

## Final Evaluation Report

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Your Details	
<b>Full Name</b>	Carrie Hickman
<b>Project Title</b>	The effects of high temperatures on behaviour, reproduction and nestling physiology in the southern ground-hornbill.
<b>Application ID</b>	38371-2
<b>Date of this Report</b>	18/01/2024

**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
Collect morphometric measurements and blood samples from nestlings.				An additional nine nestlings were measured and sampled in the breeding season. This was a successful season and has contributed to our dataset which will allow us to assess growth rates and physiological stress. This is still ongoing.
Conduct field observations, recording adult birds' behaviour, such as foraging and seeking shade.				I collected this data year-round when opportunistically encountering the birds in the field. This will allow us to investigate what their behavioural responses are in relation to high temperatures and whether there are threshold temperatures at which these behaviours are more apparent. Sightings of the birds are not frequent, so I relied on citizen science to increase my sample size.
Involving the community in citizen science to help with data collection.				Several WhatsApp groups were set up for different areas, as a way for local guides, residents, and tourists to submit sightings of ground hornbills when they saw them. This contributes towards our dataset on behavioural responses to high temperatures as well as monitoring group movements and distributions. We now have enough data on this to start data analysis and writing for publication.
Raising awareness of ground-hornbill conservation and disseminate scientific findings.				Educational and awareness talks have been given to the community. I presented scientific findings at one international and one local conference. I also attended the Rufford Foundation Learning Event in Namibia and was interviewed by a safari company on their podcast.

**2. Describe the three most important outcomes of your project.**

- a) Successful data collection, allowing for a greater understanding of the physiological consequences of rapidly changing environments, such as increasing temperatures, on nestling development. We can now be better

informed when making decisions aimed at the conservation of the species. Such as improving artificial nests and understanding long-term populations trends as well as favourable habitats in which the birds have a better chance of survival.

- b) Using citizen science to gather more information has been a rewarding experience. Not only were we able to collect enough behavioural observations, but we were able to engage more with the community. The creation of WhatsApp groups served as a platform for disseminating information about the birds, generating heightened interest and awareness.
- c) Actively participating in conferences and workshops has provided a platform to disseminate recent research findings. This allowed me to convey the importance of my research and learn from others which was very inspiring. This positive experience is reflected in my passion and enthusiasm to continue and grow this research and conservation project on ground hornbills.

**3. Explain any unforeseen difficulties that arose during the project and how these were tackled.**

The birds bred earlier than usual, and the Rufford Foundation grant was received after the project commenced, however small private donations to the project enabled data collection to commence on time.

We had torrential rain during February 2023, which made it very challenging to reach some nest sites in that month. Rivers were in full flood which made the usual river crossing in the vehicle impossible at times. We relied on the help of local guides in the area to help us cross rivers and reserve management to pull us out on occasions when we got stuck in mud. We had to make a lot of detours which added to our fuel consumption and fuel budget.

**4. Describe the involvement of local communities and how they have benefited from the project.**

We invited local field guides, environmental monitors, and landowners into the field with us when checking on nests and doing nestling measurements and sample collection. This gave us an opportunity to inform them about the birds and the work that we do, which we hope they will share with their community and visiting tourists that they guide.

Thanks to the Rufford Foundation grant I was able to train and employ two part time interns to assist with data collection for 3 months. They helped me with inputting behavioural data from camera trap videos and joined us on a field trip. They work at a local nonprofit (Kruger to Canyons) and this work on the ground hornbill project provided them with new skills and knowledge and benefitted them financially.

## **5. Are there any plans to continue this work?**

Yes, I will continue data collection for my PhD for an additional season. Installing, maintaining, and monitoring artificial nests, as well as educational talks will be ongoing as part of the conservation side of this long-term project. We also have plans to try to put tracking devices on the birds in the future to help us to monitor groups movements and locate the birds in the field to conduct behavioural observations. This aligns with our current research on the effects of heat, and we intend to identify how the birds use the landscape throughout the seasons in relation to weather. Trials are being conducted on captive birds initially, to find the best fitment techniques for these tracking devices.

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

The project has a very active presence on social media, where camera trap videos, field activities and photos are shared with the public. We produce a quarterly report to the reserve landowners, management, lodges, and field guides. We publish articles in local magazines and newspapers. We also give talks to local communities, in workshops, webinars and scientific conferences. Results from this research will form a PhD thesis where chapters from this will be published in peer reviewed scientific papers.

You can view our Facebook page here: [GroundHornbillResearch](#) and Instagram page here: [apnr\\_ground\\_hornbill\\_project](#)

## **7. Looking ahead, what do you feel are the important next steps?**

1. Modify and improve on nest designs considering our research findings.
2. Install tracking devices on the birds to help with locating groups in the field to conduct behavioural observations. Tracking devices will also allow us to investigate how the birds use the landscape throughout the seasons and help us monitor dispersing birds.
3. Keep growing the citizen science community to help us better understand group movements.
4. Hire a full-time field assistant to help with data collection, identifying individuals and building a photographic ID kit.
5. Install camera inside nest boxes, to monitor food that chick eats and behaviour inside the nest.

**8. 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 logo was used in reports and on the acknowledgement page in all my conference presentations. After attending The Rufford Foundation Learning Event I posted about the event on our social media platforms.

**9. Provide a full list of all the members of your team and their role in the project.**

**Carrie Hickman** – PhD candidate and principal researcher on this project.

**Dr Kyle-Mark Middleton** – Field assistant who helps with data collection and installing nests.

**Dr Rita Covas** – Academic supervisor (University of Porto/FitzPatrick Institute of African Ornithology) on this research project and APNR Ground-Hornbill Project research coordinator.

**A/Prof Susan Cunningham** - Academic supervisor (FitzPatrick Institute of African Ornithology) on this research project and Hot Birds Research Project coordinator.

**Mpho Lavhengwa** – Data capture for the project, assisting with camera trap data collection and behavioural observations.

**Phomelelo Malatji** - Data capture for the project, assisting with camera trap data collection and behavioural observations.

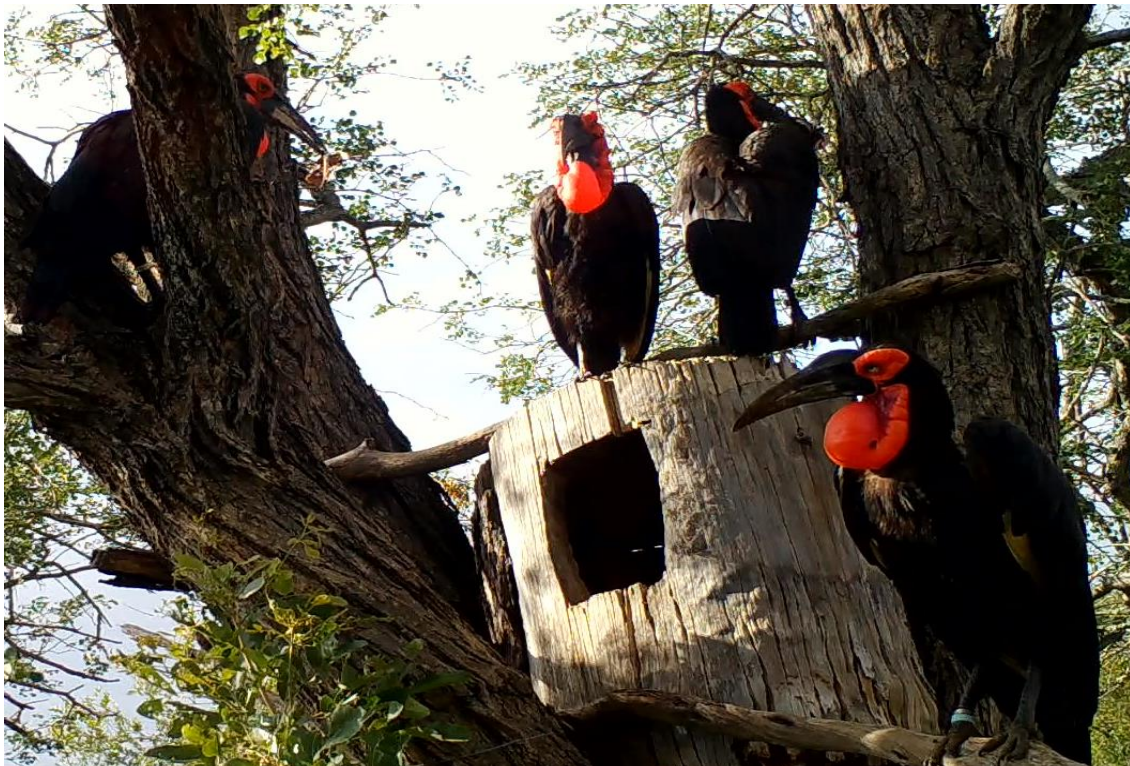
**Dr Francois Criscuolo** – Researcher at CNRS, Strasbourg France who is supervising the telomere analyses at his laboratory in Strasbourg.

**10. Any other comments?**

Thank you to The Rufford Foundation for your continued support on this project and for inviting me on one of your learning events. It made a positive impact on my work in conservation.



**Figure 1.** Ground Hornbill nestling just before fledging, morphometric measurements being collected.



**Figure 2.** Image of ground-hornbill family group at nest site captured by camera trap.



**Figure 3.** Data entry assistants, Mpho and Phomelelo, along with Carrie visiting a nest site.