

# Trans-Kalahari Predator Programme

## Research Division



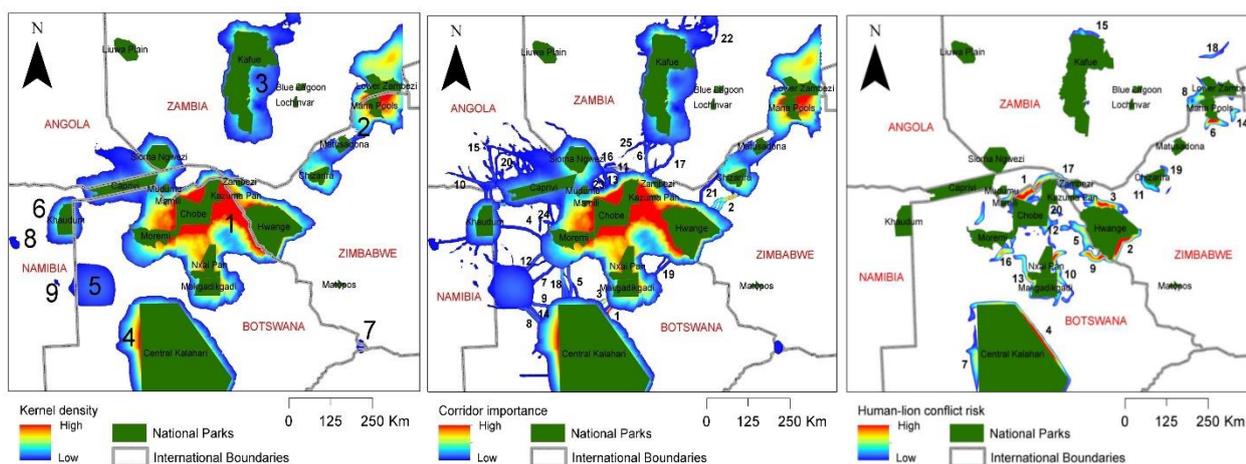
## Camera Trapping for Carnivores: Theoretical and Practical Training Interim Report

### SUMMARY

In May 2021, the Trans-Kalahari Predator Programme, provided an online theoretical course, consisting of 4 pre-recorded online lectures with accompanying worksheets as well as a live question and answer session, over a 10-day period between May 3<sup>rd</sup> and May 12<sup>th</sup> 2021. This was followed by a practical training session in the field for participants who completed the online sessions, between 18<sup>th</sup> and 21<sup>st</sup> May, which demonstrated the practical considerations for setting up a planned survey in the field. This practical training took place in Chobe National Park, where participants assisted the Trans-Kalahari Predator Programme in the setup of an ongoing large carnivore survey for the region. In total we trained 20 members of the DWNP's Research Division from the Ngamiland (3), Gaborone (4), Central (4), Kgalagadi (4) and Chobe (5) districts. An additional officer from Ghanzi district participated in the online course but could not attend the practical session. In addition to the DWNP, TKPP also spent one day training local guides and managers (5), and one day training our local guardian team (4) on the practical aspects of using camera traps to capture information about wildlife. The training was well received, and once the current survey is completed, additional training sessions on data sorting and management will be conducted with participants from the DWNP. This training was made possible with sponsorship from WWF USA and the Rufford Foundation.

## Background

The Trans-Kalahari Predator Programme has focused on the development of the KAZA Lion Landscape Connectivity Model (Cushman et al. 2018), which was identified as one of the major cross-cutting projects across KAZA for large carnivores. The aim of this model is to use spatial analysis as a tool to not only predict potential corridors for lions across the landscape, but also identify potential human-lion conflict hotspots, where successful mitigation methods can improve the livelihoods of local people and reduce retaliatory killings to ensure the stability of local lion populations. The original model was developed based on lion data obtained from the Hwange Lion Research Project in Zimbabwe, using information on real, biologically meaningful lion movement, together with up-to-date information on natural and anthropogenic landscape features. However, as the initial model was extrapolated from Zimbabwe data, more intense data collection is required to increase the accuracy of the model locally in Botswana (see Figure 1; Cushman et al. (2018). Prioritizing core areas, corridor and conflict hotspots for lion conservation in southern Africa. PLoS ONE).



**Figure 1** Left: Core lion population areas in and adjacent to the KAZA TFCA, ranked by importance.

Middle: Linkages/corridors between lion core areas outside national parks/game reserves (green) in and adjacent to the KAZA TFCA, ranked by their relative strength and vulnerability.

Right: High risk human-lion conflict hotspots in and adjacent to the KAZA TFCA, ranked by their relative risk.

As Botswana has a contrasting array of habitats, to increase local applicability of the KAZA lion landscape model in Botswana, the TKPP team has focused on strengthening the model by providing up to date estimates on the size of source populations in Botswana. Therefore, since 2017, the TKPP team has systematically surveyed key habitat types across key protected areas within Botswana,

including the Okavango Delta, Makgadikgadi Pans National Park as well as the Mabusahube region of the Kgalagadi Transfrontier Park. Camera trapping is currently the most accurate and unbiased method available for estimating carnivore densities over large areas. When coupled with local environmental and anthropogenic factors, these surveys will not only provide an estimate of lion densities, as well as of other large carnivores, but can determine which factors are responsible for the differences in densities across the region. For this reason, TKPP was identified by DWNP as a key partner in providing training in large scale camera trapping surveys for the DWNP's Research Division.

## Theoretical Training

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Due to the constraints of Covid-19, the TKPP team, together with the Head of Research from DWNP based in Gaborone, decided to provide theoretical training regarding camera trapping for large carnivores in the form of an online course for the DWNP Research Department. In this way, more officers could be accommodated in the training while minimizing risk for Covid-19 transmission. An online course relating to underlying theory and current best practices for using camera traps to conduct surveys for large carnivores was thus provided as a series of four lectures (Figure 2):

### ***Lecture 1: Introduction to Camera Trapping and Applications***

The first lecture introduced camera trapping as a means of collecting scientific data, while outlining a brief history of the technique and how technological advances have allowed it to develop as one of the leading methods for surveying large carnivores around the world. The relative advantages and disadvantages of camera trapping were discussed in context of large carnivore surveys, using real-world examples to illustrate these points. The lecture also covered the different levels of questions, ranging from community level to species or individual behaviour level, that can be answered using camera trapping, as well as examples of other applications related to conservation. The last part of the lecture consisted of real-life case studies from Botswana and other areas to illustrate the potential of camera trapping as a method to answer scientific questions at these different levels.

### ***Lecture 2: Camera Trap Theory for Large Carnivore Surveys***

This lecture was aimed at examining the theory related to estimating densities for large carnivores from camera trap data, and why density estimates are important from a conservation perspective. Capture-mark recapture (CMR) theory was introduced as a topic, together with examples of how scientists have used capture-mark recapture to estimate population sizes for different species. The assumptions that need to be fulfilled for capture-mark recapture methodology were discussed, as well as the disadvantages of using traditional capture mark recapture to estimate population sizes.

The concept of spatially-explicit capture mark recapture (SECR) was then introduced, together with the assumptions to be met and how SECR has improved the accuracy of density estimates by addressing some of the disadvantages of traditional CMR. The lecture was then ended with an illustration of how camera trap data is used to estimate density within the SECR framework.

### ***Lecture 3: Practical Considerations: Survey Planning and Setup***

The third lecture consisted of a combination of theoretical and practical discussions on planning camera trap studies. Emphasis was placed on understanding the question that needs to be answered when considering study design, as well as outlining minimum resources required to conduct surveys at large scales. A breakdown was given of the different capabilities of camera traps, and how study design and objectives may influence choice of camera make. A recap was provided on the assumptions that need to be fulfilled to conduct spatially-explicit capture mark recapture studies, and this was linked to recommendations on how to plan for survey size, number of camera stations and minimum survey length to be able to reliably estimate densities. Lastly, practical recommendations were given on the setup of camera stations in the field and the recording of supplementary data during survey setup.

### ***Lecture 4: Data handling and management***

The last lecture provided an outline of the various stages of data management and handling, and outlined the technical skills required at each of these stages. Recommendations were then given for how data could be downloaded during the running of the survey as well as after the survey, and managed to account and check for errors. Examples of how data could be managed and sorted into species folders were displayed, and programmes which could be used to summarize metadata from pictures were recommended. Instructions were provided on how to prepare the excel files necessary for analysis, including records of when camera traps were working, as well as capture histories of individuals identified for species of interest. An example was also given on how maps need to be constructed to represent the study area, and different analysis options were presented while discussing their relative pros and cons. Lastly, additional options for potential outputs from surveys were presented.

**CAMERA TRAPPING FOR CARNIVORES**

Theory and Practical Training for Large Carnivore Surveys

**Lecture 1:  
Introduction to Camera  
Trapping and  
Applications**

TKPP

WILDCRU  
Wildlife Conservation Research Unit

For enquiries: Please contact [grk@wcru.org.za](mailto:grk@wcru.org.za)

Camera Traps Around the World

Importance of Estimating Density

Survey Planning

Other Outputs

Lecture 1.mp4

Lecture 2.mp4

Lecture 3.mp4

Lecture 4.mp4

**Figure 2.** Lectures were structured as PowerPoint presentations, pre-recorded and then uploaded according to a schedule onto Google Drive, and participants were sent accompanying worksheets to fill out associated with each lecture to ensure that the content was clearly understood.

Lectures were pre-recorded using Zoom, and each lecture was accompanied by a worksheet consisting of a list of questions pertaining to the lecture content for that day. Lectures were made available every second day on a Google Drive folder, and participants were required to watch each lecture and return completed worksheets as proof of completion before the last day of the online course. This allowed officers to complete the lecture series at a time which was most convenient for them. On the last day of the online lectures, a live Zoom meeting was held as a question and answer session to allow participants to ask questions or request further clarification on the lectures. Once lectures and the Q&A session were completed, the officers were provided with the answer templates for worksheets, as well as a file of supplementary reading containing relevant recent publications and manuals with recommendations for camera trap surveys.

## Practical Training

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The practical training for surveys was aimed at allowing DWNP research officers an opportunity to experience a survey setup first-hand, while thinking about how lessons learnt during the theoretical lessons apply in the field. The practical sessions were thus arranged to coincide with the setup of a planned large carnivore survey of Chobe National Park to be conducted by TKPP. Only members of the Research Division that completed the online course travelled to Kasane to take part in the practical training, which included 20 officers from 5 districts across the country (Appendix 1). Each day, up to 8 officers were accommodated by the TKPP team and taken to the field site in Chobe National Park to assist in the set-up of a survey, with officers given the option to participate in one or two days of training. At the beginning of each day, officers were provided with hand sanitizer, had their temperatures taken and names recorded as part of adherence to Covid-19 regulations. Officers also signed an indemnity form to adhere to insurance regulations of the WildCAT Botswana Trust.

Officers were then taken to the field site, and the setup of the camera survey was discussed in context of theoretical training (Figure 3). Each group participated in the setup of between 5 and 6 stations for the Chobe River Front survey each day, and the following procedures were covered:

- Camera programming and setup. Officers were each provided with a camera trap, and taken through the programming process, while discussing the different options for camera settings and the relative trade-offs in battery life and SD card memory
- Practical procedures for choosing a camera trap site based on original planning, animal activity on nearby roads or game trails, available cover and security concerns
- Set-up of camera stations, including distance between traps, offsetting of traps, height of traps above the ground and procedures for clearing vegetation/trap obstructions
- Procedures for recording trap-related information including date, trap number, GPS coordinates, habitat types, camera numbers, SD card numbers, camera angle and pictures of traps/surrounding habitats

After traps were setup, participants were provided with lunch, the group was debriefed, and then returned to the Kasane regional office.

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**Figure 3.** Research officers from Botswana’s Department of Wildlife and National Parks taking part in camera survey setup during the practical component of the training course.

## Training of Guides and Community Guardians

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In addition to training DWNP Research Division Officers, the TKPP team also spent a day training the Chobe Enclave Community Guardian Team (Figure 4) on the practical aspects of setting up cameras to capture images of wildlife. This is in preparation to trail a new Community Camera Trapping Project that will be implemented in the Chobe Enclave to provide benefit sharing to communities where pictures of important or conflict-causing species are recorded on community land. During the course of the survey, our community guardian team will also assist the research team in monitoring camera traps within the park. Lastly, the TKPP team also spent a day with the guides and environmental manager of Chobe Game Lodge (Figure 5), discussing the ongoing camera trap survey, and allowing them the opportunity to participate in the setup of camera trap stations. The camera trap survey will provide baseline data on the lion population within the park, and guides from Chobe Game Lodge will also participate in a general monitoring programme of the lions in the park. The camera trap training was therefore part of their introduction to our research programme and how lion data will be collected in the future. To keep tourists and other guides informed of the project, posters were produced to be placed up at Ngoma and Sedudu gates, as well as information pamphlets provided for guests and tourists to take (Figure 6).



**Figure 4.** The Chobe Enclave Community Guardian team joined during the setup of the survey to learn how to programme and setup cameras for monitoring wildlife. The team will soon be conducting their own camera trapping initiatives within their villages as part of a benefit-sharing pilot project that will reward communities for tolerating wildlife in their community lands.



**Figure 5.** Guide trainer and guides of Chobe Game Lodge participated in a day of setup to learn more about camera trapping and how surveys can contribute to our knowledge of wildlife in the area. Chobe Game Lodge employs an all-female guide team, and is providing logistical support to the camera trap surveys.

## Thank you!

We are extremely grateful to the **Department of Wildlife and National Parks** for supporting this research, and our **partners, Chobe Game Lodge**, who have provided valuable ground support.

We would further like to express our gratitude to our **sponsors from WWF and Rufford Foundation** for supporting WildCRU in our research.

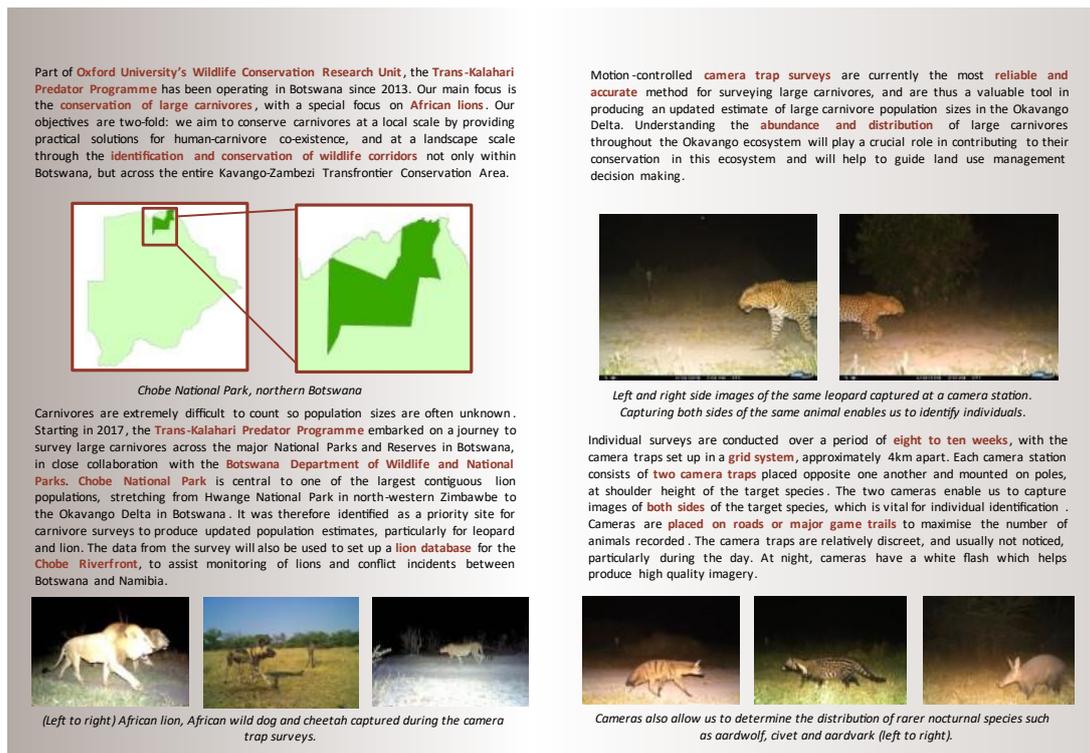
If you would like to find out more, please visit our **website** and follow us on **social media**:  
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[www.facebook.com/TKPPProgramme/](https://www.facebook.com/TKPPProgramme/)  
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If you would like to **support the conservation of Africa's last remaining carnivore populations**, please go to [www.wildcru.org/support-us/](http://www.wildcru.org/support-us/)  
 Thank you very much for your support! Through you we can conserve Africa's carnivore populations into the future!



## CHOBE NATIONAL PARK CARNIVORE SURVEY





**Figure 6.** Information pamphlets disseminated at Ngoma and Sedudu gates to keep guides and tourists informed.

## Feedback and Future Training

Feedback provided by participants was positive overall. Participants found the provision of online training useful, and easier to fit into their own schedules, and would participate in additional training offered on different topics. There was a general interest among participants to conduct another practical session in order to demonstrate the data sorting and management processes covered in Lecture 4, as well as for training for select participants in the analysis process. This training will be conducted using the Chobe National Park survey data to ensure continuity. Practical training will thus be continued on the following topics:

- Introduction to new software for camera trap image sorting and image tagging using artificial intelligence
- Practical demonstration of data management and camera trap file preparation and individual predator identification
- Analysis session on data analysis using different programs provided by TKPP's statistician (with a pre-requisite of training in R and experience with statistics)

Dates of the continued training are to be announced, but will likely take place in late August or early September to allow time for data downloads from the Chobe National Park survey.

## Acknowledgements

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The Trans-Kalahari Predator Programme would like to thank the Botswana Department of Wildlife and National Parks for their continued support to our research programme, and for their enthusiastic participation and willingness to learn throughout the training process. We would also like to thank our sponsors for this training, WWF USA and the Rufford Foundation. Lastly, we would also like to thank Chobe Game Lodge for their ongoing logistical support.

### APPENDIX 1: DWNP PARTICIPANT LIST AND GEOGRAPHICAL REACH



Figure 1. Map showing the districts of Botswana.

**Department of Wildlife and National Parks Research Officers**

<b>Name and Surname</b>	<b>District</b>
Chief Tsholofelo	Ngamiland
Tebogo Baoki	Ngamiland
Gosego Moreri	Ngamiland
Letlhogonolo Phologo	Chobe
Kaelo Nkile	Chobe
Babusi Latiwa	Chobe
Lorato Esele	Chobe
Kenosi Nkape	South-East
Monei Onaethata	South-East
Tshwaragano Mazongo	South-East
Basuti Ramakawa	South-East
Neo Lebentlele	Kgalagadi
Bakang Lehutso	Kgalagadi
Tirelo Shabane	Kgalagadi
Emmanuel Letebele	Kgalagadi
Tshepiso Phologo	Central
Bobby Ramhitshana	Central
Dineo Keithome	Central
Tsholofelo Mangole	Central