

Final Evaluation Report

Your Details	
Full Name	Mariëtte Pretorius
Project Title	Land-use change effects on the space use of cave- dwelling bat assemblages
Application ID	23505-1
Grant Amount	£5000
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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
Create a conservation management strategy for cave-dwelling bat species.				As a first step towards a conservation plan, my research identified threats around cave sites in South Africa and along potential migratory routes.
Identify important cave sites used by Natal Long- fingered bats for prioritization for conservation				
Identify important factors affecting migration and timing of migration				
Quantify land use change around caves in South Africa and identify threats to bats				
Track bats using a cable reader system and PIT tags				The large population size and relatively low number of tags deployed resulted in a very low recapture rate in the 3 years of my PhD. This part of the project should continue long-term to evaluate its efficacy.

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

When the project was registered at the University of Pretoria, concerns were raised by my supervisor and co-supervisor that the original objectives of my project would not be achievable within the 3-year timeline of the PhD study. I therefore had to include additional project objectives that could be achieved by utilising historically collected data for the purpose of my PhD.

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

My PhD study has produced seven research chapters spanning different aspects of Natal long-fingered bat ecology, morphology, physiology and behaviour, contributing to a better understanding of this understudied species in South Africa.



a) My research highlighted threats around important cave sites for bats (rapidly increasing urbanisation), as well as threats along potential migratory routes for Natal long-fingered bats (onshore wind facilities, exposure to commercial agriculture and possible insecticide poisoning, major roads and possible road fatalities). Additionally, my research provided a better insight into the migration times and factors affecting the migration of these bats. This information will be useful for creating a conservation management strategy for this and other cave-dwelling bat species.

b) To date, my research has produced two internationally recognised peerreviewed scientific publications and one local conference talk, sharing my findings with the local and worldwide scientific community.

c) My research also identified several new avenues for research regarding bats in South Africa that will direct future conservation efforts of this and other cavedwelling bat species.

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

During my project, I led and contributed to educational outreach initiatives teaching children and adults about bats at community batting events and Yebo Gogga Yebo AmaBlomo education week at the University of the Witwatersrand, Johannesburg

Read about some of it at:

1. Pretorius, M. 2018a. Yebo Gogga Yebo AmaBlomo 2018. African Bat Conservation News 47: 7.

Seamark, E. C. J., T. C. Kearney, and M. Pretorius. 2018a. Batting with the Friends of Dorningkloof Spruit - 18 February 2018. African Bat Conservation News 47: 5.

Various landowners were also involved throughout this project and attended several of my fieldwork sessions to learn more about bats. My results will be shared with them after my PhD has been submitted for examination.

5. Are there any plans to continue this work?

The equipment obtained for this project is in the possession of AfricanBats NPC, who will continue the tagging and monitoring work and any additional projects. The cable reader is currently deployed at one of the study sites, with plans to download the data as soon as the lockdown in South Africa ends.

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

One chapter of my thesis has been published in an international, peer-reviewed scientific journal



1. **Pretorius, M.**, Kearney, T., Keith, M., Markotter, W., Seamark, E., & Broders, H. (2018). Increased body mass supports energy compensation hypothesis in the breeding female Natal long-fingered bat *Miniopterus natalensis*. Acta Chiropterologica, 20(2), 319-328.

The second has been accepted for publication:

2. **Pretorius, M.**, Broders, H., Seamark, E. & Keith, M. (in press). Climatic correlates of migrant Natal long-fingered bat *Miniopterus natalensis* phenology in north-eastern South Africa. *Wildlife Research.* (Accepted 25 February 2020)

Two other chapters have been submitted for publication and are currently in review with the *Journal of Zoology* (JZO-04-20-OM-122) and *Mammal Research* (ACTH-D-20-00016). The other four research chapters will also be formatted and submitted for publication.

Popular press articles will be published on different open forums (like The Conversation), to share my findings with a broader audience.

My results have also been shared with students and scientific peers at various university and local conferences (SAWMA 2019). If circumstances permit, I have been accepted to present at other local (SAWMA) and international (ICZ) conferences later in 2020.

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

As planned, the grant was used within the first 3 months of the project to purchase all the major Biomark and other equipment that was subsequently used for the duration of the project.

8. 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
Pesola Digital tabletop scale (×1)	100	100		
24V DC battery (×1)	47	293	+251	Better quality, more expensive batteries (×2 of 12V 105aH) were required to power the cable system than previously thought



Data logger board (×1)	302	176	-126	Exchange rate difference and a change in supplier cost
Biomark cord system (×1)		2470	-104	Exchange rate difference
Biomark MK25 Implanter gun (×1)	31	30	-1	Exchange rate difference
Biomark MiniHPT8 Pre-load Tray (×10)	1911	1860	-50	Exchange rate difference
Swift Bank Charge	27	27		
250ml Betadine solution (×1)	8	8		
Total	5000	4964	-28	Exchange rate on 06/20/18: £1 = \$1.3172 £1 = 17.0598 ZAR

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

- To continue population monitoring of cave-dwelling bats in South Africa and create a formal, centralised and systematic population monitoring scheme to consolidate data on bats throughout South Africa.
- To create a formal cave conservation management strategy in collaboration with local and provincial governments.
- To quantify migratory and other bat mortalities at onshore wind facilities that likely intersect with bat migratory routes.
- To involve local people and spiritual leaders in the conservation of caves, particularly in the instances where caves important to bats are also important cultural and religious sites.
- To continue and increase current educational outreach initiatives to dispel myths and misconceptions about bats.

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, the Rufford logo was used at all educational events, in several PowerPoint presentation slides at university and local conferences and Rufford was acknowledged in the two published scientific papers and my thesis.

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

Mariëtte Pretorius (Mammal Research Institute, University of Pretoria, South Africa) - Pl and project manager.



Dr Mark Keith (Mammal Research Institute, University of Pretoria, South Africa) - PhD supervisor: assisted with fieldwork and manuscript improvement, co-authored published manuscripts.

Prof Hugh Broders (Department of Biology, University of Waterloo, Canada) - PhD cosupervisor: provided advice on PIT tag and cable reader deployment, assisted with manuscript improvement, co-authored published manuscripts.

Dr Grant Hall (Mammal Research Institute, University of Pretoria, South Africa)- ran isotope analysis and provided technical support.

AfricanBats NPC (Ernest Seamark, Teresa Kearney) - managed equipment purchases, provided logistical support and granted access to historical datasets, co-authored published manuscripts.

Prof Wanda Markotter (Centre for Viral Zoonosis, University of Pretoria, South Africa) provide additional financial, logistical and field support, assisted with manuscript improvement, co-authored published manuscripts.

Field assistants: Dr. Nimmi Seoraj-Pillai, Anju Pillai, Sashendra Pillai, Caroline Hannweg and Meng Jing Wei - assisted with recording and collecting data and carrying equipment in the field.

11. Any other comments?

Some final photographs of my project:



Myself (on the right) and a willing field assistant (Sashendra Pillai) going into a cave to collect roosting bats dressed in protective gear: gloves, gumboots, N95 mask, caving overalls and a caving helmet. These procedures are important for our own safety and everything is sprayed with a 10% bleach solution upon exiting the cave in accordance with decontamination protocols.



After capture, bats are processed for different measurements before receiving a PIT tag: Forearm length, age, body weight, head length and whether they are male or female. If bats appear dehydrated, they are offered a drop of water from a plastic syringe before being released