biology students and animal rescuers through providing them training of management, research, rescue and rehabilitation methods in concern to crocodile conservation. One workshop on management and a training program on monitoring and research for crocodile conservation was conducted. The very appreciative enthusiasm of the participants, especially the college students would definitely create a group having knowledge on human–crocodile interactions. We are sure that this programme was an example for motivating participant in this subject matter.

The possibility of developing future studies (monitoring and evaluation of future attitude and behaviour modification strategies)

With the availability of this new baseline data regarding the mugger population, people's relation with the crocodile, there are possibilities for replication and adaptation of the tools developed during this project. Our aim is to have other researchers and wildlife managers using the obtained results; therefore, they will be made available to all involved in research, conservation or management of muggers. As the attitudes and perception are prone to change with time and change in prevailing existence and relations, it is necessary to keep a track of the changes in people's attitudes. It is after the people who have to live near these crocodiles.

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

1. Local communities' involvement is active and appreciable throughout the project and that they are directly and indirectly benefitted by the project. The involvement of the local communities is reflected in the approximately 400 respondents that kindly agreed to participate in the interview survey. The participants were directly benefited in terms of knowledge in relation to importance of crocodile in environment and human–crocodile animal interaction. Our educational programmes in schools and communities are yielding significant results. The student participants are committed to share the acquired knowledge in their families and communities which would certainly help to disseminate information on crocodile behaviours and how co-existence between crocodile and humans can occur. The enhancement of awareness among the local communities has shown strong desire and willingness to get involved actively in conservation activities. Throughout the year, we have documented a substantial increase in the number of residents that actually call us to report problematic crocodiles who have ventured close to the human habitation rather than doing something themselves. Local people were willing to discuss freely and helped to provide a clear perspective of these issues.
2. This study also was able to make a strong collaboration with the local District Forest Department, especially in rescue and rehabilitation of crocodiles in the wetlands of Charotar.
3. Many young students from the villages like Deva, Vaso, Malataj and Heranj (which have significant crocodile population) showed interests in working as volunteers with us for monitoring the crocodiles. They act as "croc watcher" helping with our project work via providing us with sighting information and other behavioural to us. Vishal Mistry, a young resident of Vaso village joined us as field assistant helping us in monitoring and other project activities.
4. We organised a two day workshop cum crocodile monitoring programme for two days (14th -15th December 2013). More than 40 participants took part in the survey, which lead to 98 direct sightings of individual crocodiles. Many of the participants for the first time realised the existence of such a crocodile place amongst a highly populated area with minimal conflict. They actively participated in the event and that these activities have enabled them in the identification of size

classes of crocodiles and updating the field data sheet. Many of the participants kept volunteering with us even after the event was finished. Involvement of students from different universities and careers as part of the event has resulted in very interesting synergies amongst them and in their individual interests. Many have directed their attention to the depleting environment in India and have decided to take up career in wildlife conservation.

5. Are there any plans to continue this work?

1. Yes, this work is the first step in an ongoing effort to monitor the existing crocodile population, promote a sustainable interaction between the humans and crocodiles, raising environmental awareness and exploring the role of the local communities in the management and conservation of crocodiles. Our research has not stopped and will continue. We are currently analysing the data and will write a publishable scientific research article on the mugger crocodile population and habitat viability of the said region.
2. We would like to continue my work in the human-wildlife interface but with greater focus on extension and awareness creation. We would continue education programme through documentary show, presentations and competition, etc. to impart knowledge to local community people on muggers' behaviour and tactics to be safe from aggressive wild animals in order to enable them to live constructively.
3. Based on the outcome of this study, the detail investigation of habitat quality, nesting behaviour and the effect of human use on muggers in these wetlands are immediately needed in order to design an effective conservation measures to ensure their long term survival.
4. A similar assessment, in line with the present study, is being planned in the Vadodara region (the region with highest number of crocodile's attacks in India) for the next year, as part of a bigger initiative to protect and manage these mugger populations in Gujarat.
5. I also have a plan to prepare a database on mugger-induced human injury/casualty in Gujarat and subsequently other areas in India having such problem in order to prepare a database in the national level. I believe that this type of database will help the management authority with stringent information for reviewing the existing conflict management and other mechanisms for further conservation and management planning process.
6. Anirudh Vasava, one of the team mates is planning to present a research paper with a possible title "Spatial risk model and mitigation implications for human-crocodile conflict in western India" at the student conference for conservation science to be held at Cambridge (UK) in 2015.

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

The information derived from this study would be widely shared to the local communities, researchers, wildlife managers and interested parties through public forums, media, interaction programmes and publication of findings. Once our rest of the data are compiled and analysed, we will provide a complete report to the Gujarat state Forest Department to assist them in managing the crocodiles in this region, and replicate the methods elsewhere in Gujarat. A PDF copy of the report will also be emailed to other conservation organisations working in Gujarat and elsewhere in India. We will also write the results in a scientific format to be published in a scientific journal and/ or the Crocodile Specialist Group Newsletter for the scientific community. Additional, we also plan to submit press releases to all the newspapers (English as well as) widely read in Gujarat to share our final conclusions publically. Over the last one year, we have made several power point presentations in various school and colleges explaining about our efforts on crocodile conservation. We were also invited to present our work during a crocodile conservation and management workshop for the Forest Officers involved in tackling the crocodile management at Vadodara, Gujarat, India. On the other hand, we will also look at the opportunities of

sharing the results through participation in national/international conferences. For instance, we recently presented a paper under the title “Attitudes, Perceptions and Knowledge of the local people regarding crocodile and their conservation in Charotar region, Gujarat, India” at the IUCN SSC Crocodile Specialist Group’s World Crocodile Conference in Louisiana, USA in May 2014. This was an excellent opportunity to share the results to its full extent within a socio-cultural perspective. Anirudh Vasava who is helping me in data collection and analysis is also planning to present the results of the project at the Students Conference on Conservation science to be organised at University of Cambridge (UK) in March 2015. Most importantly, we plan to utilise the data to construct a crocodile conservation plan for Gujarat.

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

The RSG was used throughout the project period as per the plan. In fact we were able to finish the objectives in less time than anticipated. The grant was obtained in July 2013. Obtaining research permits and recruitment of field personnel took up the first 2 months. Monitoring activities and interview survey started as soon as we got the permissions. Interview surveys were conducted from September 2013 to January 2014 end, whereas the monitoring of crocodile is still continued till date and will be monitored in future too. Training on monitoring and research techniques and were provided in December 2013. Management, rescue and rehabilitation workshop for the forest department staff, NGO and biology students were conducted in January 2014. Education and awareness programmes were conducted from January 2014 and continued till July 2014 end. The targeted project objectives have been achieved within this time frame suggested.

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
Researcher per diem (£5/day x 180 days)	900	975	75	We had to carry out field work for 15 days more than estimated.
Field Assistant per diem (£ 2.5/day x 180 day)	450	488	38	We had to carry out field work for 15 days more than estimated.
GPS Mapping: Garmin TM E trex 30	215	222	7	Rise in price
Range finder: Nikon TM ProStaff 3 Laser	92	113	21	Rise in price
Powerful Flash lights: PEAK TM PKCOTX01	10	17	7	Different model was purchased due to unavailability of choose.
LCD Projector, Screen, Laptop (on Hire)	113	121	8	
Hiring Motorcycle-Fuel & maintenance of the motorcycle (7 months)	700	723	23	We had to carry out field work for 15 days more than estimated.
Food and Lodging (for 2 persons 180 days)	450	490	40	We had to carry out field work for 15 days more than

				estimated.
Bus Fare	80	58	(-22)	Was lesser than estimated.
Awareness and Publicity material, AV shows, Poster, Stickers, Overhead Slides, Project campaign banners etc.	452	366	(-86)	We were able to carry out education programmes and printing of material at lower cost due to help from VNC (organisation)
Report writing and Dissemination of information. Distributing the results to various federal organisations, educational institutes, NGOs, and other likeminded	226	190	(-36)	We got help from VNC (organisation) for distribution of reports and materials.
Contingencies and Miscellaneous Price hikes, Rate fluctuations, CD's, Pages, printer cartridge, postage, telephones etc.	339	303	(-36)	We were able do project without trouble and at lower cost due to help from VNC (organisation)
TOTAL	4027	4066	39	

P.S.: I attended international conference by IUCN SSC Crocodile Specialist Group's in Louisiana, USA in May 2014. Expense for the same was approx. GBP 1425/- which was borne by self. Although it was not part of initial project proposal, we decided to take up this opportunity to showcase our work and results at world forum. (Logo and name of Rufford foundation was displayed in my Presentation over there.)

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

The following are some of the next steps we are planning. We are looking forward to apply for the Rufford Booster grant to work further in these ideas

1. Once the final data is analysed for the current phase, we will write a detail final report to be submitted to the Gujarat Forest Department, since they are responsible for the protection and management of the species in the area. Reports will also be distributed to other NGO and research organisation. This will be followed by writing research articles and possibly preparing a crocodile management plan for the Gujarat State forest Department.
2. With our results we now that the crocodile population in the Charotar is a very important significant population contributing to the overall population of India, and thus needs continuous monitoring. Thus the next important step for conservation of these species in Charotar is to continue with population monitoring and nesting surveys over a long period of time so as to understand population trends and limiting factors for successful nesting. Establishment of a trained Crocodile Monitoring Team together with the Local forest department for monitoring of these crocodiles over the area would be an important part of this process. Perception and attitudes change over time, and thus have to be reassessed and reviewed frequently, which we precisely want to keep doing
3. Although we have conducted workshops and training programme for the forest department personnel, they here needs more technical guidance and training to manage the crocodiles the. We wish to expand our outreach training programmes on crocodile monitoring, rescue and rehabilitation in other areas where there is significant crocodile population.

4. Lately, there have been several cases of crocodile attacks on humans in Gujarat state around the banks of Vishwamitri in Vadodara and around Narmada Rivers. These places are not far from the present study area. Especially Vadodara is emerging as one of the high crocodile–human conflict zone in India. Dr. Raju Vyas, a well known herpetologist and a team member, has been monitoring the existing crocodile population for more than 15 years. Systematic documentation and assessment of the prevalence of crocodile-induced human deaths and injuries is urgently necessary at this moment. So, while continuing the monitoring of crocodiles in the present study, we plan to extend our study in Vadodara region and around Narmada rivers In Gujarat, with a concentration on human–crocodile interaction and awareness programmes, while also developing a state-wide spatial risk map in the conflict prone zones in Gujarat and assist policy makers and planners in formulating pragmatic solution to for the management of human-wild animal conflict issue in conservation and management of wild animals and protected areas.

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 the materials (posters, brochures, presentations, certificates, banners) related to the project including all of the surveys used for the pilot and final assessments and during all forms of interaction meetings and workshops. Also, the RSGF logo was used in our presentations at the IUCN SSC Crocodile Specialist Group's World Crocodile Conference in Louisiana, USA in May 2014 and also at the Crocodile Management Workshop arranged by the Gujarat Forest Department at Vadodara, where our project results were discussed within a socio-ecological perspective. Rufford Foundation was acknowledged for financial support for everywhere. In this context, I believe that RSGF received wide publicity. We will keep using the logo in the publications to come, as well as in any conference, seminar, meeting, etc.

11. Any other comments?

RSGF has been instrumental in laying the foundation of this project. Despite the fact that I have been majorly a nature educator throughout our life and that this was my first research project, RSGF had faith in me and gave me the chance to carry out this project. This project, which is now being recognised as very important work for the conservation of crocodiles in Gujarat, have not only provide astounding results regarding the population status and interaction between humans and crocodiles, but are influencing the views of forest managers and scientists alike. The Gujarat Forest Department Authority, Local Governmental authority, the village authority, local organisations and school managements (where we carried out the Awareness Programmes), all appreciated the work very much, and which came out as the one of the significant achievement of the project. We are getting invitations to provide training and lectures for conducting research and management of the crocodiles in the Gujarat. Anirudh Vasava, a member of the project team helped to secure additional funding to support the project work till October 2014.

I would like to express my deepest gratitude to the RSGF for making this project a reality. I would also like to thank the team members and volunteers at Voluntary Nature Conservancy for helping us in collecting data. We are looking forward to apply for successive Rufford Grant to continue working in this very crucial aspect of people and the crocodile management, while expanding our study area and objectives.

Annexure 1

Following questionnaire was used during the survey.

A. Basic information

- 1) Age and sex
- 2) Education:
- 3) Occupation:
- 4) How long you have lived in this place?

B. Dependence on water body

- 5) How do you depend on the near water body? (Drinking, bathing & washing clothes, washing of household materials etc.)
- 6) Time of utilization of water body by humans
- 7) Time of utilization of water body by livestock
- 8) Do you go fishing? (yes/no, if yes, specify mode of fishing)
- 9) Do the people from outside village come for fishing? (if yes, specify the place & time of the year)
- 10) Any other products that you collect from nearby water bodies?

C. Local people's knowledge on mugger

- 11) Have you seen crocodiles in the wild/near you? Yes/No, (if yes, where and how many?)
- 12) How often do you see them?
- 13) What do they eat?
- 14) Do they nest here?
- 15) Did you see the mugger eggs/hatchlings? Yes/No (If yes, how much and when?)
- 16) Has number of crocodiles on nearby wetland/water body/property increased in the last 10 years?
- 17) Do you know that crocodiles are protected? Yes/No

D. Attitude and tolerance to Muggers

18) Do you like Muggers? (Yes/ No)

19) If yes, why do you like them? (If no, skip to question No. 24)

(a) Beautiful Animal (b) endangered species (c) maintains ecosystem (d) religious

20) Do you like mugger near you? (Yes/No)

21) Should these muggers be conserved? (Yes/No)

22) Where these muggers should be conserved?

23) Will you support mugger conservation even if a family member is attacked and injured?

(a) Agree (b) Neutral (c) Disagree

24) Why don't you like muggers?

E. Crocodile conflict

25) Any incidence of crocodile attack on livestock/poultry/pets? (If yes, then when and where?) (If no, skip to question no.27)

26) Do you guard your livestock near water bodies? Yes/No

27) Any incidence of crocodile attack on humans? Yes/No (if yes provide details/If no, don't ask further question)

28) Why do you think they attack?

29) Have people ever tried to control/kill these problematic muggers? Y/N

30) If Yes, then how?

31) What steps the forest department takes to solve this problem?

32) Are you satisfied with current problem-mugger management by forest department? (Yes/No)

33) If no, what should be the problem mugger management strategy?