

Final Evaluation Report

Your Details	
Full Name	Jignasu Dolia
Project Title	Distribution, threat assessment and conservation of King Cobras in the Kumaon region of Uttarakhand, northern India
Application ID	31295-2
Grant Amount	£ 6000
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Date of this Report	22/02/2022

1. 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
Locating and monitoring King Cobra nests until hatching				In total, we monitored six nests over two nesting seasons (2020-21), which exceeded our expectations. In 2021, for the first time, we located a nest at an altitude >1700 m asl.
Collecting behavioural data of nesting females				We were able to record detailed nesting behaviour (including video footage) for three of the six female king cobras.
Collecting morphometric data of resulting hatchlings				Three of the six nests that we monitored failed to hatch due to natural causes, hence we could only partially meet this objective. However, in total, we collected morphometric data for 64 king cobra hatchlings.
Raising awareness among key stakeholder groups				We had initially planned to conduct snake-awareness programmes in local schools/colleges. But this was not feasible, due to Covid-19. Instead, we mostly trained forest department personnel to correctly identify, rescue, and release snakes
Assessing the distribution and threats faced by the species in this landscape				We could not carry out systematic surveys to determine distribution and threats to the species, due to logistical problems. But, due to our wide network at the grassroots level, we could collect some valuable opportunistic data.

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

1. During 2020, it was challenging to carry out fieldwork due to the Covid-19 pandemic, especially the outreach activities we had planned. Local schools/colleges (our initial target audience for awareness programmes) were closed for months. To meet our goal, we had to shift our target audience to mainly include forest department field staff (also important stakeholders). Apart from raising awareness on snakes and snakebite, we also imparted training on how to rescue

snakes professionally. This training was much needed and has resulted in improved snake-rescue operations at the ground level.

2. Another difficulty (turned into an opportunity) that arose during the course of this project was when we found a pair of 10-foot-long king cobras, who had taken up temporary residence in a small village. The initial reaction of the nearby people was that of fear, understandably so. They obviously wanted us to catch these venomous snakes and release them somewhere far away. But, after carefully assessing the perceived vs. actual risks, I decided to not rescue the snakes but instead stand guard (and collect unique behavioural data while ensuring that nobody harms these snakes and vice versa). After all, this was the first time in 15 years that we witnessed a male and female king cobra together, and I was determined to not let this opportunity pass. After persistent engagement and dialogue with the concerned village folk, I managed to convince all (except one family) that the snakes meant no harm and would go their own way after a few days. Luckily for us, this drama unfolded right below our friends' house, making it logistically easy for us to move in for a few days to keep watch over these snakes. Fearing that someone may try and harm the snakes, I thought it best to officially involve the forest department, thanks to which we were also able to quickly mobilise and install three CCTV cameras on site. Setting up these cameras were a game changer and resulted in some fantastic natural history footage, one of which included a house cat attempting to attack (in vain) the male king cobra (Image 1)! All in all, it was a win-win situation for everyone involved, including the romantic snakes (Image 2)!

3. A third difficulty we faced was while producing the customised deck of cards as part of the outreach materials (Image 5). I had originally planned to get only 15-20 decks printed. However, none of the playing card printing companies we consulted were willing to print less than a minimum of 200 decks, due to economies of scale. However, because I believed in this product and thought it to be a unique and fun way to learn about snakes, I made a personal contribution to meet the total cost of production, as a result of which we got many more decks to distribute among the key stakeholders.

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

Locating and monitoring six king cobra nests

One of the nests of 2020 was located right beside a village temple. Some local villagers even offered their daily prayers to the snake from close quarters, unaware of the potential risks involved. As soon as we got to know of this nest, we barricaded the area surrounding the nest with the help of some villagers and the forest department, lest other people (or their livestock) unknowingly trample upon the nesting female. We managed to protect this nest successfully, which contained 24 eggs, all of which hatched successfully in late September 2020.

In 2021, one king cobra nest was found at an elevation of 1730 m asl (Image 3), the highest we have recorded so far in our study area. The female snake was seen attending her nest till August 23rd. Unfortunately, except for one egg, all 24 others failed to hatch, due to lethally low nest temperatures (mean temperature was 21°C). However, one hatchling miraculously hatched on November 1st (the latest in

the year we have ever recorded), when mean nest temperature was 16°C! Our findings offer unique insights into the nesting ecology and thermal biology of this species.

Observing and protecting a pair of king cobras in the wild for the first time

In May 2021, a pair of adult king cobras was sighted in a small village of Nainital District. The nearby villagers were understandably scared and wanted the venomous snakes removed. However, catching these 10-foot-long snakes, which had taken temporary refuge inside the crevice of a wall, was highly risky, almost impossible, and, in my professional judgement, unnecessary. As the snakes were not bothering anyone, and their movement was restricted to a small area, we decided to protect them in situ. Moreover, this was a unique opportunity to study their natural pre- or post-mating behaviour. As this was the first time we were witnessing such a phenomenon, we promptly set up CCTV cameras to monitor and record their behaviour remotely. An exciting moment was when a domestic cat pounced on the unaware male king cobra! Luckily, neither the snake nor the cat was harmed. After about a week, the snakes left of their own accord, as we had predicted and hoped for.

Building capacity among local forest department staff to identify snakes and rescue them professionally

Although forest department staff and local snake rescuers 'rescue' snakes regularly, most of them do not have the know-how or the proper equipment to do so professionally and ethically. Sometimes, the rescuers cannot even correctly identify the snakes they are supposedly rescuing. Thus, through our detailed snake awareness cum rescue training programmes, we helped build capacity of key frontline staff of all ranges in Nainital Forest Division. By interacting with them, we also got important distribution data for king cobras and other snakes of the region.

4. What do you consider to be the most significant achievement of this work?

5. Briefly describe the involvement of local communities and how they have benefitted from the project.

We work closely with local communities to protect nests in situ. Without them, finding nests is nearly impossible. Even if found, protecting nests without the cooperation of locals is difficult. Some of the locals have helped us year after year, by facilitating fieldwork and by being wonderful hosts during our field visits. The locals, in turn, have benefitted from this project in the following ways:

- Select locals have received remuneration for the help and support they extended and were also officially recognised and felicitated by the local forest department.
- Their knowledge and attitude towards snakes have improved through our outreach-related activities.
- Many frontline forest department staff have been trained to identify snakes correctly and to rescue snakes in a safe and humane manner.

6. Are there any plans to continue this work?

Yes, I would like to continue this work, but after a break. In the future, I'm keen on conducting radiotelemetry on king cobras in this unique mountainous landscape, which would likely provide valuable insights into the ecology and natural history of this elusive snake. However, at present, I would like to focus on finishing my PhD, before undertaking further fieldwork.

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

I plan to publish results from this work in peer-reviewed journals (either as full length articles or short notes), and possibly through popular articles in wildlife magazines. Data collected during this project, and previous ones, will serve towards my PhD, which will hopefully result in at least three publications. The salient results of this study will also be shared during presentations made at conferences and other gatherings.

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

The grant was used between July 2020 and February 2022, which spanned a significantly longer duration than originally planned. The main reasons for this delay were:

1. The Covid-19 pandemic restricted our fieldwork during 2020. As a result, we did not get sufficient data, and hence extended our fieldwork till late 2021 (after prior approval from The Rufford Foundation).

2. Producing the outreach material (especially the customised playing cards) took much longer than anticipated. The process had to go through multiple iterations (between the designer, the printing company and me) over several months to arrive at an end product that was concise, attractive and informative. Even after the design was finalised, there was considerable delay before the final printing could take place, due to technical issues. This was the first time I was creating such a product, and I underestimated the time, effort and expense involved in doing so. However, I am pleased with the final product and I'm confident that it will help spread much-needed awareness on snakes in the region.

9. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Subsistence– field assistant monthly charges	950	955	+5	This slight discrepancy is due to conversion differences. As per the original budget, field assistant salary ought to be INR 8956 (i.e., £95) per month, whereas, in reality, it was INR 9000 (i.e., £95.5) per month
Subsistence– per diem expenses for project PI	2160	2145	-15	This difference is due to estimated vs. actual per diem expenses
Health– medical insurance for two project personnel	130	129	-1	
Equipment– data loggers	800	785	-15	I managed to procure these loggers at a slightly cheaper rate than budgeted, thanks to a different supplier
Equipment– weather meter	162	187	+25	This difference is because of two reasons: (1) a protective carrying case worth £12 was additionally purchased along with the weather meter (2) extra charges towards shipping and taxes worth £21 were levied during the actual purchase
Equipment– external hard drive	124	135	+11	I had originally planned to purchase the hard drive from USA, but due to logistical problems, I had to buy it in India, thus the slightly higher cost
Equipment– Infrared thermometer	49	57	+8	This difference is because of additional shipping charges (i.e., £9) levied during actual purchase of this product from the USA. Estimating shipping charges during budget preparation is difficult, as the

				delivery address is not always known beforehand
Remuneration–for KC nest informants	48	48		
Remuneration–for long-term help in nest protection	240	220	-20	One of the six beneficiaries received a smaller amount (£21 instead of £40) than budgeted, because he put in relatively less effort to protect a nest, hence the lower remuneration
Travel– local travel during fieldwork	930	704	-226	We could not travel as extensively as planned due to the Covid-19 pandemic and associated travel restrictions. Also, some of our travel was done using a Forest Department vehicle, thus reducing costs in this category
Consumables– for nest enclosure material	24	16	-8	This difference is because of two factors: (1) the actual quantity of material required was less than anticipated (due to some smaller-sized nests), and (2) cost per unit length of the material was slightly cheaper than estimated
Consumables–batteries for equipment during fieldwork	33	63	+30	As fieldwork was extended over two nesting seasons, we required many more batteries to run the camera traps at nest sites, hence the additional expense in this category
Outreach	350	556	+206	This large difference between budgeted cost vs. actual cost is due to the fact that the minimum order quantity for printing a key outreach material (i.e., customized playing cards) was 200. While preparing the budget (in which I had planned to print 15 decks), I was unaware of this practical constraint. See Budget note 2 below for more details
TOTAL	6000	6000		

Budget notes: 1. The exchange rate we used to make the above calculations was the same as the one we used while preparing the original budget (i.e., £1=\$1.23=INR 94.27). Values have been rounded off to the nearest pound.

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

From a conservation perspective:

To develop a conservation model where the onus of protecting king cobra nests, outside protected areas, lies with local communities as well

At present, protecting king cobra nests in situ is possible thanks to the initiative and motivation of a few individuals. However, this is not sustainable in the long run, for obvious reasons. Somehow, we need to try and develop a model wherein local communities benefit more from protecting a king cobra and/or its nest, rather than by harming it. We are aware that this can be a double-edged sword, especially because snakes and their venom can (and are) often misused for nefarious purposes. However, I believe that if we can develop such a conservation model, the future of king cobras, especially outside protected areas, will be promising.

To further carry out snake-awareness programmes at the grassroots level

Many more awareness programmes need to be carried out across this landscape to try and bring about a lasting change with regards to people and their prevailing attitudes towards snakes. Apart from imparting scientific knowledge, we need to also urge people to try and be more tolerant towards snakes, and other wildlife.

From a scientific perspective:

To conduct radiotelemetry and genetic studies on king cobras of the western Himalayas

Research has now shown that there are four distinct and independently evolving lineages of king cobras (Shankar et al. 2021). The population of king cobras which we are studying and conserving (i.e., Indo-Chinese lineage) is very interesting, but not sufficiently known. In order to further our knowledge on the basic ecology of this population of king cobras, conducting radio-telemetric and genetic studies will be of great value. They will help us answer basic questions with regards to their diet, mating behaviour, home range size, wintering biology, genetic diversity etc., which will help us conserve this snake more scientifically.

11. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, the Rufford Foundation's logo was used, and prominently displayed, in the promotional materials (i.e., customised playing cards and t-shirts) produced by this project, and also in the snake awareness presentation screened widely in the study area. Moreover, RF's support was acknowledged in an article published in "The Pioneer", a widely read English daily newspaper. The article was written by a renowned journalist and consulting editor of the Pioneer, Hiranmay Karlekar, under whose house a mating pair of king cobras was found and successfully protected in May 2021 by our team, along with support from the local Forest Department. Here's a link to that article: <https://www.dailypioneer.com/2021/sunday-edition/a-romantic-interlude-in-the-himalayas.html>

12. Please provide a full list of all the members of your team and briefly what was their role in the project.

Jignasu Dolia (Principal Investigator)- Conceived the project and executed it. He carried out fieldwork over two nesting seasons, conducted snake-awareness programmes, analysed data, authored reports and articles, and developed the outreach material.

Krishan Kumar (Field Assistant)- He was an integral part of fieldwork over two years. He helped protect six nests and did most of the extensive follow-up monitoring of nests, especially in 2021. Krishan has been working with Jignasu Dolia since 2017, and is dedicated, sincere and committed to the work.

K.S. Sajwan- He helped us liaise with local people. Thanks to his contacts at the grassroot level, we got to know of the second King Cobra nest in 2020. He also participated in morphometric data collection for the resulting hatchlings, and actively participated in some of the outreach programmes.

Tulsi Negi- She discovered and helped protect a King Cobra's nest that was found on her land in 2021. She regularly monitored the nest until hatching, despite her busy schedule. Tulsi has been associated with our work over the years and is actively involved in helping spread awareness on snakes.

13. Any other comments?

I am very grateful to The Rufford Foundation for taking interest in our work and for financially supporting this project. I am also thankful to the Uttarakhand Forest Department for providing the necessary permission to carry out this work and for providing logistical support during fieldwork.



A domestic cat trying to approach an alert male King Cobra. © Jignasu Dolia.



The amorous pair of King Cobras we observed and helped protect in May 2021. © Jignasu Dolia



A female King Cobra guarding her nest made of pine and oak leaves. This nest was found at an elevation of 1730 m asl. © Jignasu Dolia



Project Lead (Jignasu Dolia) conducting a snake-awareness programme for students and teachers of Mangoli Intercollege, Nainital District.



Photographs of the custom designed snake playing cards we produced as part of the main outreach material for this project.