



APNR Ground-Hornbill Project

Progress Report

October 2023



## The effects of high temperatures on behaviour, reproduction, and nestling physiology in the southern ground-hornbill

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### Environmental temperatures and landscape survey

To measure the operative environmental temperatures in winter (July), I repeated the black bulb experiment that I did in summer (January). Again, these were placed in microsites typically used by ground-hornbills (e.g. ground sun, ground shade, tree sun, and tree shade). My aim was to assess the differences in landscape temperatures between the two seasons. We also conducted a survey to assess the availability of shade in winter compared to summer.

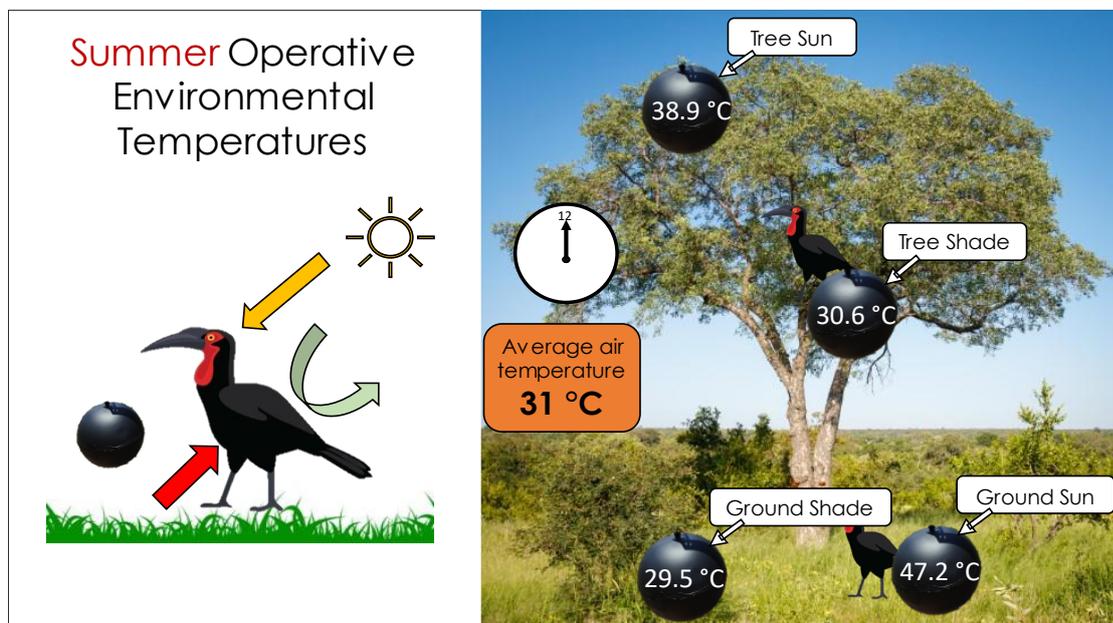


Figure 1. Picture showing black bulb locations and the average black bulb temperatures, and the average air temperature in summer at mid-day.

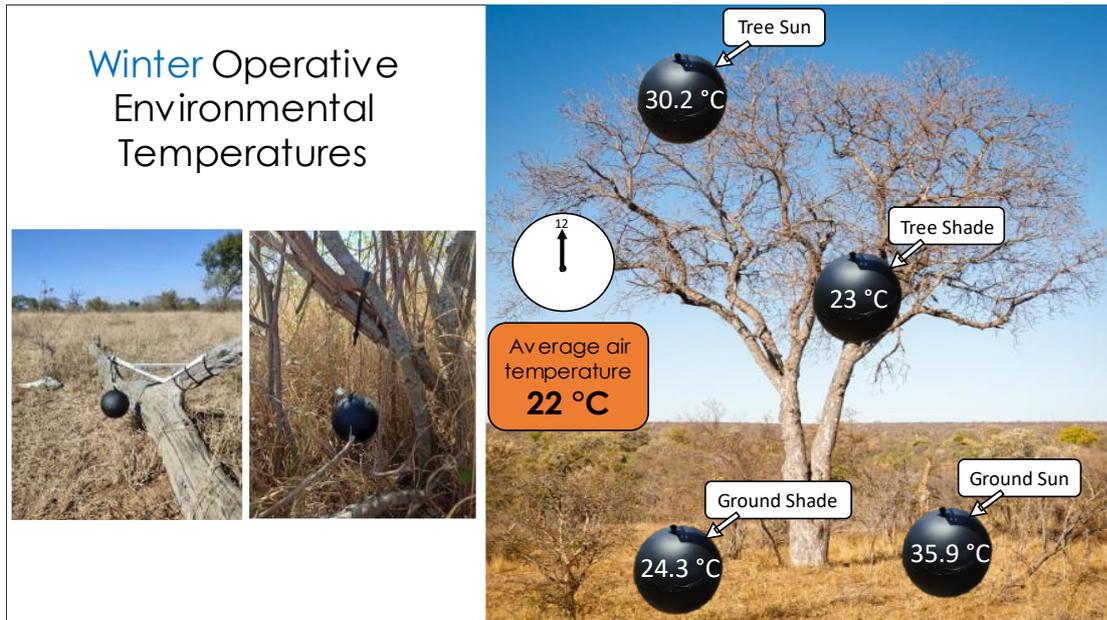


Figure 2. Picture showing black bulb locations and the average black bulb temperatures and the average air temperature in winter at mid-day.

Our results showed that at the same air temperature, the landscape feels hotter in winter compared to summer, because less shade is available in the landscape. This has implications for ground-hornbills and other ground foraging birds, as they are more exposed to solar and ground radiation in the winter, and worryingly, winter temperatures are significantly increasing. This means that birds may struggle to maintain body condition and be more susceptible to lethal dehydration, during winter when there is less food available.

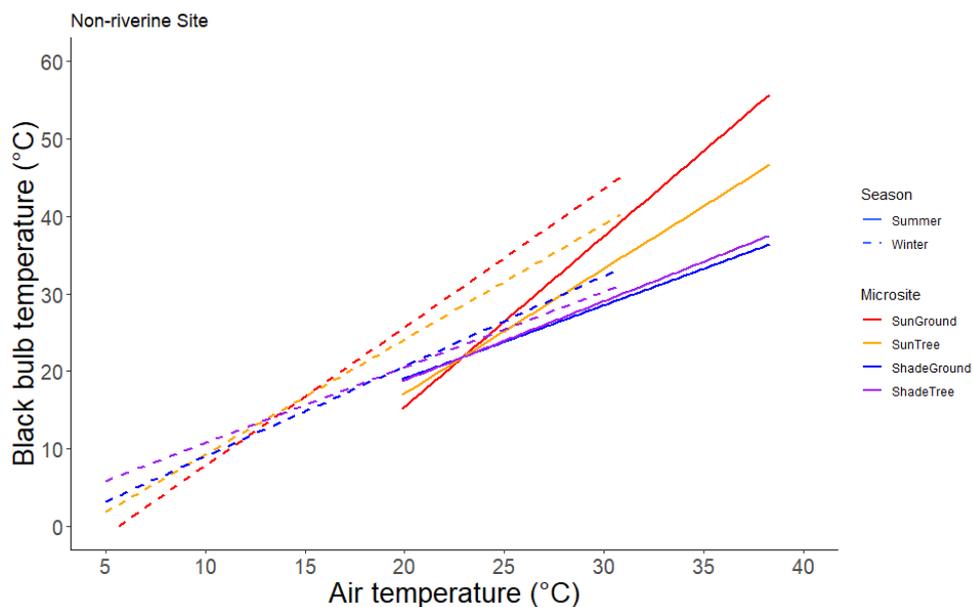
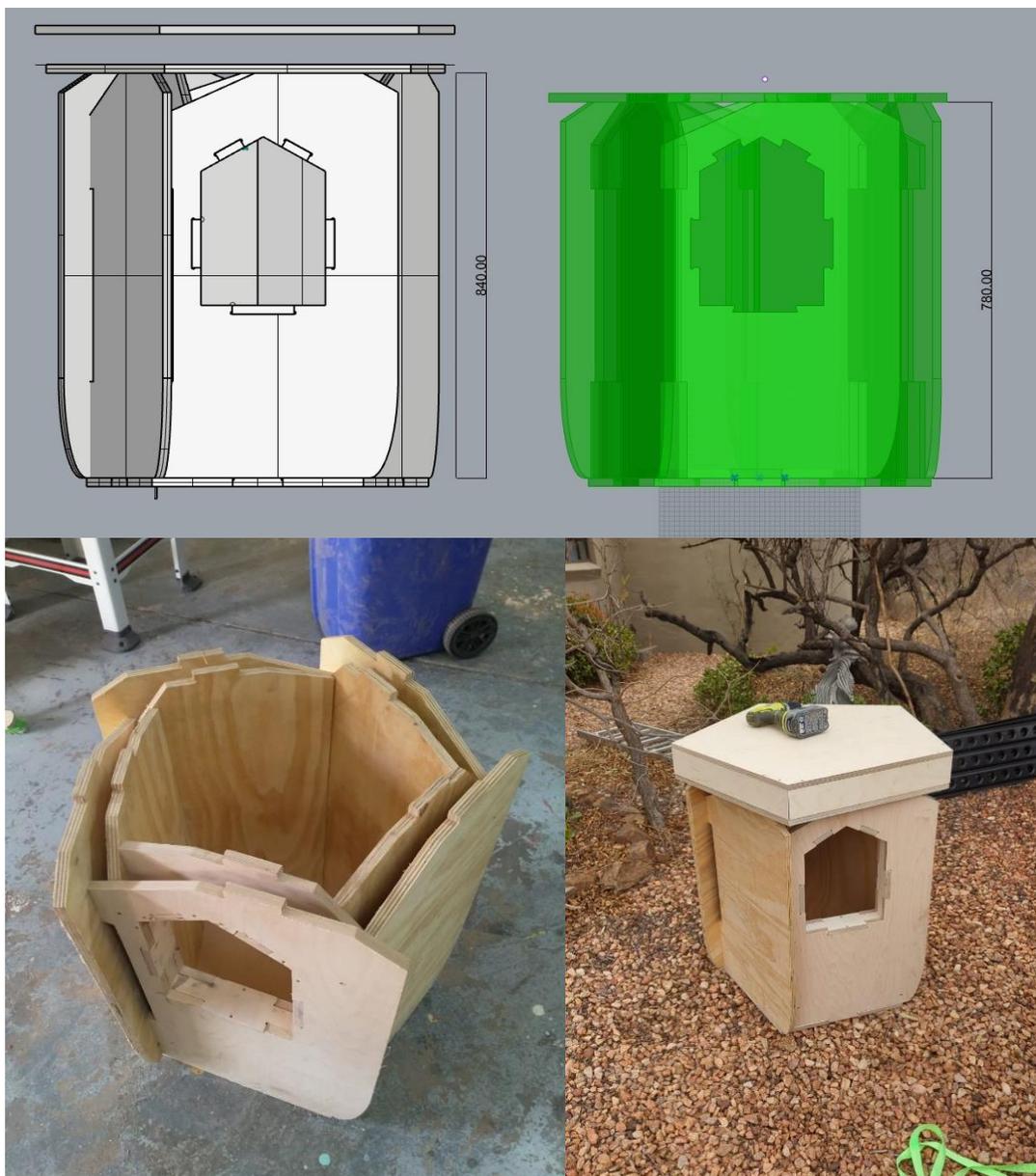


Figure 3. Black bulb temperature as a function of air temperature for each microsite in a non-riverine site, with the dashed lines showing winter temperatures and solid lines summer temperatures.

## New nests

New nests have been designed by Kyle Brand from Tshwane University of Technology. They are made from a double layer of wood, with an air gap in between, to shade the nest from direct sunlight and to allow for convective cooling in between the layers. Our aim is to provide birds with artificial nests that will protect them against high air temperatures. They were also designed with future technology in mind. They have an enclosed, hidden compartment on the roof where equipment such as cameras and scales can be installed to weigh the birds. The compartment will hopefully prevent this equipment from being destroyed by the birds' strong beaks.



*Figure 4. New nest design with double layer and hidden compartment on roof*

We have already installed two of these newly designed nests, one on Klaseriemond and one in southern Thornybush. We also replaced Jejane's nest, which had completely disintegrated due to termites. We chose to replace this with an M1 composite nest due to termite activity in the tree.



*Figure 5. New artificial nest on Thornybush reserve (left) and Jejane reserve (right).*

## Conferences and Workshops

In May, Kyle and I both presented at the 8<sup>th</sup> International Hornbill Conference. The conference was hosted by the Hornbill Research Foundation at the Faculty of Forestry at Kasetsart University in Bangkok, Thailand. The four main sessions included: The impacts of climate change on hornbills, applied hornbill conservation, hornbill ecology, hornbill evolutionary biology, and genetics. This conference was of significant importance considering the limited representation from Africa, with only three representatives out of more than 120 attendees, mainly from the continent of Asia, and offered a unique platform to connect with other professionals engaged in hornbill research and conservation projects.

In August, I attended the FitzPatrick Institute AGM in Cape Town, where I presented recent results of my Ph.D. Just after this, I attended and presented at the Hot Birds Research Project biannual conference, which was also held in Cape Town. The conference brought together all Hot Birds researchers who are investigating the effects of climate warming on bird species in

South Africa. The conference included a plenary by Prof. Steven Beissinger from the University of California and Dr. Wendy Foden from San Parks.



*Figure 6. Carrie and Kyle at the Hornbill conference (left), Carrie presenting her research (right).*



*Figure 7. FitzPatrick Institute AGM attendees at the University of Cape Town*

In September, I had the privilege of attending a learning event at the Cheetah Conservation Fund in Namibia, held by the Rufford Foundation, which brought together Rufford Foundation grantees from southern Africa to network, exchange knowledge and strengthen capacity through workshops. It was a great opportunity to discuss the realities of conservation in Africa and I left with a sense of community and encouragement that has inspired me in my ongoing efforts to help conserve the southern ground-hornbill. I would like to thank the Rufford Foundation and the Bats Without Borders team for inviting me and organising such a wonderful event.



Figure 8. Attending The Rufford Foundation learning event in Namibia, September 2023.

## Communication

Since April 2023 the team have conducted three informative talks to the public and local guides in the community, presented at one international conference, one local conference, and one institutional AGM. Team member, Kyle, wrote a popular article about southern ground-hornbill conservation for Kruger Magazine. This magazine is widely distributed in South Africa and is read by young learners living on the doorstep of the Greater Kruger Reserves, as well as tourists who visit the area.

## Team

Mpho and Phomelelo, who joined the team earlier this year to help extract data from camera traps, have completed this project. They were incredibly meticulous and dedicated to this task and helped me stay on top of it all. They will join me in the field in October when field work starts.