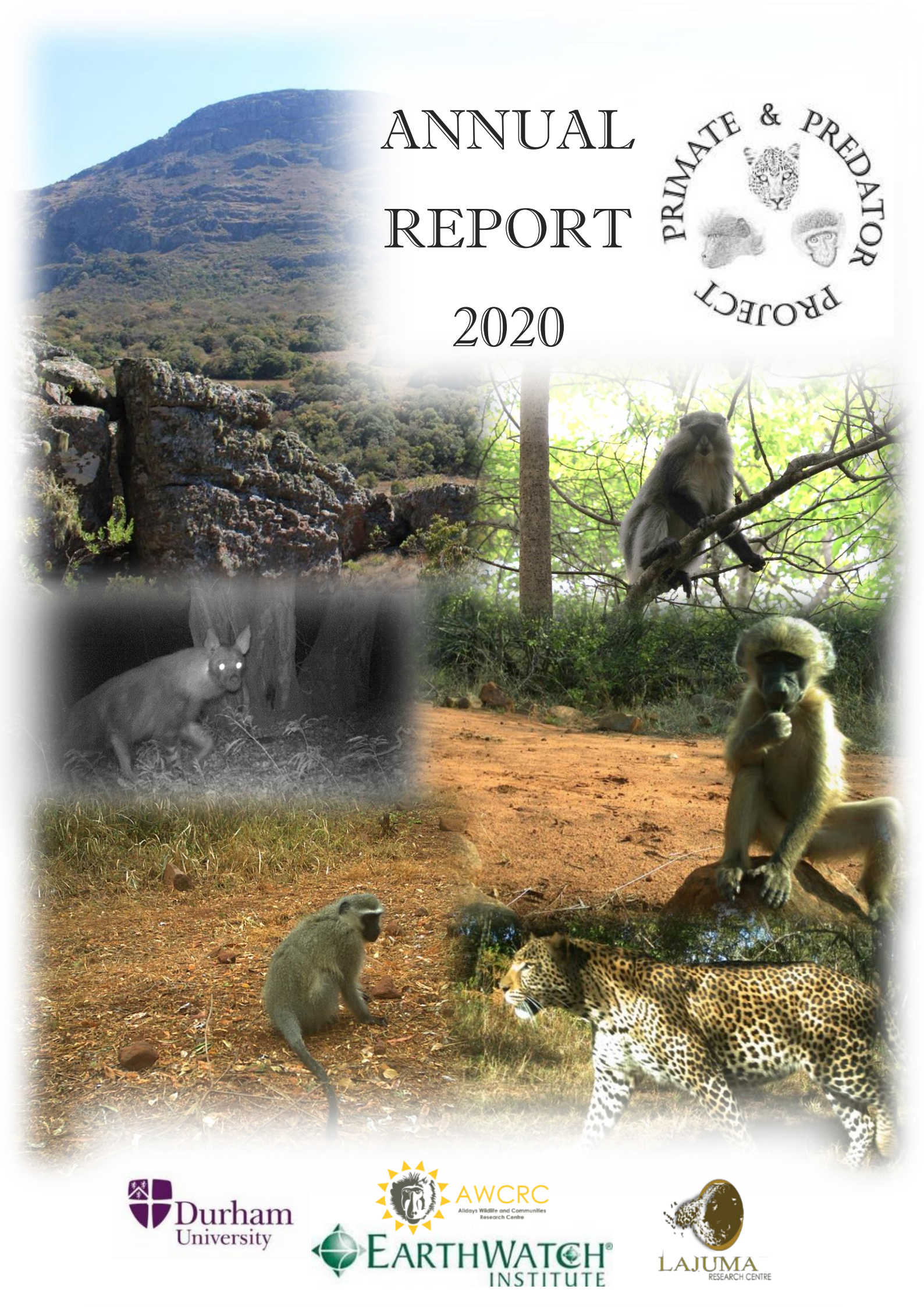


ANNUAL REPORT

2020





The Primate and Predator Project

The Primate and Predator Project (hereafter 'PPP') was established through a partnership between Durham University and Lajuma Research Centre in early 2011. Both the PPP and Lajuma Research Centre are based in the Luvhondo Private Nature Reserve, an area covering 42.3km² within the UNESCO Vhembe Biosphere Reserve. Since its inception nine years ago, the PPP has grown beyond the Soutpansberg field site and has a sister research site (Alldays Wildlife and Community Research Centre – AWCRC) based in Alldays, to the west of the Soutpansberg Mountains.

The Primate and Predator Project aims to:

- i. Assess the role of mountainous regions in biodiversity conservation.
- ii. Understand the behavioural ecology of predator-prey interactions, focusing on diurnal primates and their predators as a model system.
- iii. Evaluate the nature and extent of human-wildlife conflict within the Soutpansberg Mountain region.



Through a team of full-time managers and volunteers on the ground at both the Soutpansberg and AWCRC field sites, the project focuses on three main areas: monitoring and gathering data on populations of local predators, such as leopard and brown hyaena, through camera trapping and other data collection methods, collecting behavioural and other data on local primate groups through direct observation of habituated groups of baboons, samango monkeys and vervet monkeys and engagement with local communities around issues of human-wildlife conflict, wildlife management and conservation. This report summarizes some of the scientific and community-based activities of the PPP during 2020.



The Team



Prof Russell Hill

*Principle investigator & reader,
Department of Anthropology, Durham
University, UK*

Field-site managers



Chris Joubert

*Predator coordinator,
Soutpansberg field research site*



Cyritha Barwise-Joubert

*Primate coordinator,
Soutpansberg field research site*



Dr Luke Duncan

*Field research coordinator,
Soutpansberg field research site*



Dr Leah Findlay

*Research coordinator, Alldays
field research site (AWCRC)*

For enquires PPP can be contacted at:

Postal address: Primate and Predator Project
Lajuma Research Centre
PO Box 522, Louis Trichardt (Makhado)
0920, South Africa

E-mail: primate.predator@durham.ac.uk

Phone: +27 (0)64 015 4869

Website:

http://community.dur.ac.uk/r.a.hill/primate_and_predator_project.htm

<https://alldayswrc.org/>

Blog:

<http://primateandpredatorproject.wordpress.com/>

Publications:

<http://primateandpredatorproject.wordpress.com/downloads/>

Facebook:

<https://www.facebook.com/PrimateandPredat0rProject/>

<https://www.facebook.com/AlldaysWildlifeandCommunitiesResearchCentre>

YouTube channel:

http://www.youtube.com/channel/UCp6R2F0SePk_9kEcMdvV0bA

Twitter:

[@PrimatePredator](https://twitter.com/PrimatePredator)

Instagram:

[@primate_predator](https://www.instagram.com/primate_predator)

Project information

Donate to the Primate and Predator Project

The important work we are doing to protect primates, predators and the biodiversity of the Soutpansberg Mountains and surrounding areas is not possible without on-going funding. As such we are very grateful to all the individuals and organisations that offered PPP financial support in 2020. If you would like to support the project further by making a donation, please visit <https://dunelm.org.uk/donations/departments/AnthProjects/PPP> and email us at primate.predator@durham.ac.uk so that we can ensure that the project received the donation.



In memoriam: Dr Ian Gaigher



Dr Ian Gaigher supporting one of the Earthwatch teams in 2011

2020 has been an unprecedented year. The covid-19 global pandemic has brought enormous challenges and loss and its impacts will be felt for many years to come. Yet against this backdrop, the incredibly sad passing of Ian Gaigher in April 2020 underlined that some legacies rise above everything in the world around them, like Mt. Lajuma itself, and highlight how inspirational some people can be. Ian worked tirelessly for conservation and research in the Soutpansberg region and in establishing the Lajuma Research Centre, he provided a base for researchers from all over the world. It is impossible to overstate his contribution to our project. I still vividly remember meeting Ian for the first time and his boundless enthusiasm and energy as he showed us around his property, Lajuma. His knowledge and commitment helped shape the early projects and experiences of our students and volunteers and so built the foundations that allowed our project to grow. Indeed, his incredible work ethic saw him literally help build the foundations for our camp and project office and he was instrumental in helping us develop and run our Earthwatch teams and field courses and supporting everything we did. Nothing ever seemed to faze him and his characteristic smile was never far from his face. We have lost a great collaborator, supporter, mentor and friend. His presence at Lajuma and in the mountains will be sorely missed but we will continue to work to honour and promote his legacy. His inspiration will live on long after the rest of 2020 has faded to memories.

- Prof Russell Hill



Scientific outputs in 2020

Despite the restrictions of the COVID-19 pandemic, the Primate and Predator Project produced 13 scientific publications which were either published or accepted for publication in 2020.

- Findlay, L.J. & Hill, R.A. (2020) Field guarding as a crop protection method: Preliminary implications for improving field guarding. *Human–Wildlife Interactions* 14: 519–530.
- Walton, B.J., Findlay, L.J. & Hill, R.A. (2021) Insights into short and long-term crop-foraging strategies in a chacma baboon (*Papio ursinus*) from GPS and accelerometer data. *Ecology & Evolution* 11: 990–1001.
- Williams, K.S., Williams, S.T., Welch, R.J., Marneweck, C.J., Mann, G.T., Pitman, R.T., Whittington-Jones, G., Balme, G. A., Parker, D.M. & Hill, R.A. (2021) Assumptions about fence permeability influence density estimates for brown hyaenas across South Africa. *Scientific Reports* 11: 620.
- Findlay, L.J. & Hill, R.A. (2020) Baboon and vervet crop foraging behaviors on a commercial South African farm: Preliminary implications for mitigation strategies. *Human–Wildlife Interactions* 14: 505–518.
- LaBarge, L.R., Allan, A.T.L., Berman C.M., Hill, R.A. & Margulis, S.W. (2021) Extent of threat detection depends on predator type and behavioral context in wild samango groups. *Behavioral Ecology and Sociobiology* 75: 13



- Stringer, S.D., Hill, R.A., Swanepoel, L., Dalrymple, S.E., Linden, B. & Koyama, N.F. (2020) Interpreting the role of frugivores in seed germination potential depends on study design: A case study from Soutpansberg Mountain, South Africa. *Acta Oecologia* 106: 103584
- Allan, A.T.L., Bailey, A. & Hill, R.A. (2020) Habituation is not neutral or equal: Individual differences in tolerance suggest an overlooked personality trait. *Science Advances* 6: eaaz0870.
- LaBarge, L.R., Allan, A.T.L., Berman C.M., Margulis, S.W. & Hill, R.A. (2020) Reactive and pre-emptive spatial cohesion in a social primate. *Animal Behaviour* 163: 115-126.
- Parker, E.J., Hill, R.A., Allan, A.T.L., Howlett, C. & Koyama, N.F. (2020) Evaluating predictors of ranging patterns in the endangered samango monkey (*Cercopithecus albogularis schwarzi*). *Integrative Zoology* 15: 385-400.
- Stringer, S.D., Hill, R.A., Swanepoel, L. & Koyama, N.F. (2020) Adapting methodology used on captive subjects for estimating gut passage time in wild monkeys. *Folia Primatologica* 9: 417-432
- Williams, K.S., Pitman, R.T., Mann, G.T., Whittington-Jones, G., Comley, J., Williams, S.T., Hill, R.A., Balme, G.A. & Parker, D.M. (2020) Utilizing bycatch camera-trap data for broad-scale occupancy and conservation: A case study of the brown hyaena *Parahyaena brunnea*. *Oryx* 1-11. doi:10.1017/S0030605319000747
- LaBarge, L.R., Hill, R.A., Berman C.M., Margulis, S.W. & Allan, A.T.L. (2020) Anthropogenic influences on primate antipredator behaviour and implications for research and conservation. *American Journal of Primatology* 82: e23087.
- Ayers, A.M., Allan, A.T.L., Howlett, C., Tordiffe, A.S.W., Williams, K.S., Williams, S.T. & Hill, R.A. (2020) Illuminating movement: Nocturnal activity patterns in chacma baboons (*Papio ursinus*). *Journal of Zoology* 310: 287-297



The white elephant in the room: The impact of COVID-19 for the PPP in 2020

The COVID-19 pandemic has had an unprecedented impact on the entire world. The effects on both the health and day-to-day lives of people in every country, not to mention the tragic deaths that have resulted from the emergence of the virus, have been substantial. Not even the remote reaches of the Soutpansberg and western Limpopo region were unaffected by the global COVID-19 pandemic. The announcement of a national “lockdown” by the South African government on the 23rd of March 2020 coupled with calls for repatriation by their home countries amidst the growing threat of the pandemic saw the departure of almost all the volunteer assistants and students at the Primate and Predator Project’s two field sites. This reduced the team at the Soutpansberg field site from 13 people down to



Luke Duncan removing a snare located in the mist-belt forest on the southern slopes of the Soutpansberg Mountains

only the three managers while at the AWCRC, the team was reduced to two managers, one volunteer and one PhD student.

Despite the sizable reduction in workforce, the PPP team continued to conduct routine data collection wherever possible. Over the 9-month lockdown period, the staff at the Soutpansberg field site continued to service the existing camera trapping grid, which is used to monitor the ranging patterns, behaviour and population dynamics of large predators. Routine data collection on samango monkey behaviour, diet and movement patterns also continued. The team also engaged with snare removal whenever possible.

Interestingly, the local wildlife in the Soutpansberg appears to have responded to the sudden change in the human population numbers around Lajuma following the departure of volunteer assistants and students. Anecdotal observations by the PPP staff and a Lajuma Research Centre assistant suggest an increase in leopard activity in the area, with more sightings, leopards being heard calling at night or more observations of spoor and scat. The sleep site selection of the local baboon group appears to have changed as well with the baboons opting to sleep on the cliffs above the PPP’s offices at Bushcamp (the base of operations for the PPP at the Soutpansberg field site) far more often than previously. One of the most notable observations was that one of our two habituated samango monkey groups was recorded as being present in Bushcamp for 10 out of the 14 days of the first two weeks following the departure of volunteer assistants and students (this troop is typically followed by



Chris Joubert servicing one of the cameras which make up the camera grid of the PPP in the Soutpansberg Mountains



a volunteer four days a week and usually will pass through Bushcamp approximately once every 5-6 days). At the AWCRC the local baboon groups began to behave more anxiously following lockdown because they encountered people more often due to people remaining at home, highlighting how differently the animals perceive humans at our two field sites. While these reports and records are anecdotal, it is nonetheless interesting to consider the impact that human activity in the area has on the local wildlife and ecology.



A samango monkey inspects one of the field vehicles at the PPP offices at Bushcamp, the base of operations at the Soutpansberg field site.



Cyrintha Barwise-Joubert explaining animal behaviour to children in the Buysdorp community located in the foothills of the Soutpansberg Mountains

The national lockdown also had a considerable impact on the capacity of the PPP to undertake community-based work. However, the PPP team still engaged in various activities with local communities wherever permissible. Once non-essential local travel was permitted after the 1st August 2020, the PPP team was once again able to head out to assist local farmers, participate in community events and teach local children and adults alike about the wilderness of the Soutpansberg and surrounding regions. In partnership with various non-governmental organisations (NGOs), the PPP staff assisted local communities with human-wildlife conflict mitigation by building livestock bomas and reinforcing

existing enclosures, community engagement activities and environmental education through local schools.

In the short time before the South African lockdown was announced, the PPP's Soutpansberg field site team was also able to assist Panthera with their annual leopard survey which normally runs from March to June each year. Due to the imposed lockdown, the survey was cut short but enough data were collected to allow

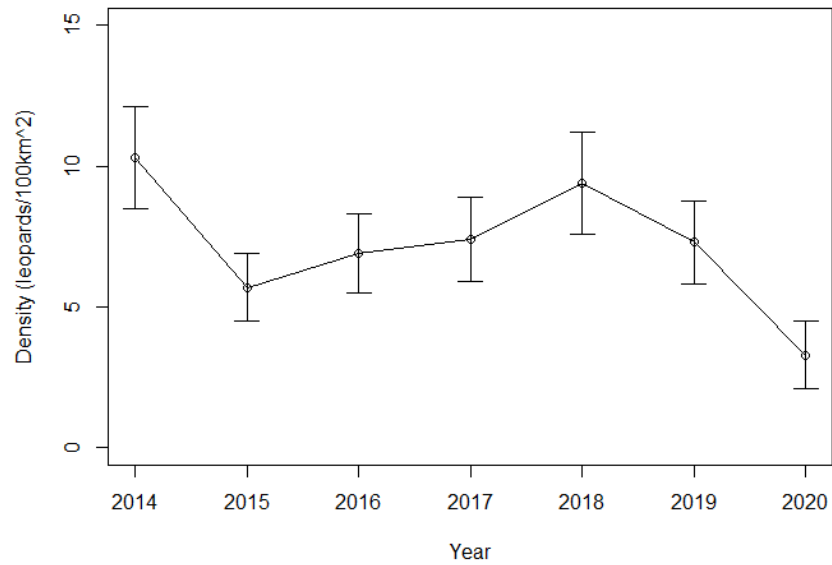


Luke Duncan helping local farmers to reinforce livestock enclosures to prevent attacks by leopards

Panthera to publish a report detailing the modelled current population trends for leopards in the western Soutpansberg. The results of the survey suggest that leopard populations are declining locally, further highlighting the need for more research and conservation efforts, but that the challenges due



to the national lockdown for the 2020 survey do limit the reliability of these findings. The 2021 survey will be particularly important in allowing us to understand whether there has been a decline in leopard numbers or whether lockdown reduced the accuracy of this year's survey.



Leopard population density estimates for the years 2014 to 2020. Reproduced from Louw et al. 2020. Panthera leopard monitoring report – camera trap survey 2020 (© Panthera)

Despite the ongoing challenges present due to the COVID-19 pandemic, the PPP will continue to operate for the foreseeable future. It is important that the behaviour and movements of the local wildlife are monitored during this period in order to ensure impacts of the COVID-19 pandemic on populations numbers and interactions with different local human communities are understood. In doing so this will contribute to our ongoing efforts toward the conservation and sustainable management of the Soutpansberg Mountains and surrounding regions through research, monitoring and community engagement.



Predator research projects in 2020



Jamie McKaughan: The best methods to estimate population densities of 'problem' species in farming landscapes in Alldays, Limpopo Province, South Africa

Jamie served as the predator research coordinator at the Alldays field site until June 2020, when he returned to the UK to complete his transfer from his MSc to a PhD with Durham University. For his PhD, Jamie will expand his research on camera trapping population estimation methods to ascertain density estimates for multiple 'problem' species and the best methodologies to do so.

Camera trapping technology has developed significantly in recent years. This advancement is particularly notable in mark and capture-recapture techniques that have allowed for reliable density estimates of some of the world's most threatened yet elusive species, including leopards *Panthera pardus* and other large cat species. While this has facilitated considerable progress in the conservation of these species, estimating population densities for species without natural unique markings remains challenging, ultimately hindering conservation efforts. Some of these species, such as chacma baboons *Papio ursinus*, black backed jackal *Canis mesomelas* and caracal *Caracal caracal* are considered some of the most damaging species to human livelihoods in southern Africa, and consequently at the forefront of negative human-wildlife interactions. Reliable density estimates will help estimate the scale of conflict issues and accordingly inform potential management strategies.

Using camera traps, the distance sampling with camera traps (DSCT) and random encounter model (REM) methodologies are emerging techniques to assess unmarked species populations. While these two methods offer promise, further studies are needed to evaluate their potential to provide reliable density estimates for unmarked species and thus inform conservation management decisions. Jamie aims to use these two, as well as capture-recapture techniques, to provide reliable density estimates of multiple species in the Alldays area, as well as identify key elements to consider for future uses of the DSCT and REM methods.



A caracal passes a camera trap during the night. Caracal are seen on the PPP's Soutpansberg camera grid but are more common in the Alldays area





Jonathan Sander: Co-occurrence of male and female leopards and their prey

Jonathan is a student at Utrecht University and conducted a research project while at the PPP's Soutpansberg field site focusing on the relationship between male and female leopards and their respective co-occurring prey species. The leopard is a solitary predator with a broad diet, typically preying on animals ranging from 10kg to 40kg and preferring species which display little anti-predator behaviour. In the western Soutpansberg Mountains, bushbuck *Tragelaphus sylvaticus* and red duiker *Cephalophus natalensis* are favoured prey



A red duiker forages in front of one of the camera trap stations on the PPP's Soutpansberg camera grid

for leopards; they fall within the preferred weight-range and pose little threat to leopards during capture and are thus considered low-risk prey species. While falling within the ideal weight range for prey species, the aggressive behaviour of chacma baboons, as well as the sharp quills of Cape porcupine *Hystrix africaeaustralis*, make these prey species more dangerous and so high-risk prey species.

Literature suggests that there might be differences in male and female leopard prey utilization within the same population. The co-occurrence of either male or female leopards and a specific prey species in a certain area is one of several indicators for the potential differences in prey preferences of male and female leopards.

This study therefore examined the co-occurrence of male and female leopards with high- and low-risk prey species in the western Soutpansberg Mountains between 2018 and 2019. Using camera trap data from the PPP's camera trap grid, Cape porcupine presence was a predictor for the number of male leopard records at a camera station with fewer male leopards recorded at locations with more porcupine. In contrast chacma baboon and bushbuck presence increased female leopard records at a camera station. The associations between the presence of the prey species and a leopard's sex were not strong, suggesting that while these may be indicative of prey preferences of each sex, other ecological factors, such as home range size, water availability, terrain and cover may be more important in predicting the co-occurrence of leopards and these prey species. Because the camera grid has been designed specifically for leopards, all four prey species considered here may not necessarily be captured as effectively by the camera grid. Further studies should consider such factors when examining co-occurrence of species.





Evelyn Smalley: The intra- and interguild spatio-temporal relationships of mesopredators within the Soutpansberg mountain range

As a final-year zoology student at the University of Manchester who intends to enter the world of wildlife film making, Evelyn's research project at the PPP Soutpansberg field site focused on how medium-sized predators utilise the landscape in both space and time. Anthropogenic activity is leading to catastrophic declines in the world's biodiversity. Large apex predators are being disproportionately affected and their loss is triggering detrimental cascades through terrestrial, marine and freshwater ecosystems. One adverse consequence that follows the loss of an apex predator is the subsequent population expansion of previously suppressed smaller predators, termed mesopredators. This expansion can lead to severe ecological damage. Despite their abundance in sub-Saharan Africa, there is deficient information about mesopredators and their relationships with sympatric species, in particular apex predators. Using non-intrusive camera trapping techniques, this study observed the temporal responses of three mesopredators found in the Soutpansberg mountain range (African civet *Civettictis civetta*, large spotted genet *Genetta tigrina* and brown hyaena *Hyaena brunnea*), in response to leopard as the apex predator in this region. Civets and genets avoided spatio-temporal overlap with leopards, whereas brown hyaenas did not. This suggests that if the local leopard population continues to decline, civet and genet populations will be released from top-down pressures, potentially triggering a mesopredator release. The understanding of interactions within and between trophic levels, can be used by conservation managers to assess which species will be particularly vulnerable to disturbances within ecological networks.



A brown hyaena approaches one of the camera traps on the PPP's Soutpansberg camera grid



Emily Harrison: Looking at the spatio-temporal sympatric relationship between leopards (*Panthera pardus*), the apex predator and the mesopredators occupying the Soutpansberg mountain range

Emily is an undergraduate student at Cardiff University and chose to investigate the relationship between leopards and other species in terms of patterns of movement during her time at the PPP Soutpansberg field site. The rapid decline of apex predators across the world has been a subject of limited research, even though 58% of the large carnivores are now classed as vulnerable. Leopards are one of the most affected apex predators. In South Africa alone they have faced a rapid decline due to



a range of different factors, of which a key anthropogenic factor is the fragmentation of their habitat, which has been reduced by 80%. They also face an abundance of problems from illegal poaching as well as a significant amount of human-wildlife conflict. These problems are shared with many other carnivores found in sub-Saharan Africa. Within the trophic levels, the mesopredators are commonly found below the apex predators and there is little known about the relationship between these two groups. Given the elusive nature of this group of predators, non-intrusive camera trapping techniques were used to investigate the relationship between them in the Soutspanberg mountain range, South Africa. By comparing the time differences between the appearance of leopards at a camera station and other animals from January 2015 to December 2019 (classified into categories of records including other leopards, prey species, mesopredators, humans and others) it was found that the leopards appear to arrive at locations where the mesopredators have been sooner than if the previous record was another species category. Furthermore, the time differences were strongly predicted by the categories of animals preceding the arrival of leopards and by the location itself (camera station under consideration). Understanding the spatio-temporal relationships between species could be important for the future of conservation strategies for larger carnivores because the impact of changes in predator abundance on the lesser trophic levels could be substantial.



Primate research projects in 2020



Andrew Allan: Baboon vigilance behaviour and exploring methodologies in studies of behaviour

Andrew's previous work, which also forms part of his PhD work at Durham University, showed that individuals in the habituated group of chacma baboons displayed consistent and individually distinct responses to observer approaches.

He explored the implications of this by measuring the inter-individual association patterns of the same group of chacma baboons at different observer distances. Mixed-model analysis showed a strong positive association between individual tolerance levels of human observers and how often an animal appeared as a neighbour to focal animals when observers were nearer; in other words, tolerant animals occurred near focal animals more often when the observer was nearby. When the observer was further away, there was a neutral relationship between the same variables. This appears to be the first empirical evidence that observer presence and behaviour can influence the association patterns of habituated animals and thus potentially have an important impact on measuring social networks in habituated wild animals.

Animals use vigilance to detect or monitor threats. While numerous aspects of vigilance have been studied across a wide range of species, little work has explored the methodological variation that can be found across these studies. Different approaches to sampling design and statistical analysis and the definition of vigilance used can make cross-study



Baboons regularly inspect the PPP's camera traps in the field

comparisons challenging and potentially complicate our understanding of animal vigilance. Using data collected from a habituated chacma baboon group to explore how results are influenced by differences in vigilance definitions and the interpretations of these definitions, it was found that results varied when different definitions of vigilance were used (i.e. definition effect) and when different observers interpreted and applied definitions (i.e. interpretation effect). Together these results suggest that differences in definitions and interpretations of definitions between studies could fundamentally influence study findings.

Andrew's work is ongoing with a current focus on exploring the pre-emptive and reactionary vigilance behaviours of the habituated chacma baboon group. This work aims at understanding how the baboons detect and monitor threats, such as leopards, other baboon groups and aggressive



individuals within their own group. It will also include visual tolerance estimates to understand how observers may influence the behaviours they are recording.



Rahman Mokhlesur: Behavioural and hormonal responses to anthropogenic food sources in chacma baboons

Rahman, a PhD student at Durham University, has spent over a year monitoring a baboon group living in Alldays that depends mainly on the local landfill site (dump) for food. Primates that live in human-influenced habitats face several ecological constraints. To overcome these constraints many primates not only display remarkable dietary flexibility in response to habitat variation and seasonally fluctuating food resources but also become habituated to living in close contact with humans. Primates living in close proximity to these human-influenced environments typically modify their diets to include high quality human-derived foods, either from agricultural crops, provisioning or other human foods, including rubbish from garbage dumps. Such flexibility is core to their ability to adapt to varied or changing ecological circumstances. Investigating this flexibility is therefore key to furthering our understanding of human-wildlife interactions, the impact of habitat change, conservation efforts and fundamental evolutionary biology. Dietary flexibility, in turn, involves a combination of behavioural and physiological factors but these are rarely investigated together. Further, the flexibility of primates in natural settings is usually investigated by comparing different groups of the same species but the flexibility of the same animals under different conditions is rarely studied, which would better limit potential confounding factors. Thus, Rahman's study is designed to investigate both behavioural and physiological responses of a single group of baboons to these changes, using behavioural observation techniques and physiological measures derived through non-invasive hormone analysis of faecal samples collected in the field.



One of the younger members of the baboon troop which were studied by Rahman at the Alldays site

Over the period he has spent in the field he has collected over 106 full days of behavioural data (approximately 637.67 hours of recorded observations), 417 faecal samples, assessed plant productivity (32 days of measuring plant productivity) and measured the quantity and quality of foods at the dump through observations of 9 828 bags of refuse.





Laura LaBarge: The ecology of fear in a wild social primate

Laura LaBarge conducted her PhD research with the PPP between 2016 and 2019 after spending 2015 as a research assistant on the project. She has been writing up her thesis and will be defending it for The State University of New York, University at Buffalo, in the winter of 2021. In 2020 she completed lab work to measure samango fecal cortisol concentrations and published two papers from data collected on them in the field.

Laura's PhD was broadly focused on how avoiding predators affects samango monkey ecology and physiology. She studied how our two habituated groups responded to spatial and temporal variation in perceived predation risk using long-term PPP data and she also used field experiments to examine how social and ecological factors affected collective predator detection. Additionally, she used hormonal markers associated with physiological stress to examine whether challenges like resource availability, intergroup competition, predator encounters, and/or researcher presence during daily follows might predict responses.



Iona Mills: The effect of food availability on aggression behaviour in samango monkeys *Cercopithecus albogularis schwarzi*

Iona hails from Scotland and joined the PPP as part of her placement year with the University of Manchester. Her research project focused on the relationship between resource availability and aggression in the local samango monkey populations. Aggression is often the result of competition when resources, which could improve an individual's reproductive fitness, are limited. In most animal species, competition among females is primarily over food whereas males compete more over access to females and thus mating success. Competition for resources can often be split into scramble or contest competition depending on the social structure and aggression frequency of a population. The samango monkey is an endangered subspecies found in South Africa whose habitat has historically been naturally fragmented (but fragmentation has also been exacerbated by human activity). Because of the restrictions of a limited habitat, food-based resource competition is potentially increased and thus this study considered aggression in relation to food availability in samango monkeys. Iona



An adult male samango monkey monitors his group on the ground



focused on using data gathered through observations of the monkeys from the July-December periods for the years 2015-2019. These months were chosen as they were out of the breeding season, and hence less mating competition and related aggression would be expected. Monthly phenological data were also collected for the five tree species that were most frequently used by samango monkeys during that period. It was found that there was monthly variation in aggression with a significant peak in aggression in October compared to the other months. There was no significant relationship between aggression and food availability as indicated by the phenology data and therefore the results suggest that food availability had no significant effect on aggression in samango monkeys over the time considered in her study.



A pair of juvenile samango monkeys playing in a Ficus tree



Community engagement during 2020 by the PPP's Soutpansberg field site team

Research and conservation cannot happen in a bubble; it must engage and involve all stakeholders in order to generate meaningful and lasting outcomes. Thus, it is important that efforts toward environmental conservation include the participation and engagement with local stakeholders such as land owners and farmers. Part of the mandate of the PPP is to engage with these stakeholders around issues of human-wildlife conflict and mitigation and environmental education.

Given the restrictions imposed by the nation-wide lockdown due to the COVID-19 pandemic, the staff of the PPP Soutpansberg field site had fewer opportunities to work with local communities than would generally be possible. However, prior to the lockdown and working within the national restrictions during lockdown, the PPP's Soutpansberg field site team was still able to partner with the African Institute of Conservation Ecology (AICE; www.aice.org.za), through funding from the Global Environment Facility (GEF; www.thegef.org), to focus on three main areas: direct human-wildlife conflict mitigation action through boma building and reinforcement, meetings with community



A boma before (top) and after (bottom) reconstruction. The rickety fence of the original boma no longer acted as a barrier to either cattle or wildlife and was replaced with a sturdy 2m high fence capped with razor wire for extra protection

leaders to discuss issues of human-wildlife conflict and education and community-centred activities.

Boma building: protecting livestock, livelihoods and wildlife

Within the Kranspoort community, the PPP Soutpansberg field site staff and AICE staff were able to assist subsistence cattle farmers by building and upgrading their cattle enclosures (called 'bomas'). Two bomas were extended and reinforced while a further one was rebuilt entirely. In the former case, the bomas had been built by the farmers and had been reinforced by the PPP and Earthwatch volunteers in previous years. However, last year, following an attack by a leopard on calves, it became apparent that further reinforcement and extension of the fences making up the boma was necessary and



so the PPP and AICE extended the height of the bomas and added gates to limit access and secure cattle at night. The bomas were initially found to be in a very poor state, but using mostly hand tools, coupled with a lot of hard labour, the PPP and AICE team were able to transform them into a robust and effective enclosure for the farmer to secure his cattle. Further to this, materials for building and reinforcing bomas were donated to the community of Buysdorp.



Chris Joubert digging a hole using a metal beam to plant a fence post for one of the bomas that were built. A mechanical auger was available but due to rocks in the soil, the holes had to be dug by hand

Engaging with community leaders

In order to best identify how to support communities, the PPP and AICE team met with community leaders of Glenferness and Buysdorp. In both cases, community leaders were able to voice their concerns around wildlife-related issues as well as for all parties to gain a better understanding of the dynamics of human-wildlife interactions. The PPP and AICE team were able to advise community leaders on how best to deal with wildlife and how best to protect their communities and livestock from wildlife.



PPP and AICE staff members with community leaders from Glenferness. Meetings were held in the tradition of the local community: in the shade of a large tree in the open air





A knowledge-sharing session with community members of Buysdorp in order to compile the cultural map of the town



Reviewing camera trap images which children from Buysdorp and surrounding areas captured at their homes

Education and community activities

Over a period of several months, the PPP joined AICE in running regular Saturday morning gatherings at the school in Buysdorp. These gatherings aimed to facilitate environmental education with a specific focus on local children, while simultaneously compiling a community-centred map of the Buysdorp area to record and showcase the local area's natural features, important landmarks and cultural heritage. The

map, which is still being finalised, will be donated to the Buysdorp community and will be made available to local tourists in order to bolster tourism in the area.

The weekly gatherings involved talks, discussion forums and activities, including guided walks to learn about animal tracks and signs, knowledge-sharing activities where elders within the community shared their knowledge and interpretation of the local fauna and flora and sessions dedicated to learning about animal diets and behaviour by examining animal skulls. By incorporating aspects of the South African National curriculum, the project was able to complement existing scholastic learning and reinforced this learning through practical exercises



Explaining how to set up a camera trap





PPP and AICE staff working together to plant a tree for Arbour Day

The VBR generously donated indigenous trees to be planted in the town of Buysdorp. Together with community members, the VBR and AICE, the PPP team helped to plant the trees at Mara Primary School.

involving local examples. One such exercise involved the children taking home camera traps to monitor the wildlife at their own homes over a two-week period, with some interesting and exciting records emerging. The photographs captured wildlife moving through the gardens of Buysdorp on a regular basis while posing no threat to the community.

One of the Saturday morning sessions was dedicated to celebrating Arbour Day in partnership

Leopards in Buysdorp

Early in 2020, a member of the Buysdorp community contacted the PPP with concerns that he had a leopard moving through his property at night. Chris Joubert was able to assist him by setting up camera traps near his home to monitor the local wildlife. Alongside antelopes, vervet monkeys and cattle, a leopard was captured on camera occasionally passing his home, apparently en route to a local stream. After a discussion around leopard behaviour, the homeowner concluded that the leopard posed very little threat to him and his family and that he would not take action against the animal.

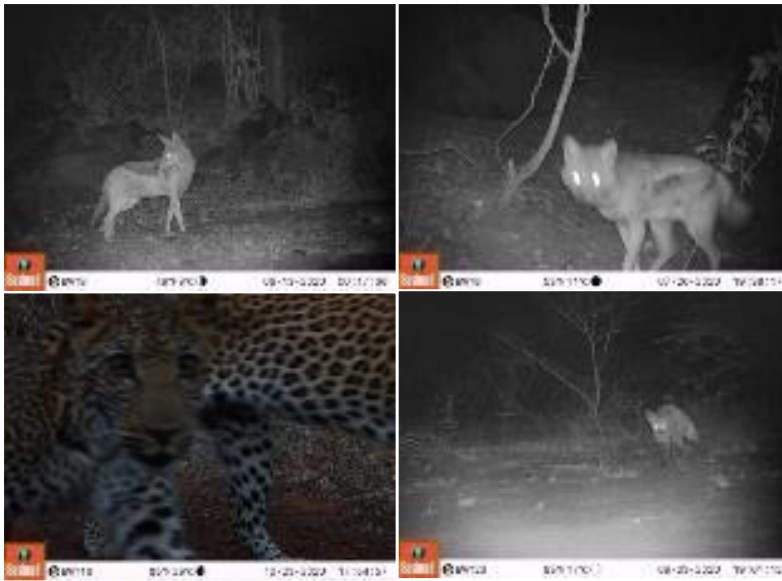


A Buysdorp community member posing in front of a camera set up near his home to monitor wildlife (at left). An image captured near his home showing a leopard (at right) which appears to move occasionally past his home to access a stream nearby

Monitoring mammals at Medike

In early 2020 the PPP, in collaboration with the Endangered Wildlife Trust (EWT; www.ewt.org.za), set up an additional camera-trapping grid on Medike, a property which is owned by EWT. A total of 13 stations were established across the 4 000-hectare (40km²) property. These stations allowed for an





Images captured on the Medike camera-trapping grid. Clockwise from top left: black-backed jackal, side-striped jackal, bat-eared fox and a newly-identified leopard cub walking with her mother

inceptive view of the animals found at Medike. From antelope, such as impala, greater kudu and bushbuck, to predators, such as leopard, brown hyaena and caracal, a catalogue of many species was established using the images captured by the cameras on Medike.

To date, more than 264 000 images have been collected from the grid. Between March

and November 2020, two entirely new leopard individuals were identified on the Medike grid (a female assigned the name Samantha and her cub Lunar) and a male leopard (LM_11_502, nicknamed Zack) that had only been identified once on the PPP’s primary camera-trap grid was recorded at Medike and appears to be resident on the property. Apart from the leopards, the Medike grid has produced some rare and exceptional records such as black-backed jackal (*Canis mesomelas*), side-striped jackal (*Canis adustus*) and bat-eared fox (*Otocyon megalotis*).

The grid is almost singlehandedly being run by Rotondwa Sithagu, who was trained in managing the camera grid by the PPP’s Soutpansberg field team, through an internship arranged collaboratively by EWT and the PPP and funded by Douglas Hamilton and an anonymous PPP donor. The task has not been made any easier by poachers and thieves; one camera was stolen in late April, which prompted the removal of two more stations and in August a second camera was vandalised by a poacher, who was apprehended. Currently, there are 11 functional camera stations on Medike.



The team at the Soutpansberg field site with Rotondwa Sithagu, outside the main office building in January 2020. Rotondwa currently runs the Medike camera-trapping grid

The annual PPP supporters’ thank-you event

Once the restrictions imposed through the national COVID-19 lockdown were eased in late 2020, the PPP team at the Soutpansberg field site were able to host the annual thank-you braai (the South





Luke giving a talk on the PPP's activities during 2020. Families were able to sit together but room capacity was much lower than normal

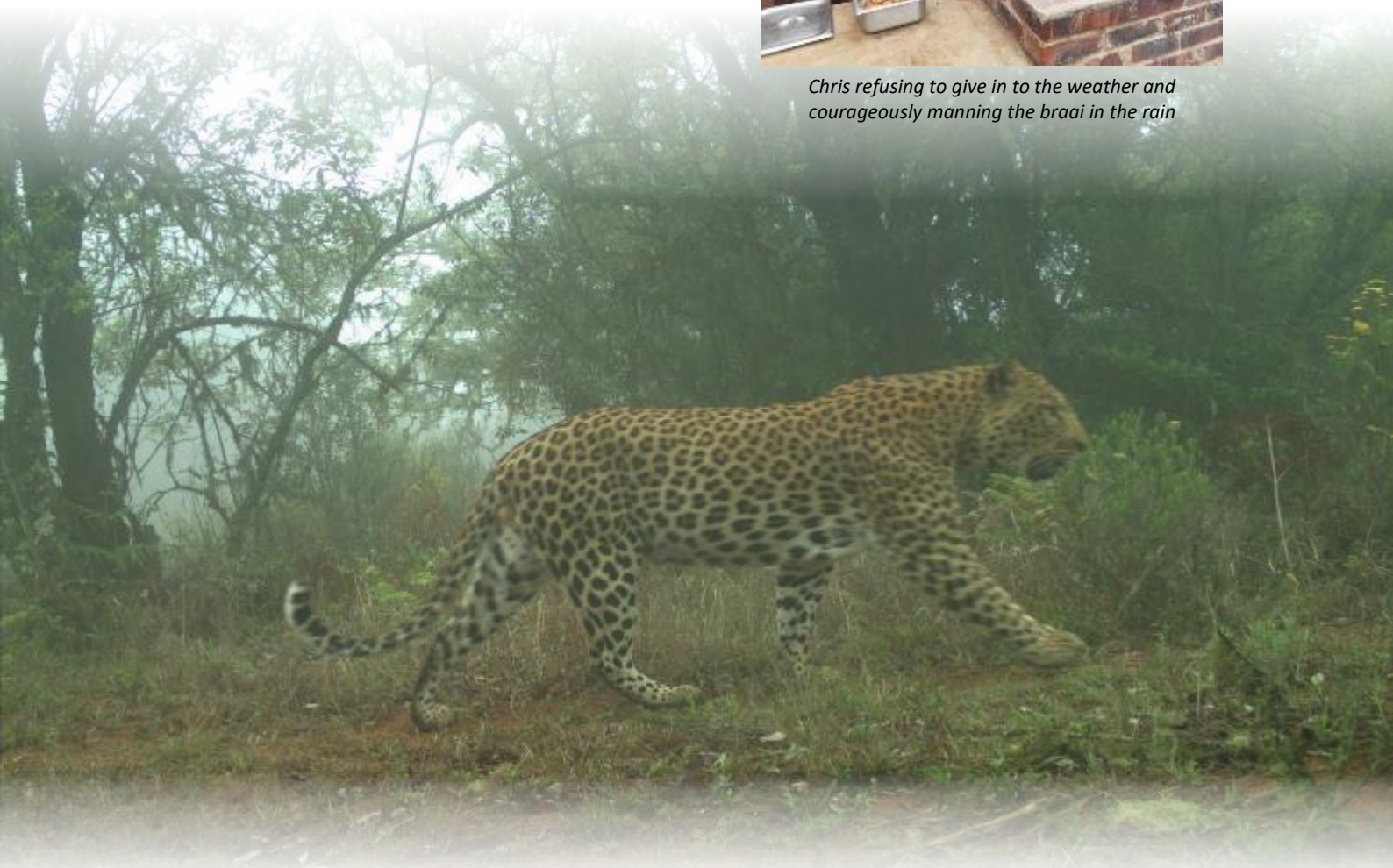
updating all on the work by the PPP in 2020, everyone shared a lunch together and whiled away the afternoon in good company.

African term for a barbecue) to show appreciation to all the local land-owners who allow the PPP staff access to their properties in order to service the camera grid and community leaders who work with the PPP. The weather was less than ideal and it rained all day but the event went ahead, hosted indoors with social distancing in place. Many land-owners attended, as did the community leaders of Buysdorp. After a short talk

by Luke Duncan



Chris refusing to give in to the weather and courageously manning the braai in the rain



Updates from the Alldays Wildlife and Communities Research Centre

The PPP at the Alldays Wildlife and Communities Research Centre (AWCRC) also had a rather quiet year due to the COVID-19 pandemic. While many volunteers and projects were postponed, a few were possible and carried out during 2020. Unfortunately, 2020 also saw the departure of Jamie McKaughan, as the volunteer-turned-staff member who had been at the AWCRC since the site opened. In addition to finalising his master's project, Jamie felt it was time to go back to England to see family. Jamie has since passed his viva to convert this Masters into a PhD with Prof Russell Hill, so he will almost certainly be returning to the AWCRC in future.

AWCRC Primate Research

Primate crop-foraging deterrent trials

With some time having been freed up during lockdown, Leah Findlay was able to analyse data from primate crop-foraging deterrent trials. Below are some of the findings:

- **Leopard model:** This trial involved presenting a predator model to primates while they foraged on crops that were supplied by AWCRC as part of the study. While intended to be tested on baboons, the team were only able to test the model's effects on vervet monkeys. The vervet monkeys spent significantly less time foraging on provisioned crops after being exposed to the leopard model and no evidence of habituation to the model was found. Predator presentations may therefore have some use in deterring at least vervet monkeys from crop fields – although further work is needed in order to identify how these can be employed in practice.



A vervet monkey feeds from a palm tree near Alldays

- **Bee sounds:** Beehive-fences – a series of beehives stationed at regular intervals along the boundary of a crop field – have been used successfully to deter crop-foraging elephants from farms but whether they are effective against crop-foraging baboons remains unclear. To test this idea, two baiting sites were set up: one where a camouflaged speaker was used to play the sound of bees buzzing and one with no sound at all. The baboons spent significantly less



time at the site where the sounds of bees were played and there was no apparent habituation to the sounds suggesting that the sounds of bees could also act as a deterrent in this species.

Electric fence mortalities

Electric fences are effective at preventing primate crop foraging. However, electric fencing also causes mortalities amongst smaller animals, especially tortoises, which typically encounter the lowest wires of the fence and are either killed immediately or become trapped and are then electrocuted. The AWCRC team have been collecting data on electric fence mortalities from February 2018 to December 2019, recording a total of 249 deaths along electric fences, the majority of which were tortoises (148). The data showed a seasonal peak in deaths during the months of December to March. While data collection was not possible throughout lockdown, 22 further deaths were recorded from January to March of 2020.

In September 2019, the AWCRC team experimented with installing a non-electrified wire in front of the lowest electrified wire around half of a monitored fence line. The non-electrified wire was intended to act as an initial barrier to movement, deterring animals from attempting to pass and being electrocuted. Data collection on the effect of this intervention was interrupted by the COVID-19 lockdown, which coincides with the end of the peak death season. Data from the period before lockdown (September 2019 to March 2020) will hopefully still offer some insights into how effective this modification is at preventing fence mortalities.

Baboons at the Dump

During 2019, the PPP at AWCRC welcomed their first PhD student, Rahman Mokhlesur from Durham University. Rahman investigated the effect of foraging at a human dump site on a group of baboons and finished his 12 month field stint during December 2020, with the help of volunteer assistant Maria Beaumont. While lockdown interrupted fieldwork, it allowed an assessment on resumption of how the baboons coped with less food at the dump. During the year there were also two separate incidences of people shooting the baboons, which resulted in the loss of one adult female, three juveniles and one infant, with two other infants missing, presumed dead. Given the time



A baboon forages through refuse at the local dump near Alldays

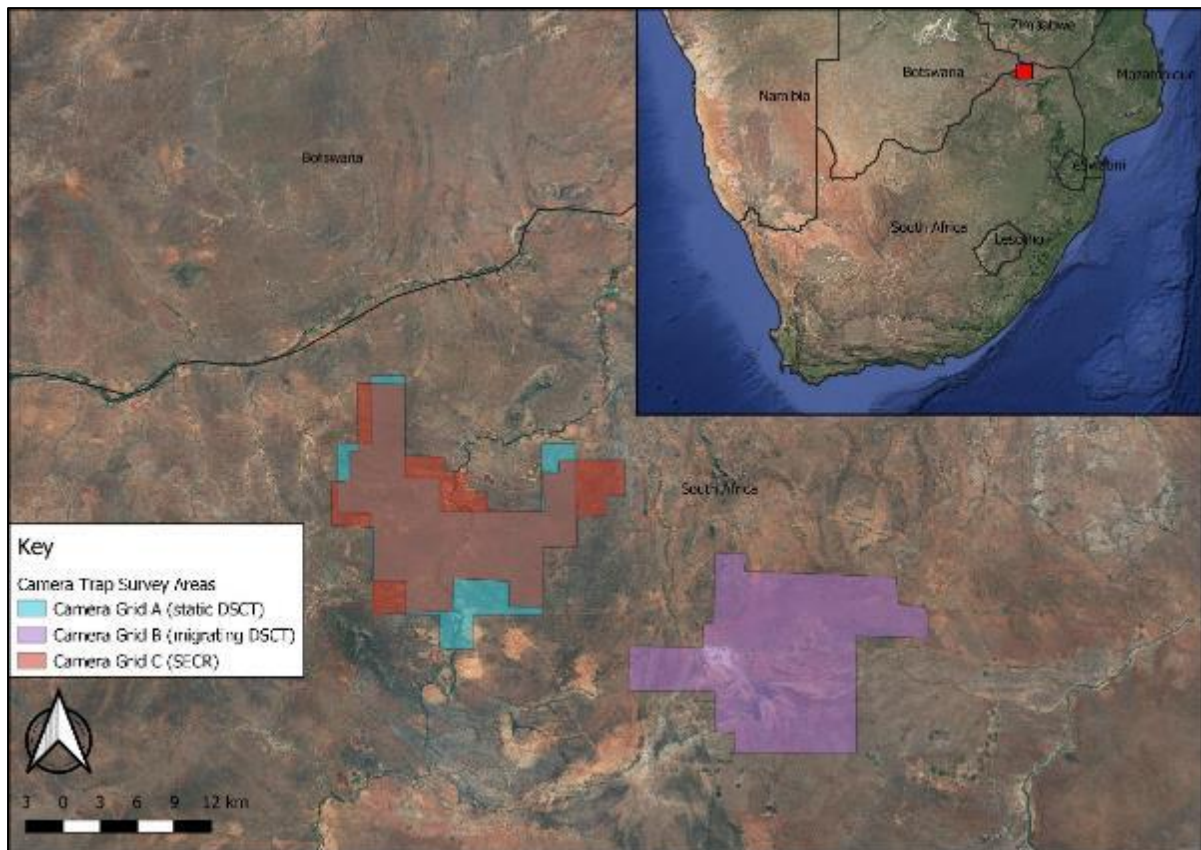
Rahman and Maria spent with the baboons and their familiarity, they found this difficult to come to terms with and the event was clearly stressful for the baboons. Since then, the troop has exhibited



unstable behaviour and ranging patterns. However, the hard work of both Rahman and Maria will hopefully offer insights into how baboons cope with deaths and stress.

AWCRC Predator Research

Two 90-day camera trapping grids were run at the AWCRC from May 2019 to September 2019 and December 2019 to May 2020 respectively, each using a different camera-trapping method. While the latter grid was run for longer than 90 days as a result of the COVID-19 lockdown restrictions, only the data for the first 90 days are currently being analysed. The first grid used a method called distance sampling and showed that, given the total number of records of each species and the number of locations they were captured at, the distance sampling method with camera traps has potential to be used as a multi-species survey method in South Africa. The second grid was set up in a slightly different manner, in an attempt to obtain more precise estimates using the same distance sampling method but by shifting the cameras by 1 km in a south-easterly direction every 30 days. Moving cameras in this fashion adds more sample sites to the analysis and therefore should improve estimate accuracy. This approach reduces overestimations for species such as civets and jackals, which tend to travel more along roads, by adding more camera sites at locations that are not on roads. Full carnivore and primate density estimates have yet to be determined. Leopard and civet captures from this grid were



Map showing the approximate location of the three camera grids run by the AWCRC in the Alldays area



less than 50 and will unlikely yield density estimates. For brown hyena, black-backed jackal, bat-eared fox *Otocyon megalotis* and chacma baboons, enough images to proceed with density estimation were obtained. Jamie will also use a further method with these data, the random encounter model, to provide density estimates for the local chacma baboon population.

In order to compare the leopard population density estimates we calculated from distance sampling with a more established and proven method termed spatially explicit capture-recapture (SECR), we set up an SECR grid in the same location as the other grids. The SECR grid was run from June 2020 to



Jamie setting up a camera trap as part of the three grids tested in Alldays

September 2020. Attractive scents were placed in a central position between the two cameras at each camera station to try and enhance picture quality by drawing leopards closer to an ideal location for capture, as this method relies on being able to identify individual leopards by their rosette patterns. The resulting data are still being analysed but initial findings show a good number of leopard images captured during the SECR survey. Prior to his departure, Jamie was able to visit the landowners he worked with individually to discuss some of the findings from this research.

Community Engagement

As part of community engagement efforts, the AWCRC team conduct snare sweeps on properties in the Alldays area. In 2020, even amidst the restrictions of lockdown, 54 snares were removed. At one snare, a banded mongoose was found caught, still alive, which was released.



Leah poses with some of the artworks of the children which were auctioned as part of a fundraising sports day in January 2020

Prior to the lockdown the AWCRC team assisted a local crèche through improvements to infrastructure and construction of indoor toilets. Further fund raising for this is underway. Moreover, before lockdown, teachers from a local primary school organised a fundraiser charity sports day in Alldays. The AWCRC team helped out on the day by organising sports events which were then run by volunteers,



assisting with catering and participating in the auction of artworks created by children at the school. All the proceeds went to Flying 4 Rhino (<https://flying4rhino.com/>), a rhinoceros conservation initiative.

Environmental Education

Unfortunately the COVID-19 lockdown prevented environmental education efforts after March 2020 but these will resume once volunteer assistants are able to return to the AWCRC. However, the AWCRC team were able to conduct various environmental education activities



Jamie awards medals to the top athletes at the fundraiser sports day in January 2020



Jamie explaining grassland ecology to children on the annual AWCRC field trip (above) during February 2020. Field trip participants pose in front of a baobab tree (below)

prior to the lockdown. At two local primary schools the team delivered nine sessions which included lessons on hyenas, snakes, scorpions and their respective habitats. The AWCRC was also able to host their annual field trip with the local children to Campfornis farm. The 2020 field trip comprised 22 children and two members of staff from the schools. The children were split into three groups, each of which went on a game drive and a guided nature walk, learnt about camera trapping, played educational games focused on environmental sustainability and got to spend some time in the swimming pool. The game drives in particular provided many opportunities to see much of the local wildlife. During lockdown, one school staff member continued teaching with the school remotely, while Jamie continued environmental education efforts through online digital videos and quizzes.



Earthwatch and the Primate and Predator Project in 2020

In the past the PPP's Soutpansberg field site has hosted several Earthwatch Expedition and Earth Skills Network groups at Lajuma. These groups provide selected Shell employees and conservation workers from throughout Africa, respectively, the opportunity to learn about sustainability and conservation, assist local communities, participate in snare clearing activities and learn about and participate in some of the work that the PPP does. Typically three Earthwatch Expedition groups and two Earthwatch Skills Network groups are held annually. Because of the COVID-19 pandemic and the associated restrictions on travel it was decided that for the safety of all concerned the groups would be postponed to a future date and we hope to welcome teams back again when the global situation allows.

Despite the uncertainties, Earthwatch generously renewed our funding for an additional year to allow our research and community activity to continue. Earthwatch has funded the PPP for many years and remains an incredible partner in our efforts. The PPP and all its staff are very grateful for the continued support of the project by Earthwatch, especially in light of the tumultuous economic climate that has resulted from the COVID-19 pandemic.

Identifying wildlife from afar

In late 2020, the staff at the PPP's Soutpansberg field site were contacted by Verena Conklin, a former Earthwatch Expedition delegate and Shell employee, who had learned of an opportunity to donate funding to the PPP through an internal Shell volunteering programme. Within the span of a month Verena had organised a small team of other former Earthwatch Expedition delegates to join her in voluntarily assisting the PPP with species identification for the images captured by our camera-trap grid, a task which would normally be carried out by the PPP's volunteer field assistants and visiting Earthwatch Expedition groups but which had not been possible for most of 2020 due to the lockdown



Verena Conklin (top left), Kurt Verheyen (top right), Monika Minorczyk (bottom left) and Helen Crawford (bottom right) have all volunteered to assist the PPP with image processing from the camera-trap grid



restrictions. Joining Verena were Kurt Verheyen, Monika Minorczyk and Helen Crawford who together have been enthusiastically and generously aiding the PPP in their own time while responsibly self-isolating. The PPP are very grateful for the help that these individuals continue to provide and deeply appreciate their generosity in giving of their time. As the pandemic continues to impact travel, we are looking at new ways of allowing people, new and old, to contribute to our research from afar.



Our thanks to our contributors

The Primate and Predator Project is by no means a standalone effort and, without the collaborations with and contributions of others, would not be possible. As such, we are extremely grateful to the many people and organisations that support our work, including landowners, funders, stakeholders, and volunteers. To the following we would like to express our sincerest thanks and appreciation for all that you do to make the work of the PPP possible.

Lajuma Research Centre, for partnering, hosting and supporting the work of PPP. Special thanks go to the landowners, management team and staff members:

- The Gaigher family
- Jabu and Bibi Linden
- Kyle Stuart
- Maintenance and housekeeping staff of Lajuma including, Ticha Mudadi, Robert Mudau, Ephraim Rambuda, Jennifer Mudadi, Hilda Musapha and Olga Mabaso

The landowners in the Soutpansberg Mountains who allow us to work on their land or offer support in other ways:

- Owners, families and staff of Amatola, Bergplaat, Bergtop, Buysdorp, Calitzdorp, Diepkloof, Goro, Koedoesvlei, Kranspoort, Leshiba, Llewellyn, Louisville, Medike, Ontmoet, Ottoshoek, Ottosdal, Sigurwana, Tolo, Uniondale and Vierfontein.

Braam de Klerk, his family and staff for hosting PPP's research centre in Alldays (AWCRC). The landowners in the Alldays area who allow us to work on their land or offer support in other ways
Oldrich van Schalkwyk and the Endangered Wildlife Trust for facilitating the employment of Rotondwa Sithagu.



The volunteer research assistants who helped with data collection and many other important activities:

Volunteers at the Soutpansberg field site

- Joseph Campbell
- Anneka Goater
- Nathanael Witsey
- Evelyn Smalley
- Chris Murray
- Emily Harrison
- Iona Mills
- Jonathan Sander
- Connie Vickers
- Aurelie Sachet Moon

Volunteers at the Alldays field site (AWCRC)

- Maria Beaumont
- Caroline Spirt
- Ariadne Kibbelaar
- Melanie Knevel
- Susanne van Kempen
- Jane Huggins
- Paul Robson

A special thank you to Holly Pringle, Evelyn Smalley, Emily Harrison, Iona Mills and Jonathan Sander, who helped with image processing from their home countries while under lockdown.

Postgraduate students who conducted fieldwork at the PPP's Soutpansberg field site and/or conducted data analysis on behalf of the PPP:

- Andrew Allan - Durham University, UK
- Rahman Mokhlesur – Durham University, UK
- Laura LaBarge - State University of New York, USA

The Earthwatch Institute and our Shell/Earthwatch volunteers, with special thanks to:

- Seren Nelson
- Rebecca Craske
- Arthur Anunciacao

Finally, we remain enormously grateful to an anonymous donor, whose generous ongoing support underpins so many of our activities and contributes so significantly to our achievements. Thank you.

