

Final Evaluation Report

Your Details	
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Project Title	Assessing the efficacy of five commonly used snake and gecko repelling agents when applied outdoors
Application ID	28353-1
Grant Amount	£5,971
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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
Assess the efficacy of geraniums, Jeyes Fluid, Snake Repel, mothballs (naphthalene) and Condy's crystals (potassium permanganate) to repel snakes in their natural movement				The agents tested had no significant effect on the number of snakes, lizards or the total number of reptiles that were trapped during the project.
Explore the effect of these repellents on a local snake community				It was clear that the agents had no effect on the number of snakes, lizards or the total number of reptile species trapped. Furthermore, I found no indication that the agents had an effect at the community level.
Assess the chemical persistence of the repellents when applied in the field				The Snake Repel, Jeyes Fluid and mothball treatments displayed rapid chemical decay. I noted that the Snake Repel treatment had decreased below the detection threshold of the GC-MS, 12 hours after deployment. I also found that the Jeyes Fluid and mothballtreatments could not be detected 72 hours after they had been deployed.

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

I was fortunate that no unforeseen difficulties were encountered during passive trapping. Reliable data were collected in the time allocated for the project. This allowed for appropriate statistical analyses in line with the initial objectives, assessing the in-field repulsion efficacy of the snake repellents. There was, however, a lack of available geraniums at local nurseries. Ideally, a single species of the ornamental plant, like *Pelargonium hortorum*, would have been preferred. This was not possible and was reflected in the writeup, accordingly.

The Initial method testing with the GC-MS enabled an accurate analysis of Snake Repel, Jeyes Fluid and mothballs. The same method, however, was not suited for an



evaluation of the geranium and Condy's crystals treatments. Given that none of the agents tested repelled snakes in their natural movement, this aspect of GC-MS was not undertaken. I was also unable to quantitatively analyse the persistence of the Snake Repel, Jeyes Fluid and mothballs treatments. This was due to a lack of available sampling vials in the field. I did, however, obtain descriptive statistics of the agents' chemical persistence. In addition to the results from the field application experiment, I am confident that the results of the project are more than sufficient to support the prediction that the agents tested are not viable snake repellents.

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

Passive trapping was conducted from December 2018 to February 2019. During this time, I recorded a total of 88 snakes. These snakes represented 17 species from five different families. Additionally, I recorded 311 lizards representing 12 species from six families, and two amphibians from two families. In summary, a total of 399 reptiles from 29 different species were sampled over a period of 56 days.

- 1. I assessed the effect of the repellents on reptile, snake and lizard abundance using a three-factor nested analysis of variance (ANOVA). The results showed that there was no significant difference between the number of snakes, lizards or the total number of reptiles trapped under any of the repellents tested and the water control.
- 2. Additionally, the nested ANOVA showed that there was no significant difference between the number of snakes, lizards or the total number of reptile species trapped under any of the repellents tested and the water control. Furthermore, non-metric multidimensional scaling (NMDS), revealed no indication that the repellents had an effect at the community level.
- 3. Gas chromatography-mass spectrometry (GC-MS) analysis of Snake Repel, Jeyes Fluid and mothballs revealed rapid chemical decay of the treatments. I found that the Snake Repel treatment decreased below the detection threshold of the GC-MS, a mere 12 hours following deployment. I also found that the Jeyes Fluid and mothball treatments were no longer chemically active (detectable by the GC-MS) 72 hours following deployment in the field set-up.

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

Several individuals from local communities volunteered to assisted in the setting of traps and the application of treatments. These volunteers gained valuable insight into the basic identification of local snakes and the safety measures that must be followed if these snakes are encountered. The results of the study have also served to enlighten these individuals as to the lack of efficacy demonstrated by these chemical agents.



5. Are there any plans to continue this work?

My work further substantiates the findings of previous authors like Brock and Howard (1962), San Julian (1985) and Ferraro (1995). It also provides support for the claims by experts that no chemical agent effectively repels snakes (African Snakebite Institute, 2019). Unfortunately, little to no research could be found where the efficacy of alternative, primary prevention methods was evaluated. Considering my results, and the clear gap in knowledge found in the literature review, I strongly believe that there is a need for further research to be done on the efficacy of alternative methods of snakebite management. I believe that this work, and further studies on potential snakebite management strategies, within snakes' own natural movement, would expedite the World Health Organisation's goal to mitigate this neglected tropical disease.

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

The results of this project were written up in the form of a MSc dissertation. Additionally, all results were made available to Enviro-Insight and the African Snakebite Institute. I presented the results at the 14th Conference of the Herpetological Association of Africa. The conference was attended by experts in Southern Africa, who are affiliated with several universities such as the University of Witwatersrand and the University of Cape Town. The conference was also attended by herpetologists from the USA. The findings of this project were therefore shared both locally and internationally. We intend to submit the results of this project for publication in the Journal of Wildlife Management or the Journal of the Herpetological Association of Africa. I also intend to submit popular summary articles to local magazines/newspaper articles like Farmers Weekly and the Zoutpansberger.

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

The funding was used upon being received on in October 2019, up to and including the end of 2019. All the expected expenditures were paid in full after the completion of the field-application experiment and commencement of statistical analyses.

8. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in \pounds 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
GC-MS analyses	£1927	£1927		
Treatments	£1221	£1490	+£269	Treatments were more



				than expected due to the frequency of sporadic rainfall events.
Trap arrays	£1149	£1380	+£231	Traps required maintenance and occasional replacing over the course of the project.
Equipment	£1048	£548	-£500	Equipment proved cheaper and more readily available than anticipated.
Logistics	£626	£626		
Totals:	£5,971	£5,971		

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

I feel that the current priority, in addition to publication in scientific journals, is to continue disseminating the results of this project at various societal levels. Snakebite envenomation remains a serious problem in many areas of Southern Africa. In South Africa specifically, many informal settlements lack transport to proper medical facilities. These communities need to be informed of more effective means of snakebite management.

10. 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. This project and the results obtained were presented at the 4th Conference of the Herpetological Association of Africa. The Rufford Foundation logo was used in the presentation affording it publicity among researchers and other experts in Southern Africa.

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

Dr. Mark Keith served as the project supervisor.

Dr. Keith provided academic support and guidance throughout the whole project.

Luke Verburgt, the first co-supervisor.

He assisted with training and techniques necessary to safely trap, handle and release herpetofauna. He also provided academic support, assisted with logistics, data collection and photography.

Dr. Yusuf Abdullahi, the second co-supervisor.

He provided academic support and guidance with GC-MS analyses. Staff members of Enviro-Insight, **Emmanuel Munhuwenyi** and **Ursula Verburgt**.



They assisted with logistics, and trap construction. Ursula Verburgt also assisted with data collection in the field.

Local community members, J. Dube, C. Janse Van Rensburg, and J. Venter provided logistical support.

Peers, M. Pretorius, and C. Hannweg, provided peer review.

12. Any other comments?

It was a privilege to do this project, the first of its kind in Southern Africa. I am grateful to The Rufford Foundation, Enviro-Insight, the University of Pretoria, and the Hackthorne Family Trust for making it possible.