

Final Project Evaluation Report

Your Details	
Full Name	Antoine Marchal
Project Title	Wildlife 3D Tracking
Application ID	24248-2
Grant Amount	£4988
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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
The three-dimensional (3D) sampling and analysing of large carnivore and human tracks.				We sampled a total of 1,101 tracks during this project. The sampled species included African wild dog, domestic dog (Belgian/German Shepherds, Anatolian/Kanjial and mix-bred) and cheetah. The study sites were Bushbuckridge and Ellisras community lands, Green Dog Conservation/Cheetah Outreach and South African Wildlife College in South Africa, Naankuse in Namibia, and Limpopo-Lipadi Private Game and Wilderness Reserve in Botswana. Beside animal tracks, we sampled 58 footprints.
Mentorship sessions with traditional trackers.				We organised two tracking mentorships. One with five Shangaan/Zulu/Shona trackers in the Lowveld (Balule Game Reserve in Greater Kruger National Park, South Africa), and the other one with four San trackers in the Kalahari (Kgalagadi Transfrontier Park, South Africa).
Improving the 3D recording technique.				A total of 10 manipulators captured 6,346 pictures and 391 videos of a reference object representing a 3D-printed paw and track. The manipulators executed five repetitions by using six types of cameras (action, bridge, compact, DSLR, smartphone and tablet camera).
Creating a community of eTrackers.				W3DT is continuously raising awareness about tracking and increasing their followers through its website and social media pages (Facebook, Instagram and Twitter).

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

W3DT does not own a powerful desktop to do the heavy processing of 3D models. Thankfully, we could use desktops from the University of Liège and the University of Pretoria. W3DT is currently raising funds to procure its own desktop. Because of the limited computing power, we couldn't entirely achieve the analysing of lab work data.

The feature extraction from tracks is a long process that is currently done manually. We hope to implement some automation processes for the segmentation of tracks (i.e. separating the track from the background) and the positioning of landmarks.

Working in a national park is never easy as it necessitates research permits which often takes time to get. Furthermore, there is always a lot of restrictions in national parks that limit the possibility of getting out of the car to sample tracks. To overcome that issue, we collaborated with a private game reserve in Botswana where we could easily get all the required authorisations to sample wild dog tracks. On the long run, we wish to improve our track sampling technique so that it can be done without leaving the safety of a car.

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

The study that we conducted on cheetah tracks was a success as we could develop track-based algorithms to identify: (i) the foot from which the track originated (i.e. front-right, front-left, hind-right and hind-left) with 98.2% accuracy, (ii) the sex with 94.8% accuracy and (iii) the identity with 93.7% accuracy. These results have the potentiality to improve the non-invasive study of cheetahs and other species.

We organised two tracking mentorship sessions with Adriaan Louw, a CyberTracker Senior Tracker and Evaluator. The nine traditional trackers who participated in these mentorship sessions could improve their tracking skills by interacting with the mentor and between themselves. These sessions also enhanced the collaboration between W3DT and CyberTracker.

The lab work enabled us to improve the 3D sampling technique that we use in the field. This is an important step to creating a simplified, while optimised, sampling protocol to be applied in citizen science.

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

The sampling of mix-bred community dogs took place in Bushbuckridge and Ellisras, two community lands in South Africa. The community members were very interested to hear about this method to differentiate species from their tracks. In fact, they experience a lot of issues with regards to the human-wildlife conflict. Very often, wild

animals would roam through community lands and attack livestock. If the herders are able to prove that their livestock were killed by wild animals, they can claim for compensation from the government. As tracks are very often the only signs left behind on the 'crime scene', this tool would be very helpful for local communities.

The tracking mentorship sessions enabled the synergy between traditional trackers and modern science. The traditional trackers learnt about our 3D tracking tool and we learnt about their ancestral skills. Each track identified by the traditional tracker was 3D recorded in order to feed our global database. Furthermore, we conducted basic interviews with the trackers to better understand their background, the origin of their tracking skills and their needs to adapt into our ever-changing world.

The tracking session that took place in the Kalahari was special as it may well be the steppingstone to the establishment of the very first indigenous tracking school in the world. This session enabled a group of four unemployed Khomani San Trackers to use us as their first students. Under the supervision of Adriaan Louw, they gave us 2.5 days of training and 1.5 days of evaluation in tracks and signs, as well as 1 day of trailing – during which we followed the trail of a lioness. This period spent with the San trackers helped us to understand their needs for the creation of their tracking school.

5. Are there any plans to continue this work?

Yes, we're planning to apply for a booster grant to help W3DT to achieve its goals for the benefits of nature and traditional trackers.

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

We're continuously updating our website and social media platforms (Facebook, Instagram and Twitter) to share the results of our work.

We invited a journalist from France, Tangi Salaün, to participate in the tracking session in the Kalahari. Tangui has a significant experience on various nature conservation matters in Africa. He is currently in negotiation with the Thompson Reuters Foundation to potentially publish his article about our project.

A scientific article was recently submitted to the scientific journal Remote Sensing in Ecology and Conservation from Wiley and the Zoological Society of London to publish our results on cheetah tracks.

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

The project lasted from October 2018 (when the funds from Rufford were received into W3DT's bank account) up to March 2020 – a total of 18 months. The period was longer than anticipated because of unforeseen reasons (such as instructor availability) and computing time for the 3D models.

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
Tracking training San trackers – renting tents for trackers		139	+139	
Tracking training Shangaan trackers – venue and food		921	+865	We couldn't use the venue that would have been free of charge, so we had to pay for the access to a different venue.
Banking fees for W3DT Africa	66		-66	
Tax exempt organisation fees for W3DT Africa	118		-118	
Accounting and tax service fees for W3DT Africa	813		-813	
Transport costs Thornybush Private Reserve	63		-63	
Tracking training Shangaan trackers - instructor (fees and transport)	1033	1140	+107	
Transport costs Kgalagadi Transfrontier Park	139		-139	
Tracking training San trackers – instructor (fees and transport)	1245	1949	+704	Travel costs for instructor more expensive than expected.
Research on tracks – Naankuse (accommodation and research fees)	1169	1119	-50	
Transport costs Naankuse	190		-190	
Transport costs Waterberg	76		-76	
Transport costs Kruger	76		-76	
TOTAL	4988	5268	+280	W3DT covered the difference.

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

The important next steps that we would like to include in our application for a booster grant are:

- To launch the Khomani San Tracker School in collaboration with CyberTracker and the Khomani San Council.
- To create a citizen science app to 3D record tracks.
- To purchase a powerful computer for the 3D processing of tracks.
- To increase our eTrackers community.

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?

The Rufford Foundation logo was used in the following cases:

- On the website of Wildlife 3D Tracking (<https://www.wildlife3dtracking.org/partners>).
- In the final presentation of the master's Degree's project on cheetah tracks.

The Rufford Foundation was acknowledged in the master's degree dissertation on cheetah tracks and the article submitted to Remote Sensing in Ecology and Conservation.

The logo will also be used in the article on the Khomani San Tracker School that we would like to publish with the Thompson Reuters Foundation.

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

As project leader, **Dr Antoine Marchal** coordinated the project. He co-supervised the Master Student, **Guillaume Baralle**, along with **Professor Philippe Lejeune**. Antoine organised and participated into the two mentorship sessions with traditional trackers. He also sampled large carnivore tracks in the field and coordinated the lab work.

Professor Philippe Lejeune and **Professor Nico de Bruyn** provided valuable scientific inputs into this project. They enable the access to powerful desktops and software belonging to their respective universities.

Guillaume Baralle was a Master student from Gembloux Agro-Bio Tech, University of Liège, Belgium. He spent two months in Namibia to sample cheetah tracks as part of his Master Project. He successfully completed his master's degree in September 2019, and he submitted an article with the results of his work to the scientific journal Remote Sensing in Ecology and Conservation.

12. Any other comments?

We deeply thank The Rufford Foundation for their continuous support, and we hope that the current pandemic will not affect their vital help for nature conservation projects across the developing world.