

**Causes, consequences and solutions to
baboon induced damage within commercial
plantations in southern Africa**

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Summary of the Symposium

**“Causes, consequences and solutions to baboon induced damage
within commercial plantations in southern Africa”**

and the Workshop

**“Search for sustainable solutions to human-wildlife conflict
within commercial plantations in southern Africa”**

held on 23 and 24 April 2012 at Protea Hotel, Kruger Gate, Mpumalanga, South Africa

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Summary

This document is a summary of proceedings for a symposium and workshop held on 23 and 24 April 2012 to address the issues related to the damage caused by baboons in commercial forestry plantations in southern Africa.

The first section summarises the proceedings and presentations given at the Symposium entitled “Causes, consequences and solutions to baboon induced damage within commercial plantations in southern Africa.”

The second section provides a brief review of several baboon control methods that were evaluated by attendees of the Workshop entitled “The search for sustainable solutions to human-wildlife conflict within commercial plantations in southern Africa”.

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Symposium: Causes, consequences and solutions to baboon induced damage within commercial plantations in southern Africa

Symposium objectives

1. To provide a scientific review of our current knowledge on:
 - Why baboons are so successful despite their long history of persecution in southern Africa and how they have adapted to living within human-modified environments in general and commercial plantations in particular;
 - The consequences to humans and baboons of spatial overlap and competition for resources;
 - The type and severity of conflict and conflict mitigation tools for monkeys in general and baboons in particular across a diversity of landscapes;
 - The legal, welfare and conservation status of baboons in South Africa and Mpumalanga;
 - Previous and current conflict mitigation methods attempted in southern Africa in general and within plantations specifically.

2. To engage commercial plantation employees and other interested and affected parties in an open forum at which current perceptions of why baboons damage plantations, the extent and severity of such damage and possible solutions are discussed. These perspectives will be captured and taken forward into a workshop attended by a small subset of select local and international experts on baboon behavioural ecology, human wildlife conflict practitioners, plantation managers and owners.

Symposium programme

Monday 23 April 2012

09h00 – 09h15	Welcome	Dr John Scotcher Chairperson: Baboon Damage Working Group (BDWG)
09h15 – 09h45	The role of researchers in mitigating conflict between humans and baboons in southern Africa	Prof. Justin O'Riain Baboon Research Unit, UCT
09h45 – 10h15	Cape Peninsular baboons: Population and management	Esme Beamish (MSc graduate), Baboon Research Unit, UCT
10h15 – 10h45	TEA	
11h15 – 11h45	Monkey Management: Using spatial ecology to understand the extent and severity of human/baboon conflict in the Cape Peninsula and South Africa	Dr Tali Hoffman Baboon Research Unit, UCT
11h45 – 12h15	The conflict mitigation toolbox: Lessons from the Peninsula applied to pine plantations in Mpumalanga	Bentley Kaplan, (PhD candidate), Baboon Research Unit, UCT
12h15 – 12h45	Samango monkeys and timber plantations in Limpopo Province	Birthe Linden University of Venda
12h45 – 13h30	LUNCH	
13h30 – 14h00	Environmental laws and the control of damage causing animals, with particular reference to Baboons	Dries Pienaar Mpumalanga Tourism and Parks Agency
14h00 – 14h30	The role of Forestry South Africa, the Baboon Damage Working Group and the Forest Stewardship Council National Representative South Africa in the search for a long term solution to baboon conflict in commercial plantations	Dr John Scotcher FSA, BDWG and FSC National Representative, South Africa
14h30 – 15h00	The type and extent of damage to Pine trees in select plantations within Mpumalanga	Thys de Wet Consultant for Komatiland Forests
15h00 – 15h30	TEA	
15h30 – 16h00	The spatial ecology and demography of baboons living within a Komatiland plantation	Thys de Wet Consultant for Komatiland Forests
16h00 – 17h00	General Discussion and Summary	Prof. Justin O'Riain and Dr John Scotcher
17h00	Closure	Dr John Scotcher

Summary of the Proceedings

Welcome. (Dr John Scotcher)

The symposium began with Dr John Scotcher (the current chairperson of the Baboon Damage Working Group (BDWG) and also the Forest Stewardship Council (FSC) national representative) welcoming the 42 delegates to the symposium. During his address, John emphasised that the objective was to find solutions that were economically based, environmentally sound and socially responsible but, perhaps most importantly, based on peer reviewed science.

The programme for the symposium and workshop were outlined in the opening address, and it was emphasised that the workshop, to be held the following day, was restricted to scientists and forest managers with experience in baboon control, so as to keep the debate focused and outcome-based.

The role of researchers in mitigating conflict between humans and baboons in southern Africa. (Professor Justin O’Riain)

The presentation given by Prof. Justin O’Riain introduced the fundamental challenges faced by wildlife populations in adapting to or being excluded by human-modified habitats. Agriculture, urbanisation and mining are rapidly transforming both terrestrial and aquatic ecosystems with measurable impacts on biodiversity. Justin provided examples of human wildlife conflict in the Western Cape ranging from the total eradication of endemic small mammals (Dune mole-rats *Bathyergus suillus*) from Cape Town International Airport through to white shark conflict on the beaches of Cape Town. In all cases, humans are the drivers of the conflict, and in all cases there is an urgent need for research to provide an understanding of the extent of the problems, and to derive possible sustainable solutions. The modern lifestyle including our demand for agricultural products and other resource based consumables makes all consumers complicit in the current biodiversity crisis both locally and globally. There is room for improvement across all sectors of agriculture, not just plantations and further there is a need for the public to be reliably informed as to current practices. Forest plantations do exact an ecological cost but what this is relative to other forms of agriculture remains to be determined. What has struck Justin since his involvement in the pine/baboon debate, is that baboons are not only tolerated within this crop, compared to maize, avocado, citrus and wheat farms, but along with many other wild animals are actually welcomed as part of the biodiversity objectives entrenched within the forestry industries approach to sustainable forestry.

Rather than attempting to assume shaky moral high ground Justin requested an emphasis firstly on understanding anthropogenic impacts, and then on striving for sustainable and practical solutions to them.

The history of baboons in exotic plantations in South Africa stretches back to the establishment of the arboretum in Tokai, Cape Town. Baboons on the Peninsula show a strong preference for plantations over indigenous Fynbos. This is not surprising given plantations offer food (e.g. pine nuts and organisms in leaf litter), shelter from temperature extremes, safety (each tree is a refuge) and proximity to water (plantations are planted on the east slopes which have higher average rainfall). Thus plantations offer optimal habitat for baboons in the Peninsula, resulting in the density of baboons being six times higher than for troops ranging in indigenous vegetation only (Hoffman and O’Riain, 2010). Amazingly, in Cape Town there has been a concerted effort by members of the public to lobby the plantation owners to not harvest their crop, and for SANParks to replant pines if Cape Pine does not heed their call and harvests. These lobby groups (e.g. Shout for shade) argue that the plantations have heritage, aesthetic and recreational value. Cape Pine is harvesting their crop, and as they do, so the baboons track the remaining stands. It is predicted that they will literally implode onto the arboretum which is to be retained for heritage value, such is the baboons’ preference for exotic trees.

Justin described having observed baboons damaging pines in Tokai. The troop was being repelled by farm workers from raiding the vineyards of Buitenverwachting for grapes. The baboons took up a vantage point in a young stand of pine trees near the vineyards from which they would make repeated attempts to cross an open patch of land and raid the vineyards. By midday, the baboons had failed to obtain any grapes but the trees that the troop had been using had been severely damaged with bark having been stripped from most. Does this represent boredom, frustration, anxiety, an alternative food source or a combination of all of these factors? Clearly, in the absence of more observational data, there is not enough information for an informed decision, and observational data from troops in areas where damage is common is needed.

Justin’s proposed approach to the role that research plays in mitigating conflict between baboons and humans was to:

- Review relevant research both in the Cape Peninsula and Mpumalanga;
- Review laws and protocols;
- Hold a workshop to determine research and management needs to mitigate conflict;
- Ensure an independent assessment by an internationally recognised leader in the field of behavioural ecology.

The team of researchers were introduced:

Prof. Justin O’Riain	Head of Baboon Research Unit (BRU), University of Cape Town
Esmé Beamish	MSc, BRU, UCT
Dr Tali Hoffman	PhD, BRU, UCT
Bentley Kaplan	PhD candidate, BRU, UCT
Thys de Wet	Komatiland Forests (KLF) consultant
Dr Kirsten Wimberger	PhD, BRU, UCT and Chair of Human Primate Interaction, Primate Ecology and Genetics Group (HPI PEGG)
Prof. Russell Hill	University of Durham, UK and the selected internationally recognised leader in the field of behavioural ecology who would provide an independent assessment of the two days’ proceedings

Justin discussed, with a schematic representation, how behavioural research integrates with conservation and management challenges. In essence, anthropogenic impacts (habitat transformation) on animal behaviour provide behavioural indicators to local managers (baboons strip bark) requiring behavioural modification (preventing or reducing cause for bark stripping). Anthropogenic impacts affect organisms at a variety of levels including:

- Movement and spatial use;
- Foraging and vigilance;
- Social organisation and reproductive behaviour.

The goal is to understand how plantations have affected baboon behaviour, and we propose to do this by addressing all three of these variables in a range of behavioural ecology studies within and outside of plantations in Mpumalanga.

The presentation concluded with Justin indicating that baboons are flexible in responding to anthropogenic impacts, and often thrive in human-altered habitats. The challenge is to understand why baboons damage plantations trees and whether this can be prevented to negate the need for managing them.

Cape Peninsular baboons: Population and management. (*Esmé Beamish*)

Esmé Beamish began by tracing the history of human-baboon conflict to Jan van Riebeeck's first visit to the Cape Peninsula. In more recent times (1960's and 1970's), many baboons were harvested for medical research. Human-baboon conflict was greatly compounded by a rapid increase in urbanisation from the 1980's to the present which saw baboons losing access to many of their preferred low lying habitats. In certain cases whole troops were removed to reduce conflict and this resulted in local extinction of baboons from parts of the Peninsula (e.g. Table Mountain and Chapman's Peak). In 1998/1999, a study on the Peninsula baboons (numbers, adult sex ratios, mortality, growth, etc.) was funded by WWF-SA and revealed that between 259 to 270 baboons were on the Peninsula, with a 4% annual growth, 14% annual mortality and a strongly skewed adult sex ratio of 1 adult male to 8 adult females. These demographics indicated that the population was at risk of extinction, and legislation was introduced to protect the baboons. In 2003, Esmé initiated a long-term population monitoring study which specifically addressed the following variables:

- Population dynamics: Growth rate as a result of mortality, births and migrations;
- Demographics: Based on annual counts in age and sex classes, providing information as to the troop compositions;
- Demographic parameters: The adult sex ratio and the immature to adult female ratio (an indicator of growth).

The study indicated that monitoring the populations was complex and dynamic as it differed at both the troop and subpopulation level.

The results from her study indicated that growth rates varied significantly between subpopulations over the study period (2006 to 2010), with the SSP population (high human overlap) showing a growth rate of 13%, while the NSP population (that live within the Tokai plantation) had a growth rate of 40% over the five year period. Together the two subpopulations had an overall growth rate of 21%. These data were supported by the immature to adult female ratio which is an additional metric for population growth and revealed a higher ratio in Tokai relative to the southern subpopulation.

The adult sex ratio (ASR) (adult male:adult female) in Chacma baboons is normally 1:2.5. However, on the Peninsula it was found to be as high as 1:8 in 1998/1999. However, with improved management there has been reduced conflict with humans, and consequently higher adult male survival. In the absence of natural predators, this has seen a rapid normalisation of the sex ratio to 1:2.2 with the northern subpopulation in the plantation actually having select troops with an almost 1:1 sex ratio suggesting an abnormal swing to excess males. The main impact on population growth was identified as being mortality, with the main cause of death among the Cape Peninsula baboons being infanticide, cars, guns and power lines. Of particular interest to the baboon symposium delegates was that troops outside the National Park (with access to human derived food) were bigger and growing at a greater rate than troops inside the National Park with access to fynbos (a poor quality food resource).

In comparing the similarities between plantation troops in the Tokai Forest with those in the Mpumalanga forest plantations, Esmé raised the following suggestions or questions:

- What drives the bark stripping – is this anxiety? And if it is anxiety, what is driving this anxiety?
- Undertake an annual census of troops.
- Determine the home ranges of the troops – has this been adequately done?
- Is there an adult male bias?
- Is the plantation a sink or source?
- Is troop removal increasing anxiety and are there other social implications?

Monkey management: Using spatial ecology to understand the extent and severity of human-baboon conflict in the Cape Peninsula and South Africa. (Dr Tali Hoffmann)

Dr Tali Hoffmann's presentation focused on spatial ecology primarily undertaken using Geographic Information Systems (GIS) technology for baboons in the Cape Peninsula. Prior to her study, little was known about the spatial ecology and landscape patterns of baboons surviving in a wide range of environments. Tali's research focused on understanding how the different habitat types of the Cape Peninsula affected the spatial patterns of baboons. Baboons have three important needs for their

survival; food, sleep sites/place of refuge and the availability of water. As part of her study, data was collected on a monthly basis for nine troops of baboons. It was found that the home ranges varied between 1.5 to 37.7 km², with troop densities varying from 1.5 to 21.1 baboons/km² and day range length (DRL) between 1.65 to 6.17 km.

In analysing the density of baboons in relation to habitat type (agriculture, urban and natural environments), Tali discovered that the baboons in the agricultural habitat (predominantly pine plantations) had a density of 12 baboons/km² with a DRL 2.5 km, the urban environment consisted of 10 baboons/km² with a DRL of 1.7 km while the natural habitat (fynbos) showed a density of 1.5 baboons/km² and a DRL of 6.2 km. These key findings indicated that troop ranging patterns were dramatically affected by habitat type which was further reflected in their diet and activity budgets. Thus, baboons have successfully adapted to diverse human modified environments on the Peninsula, and in the absence of natural predation, both troop sizes and densities exceed those recorded for populations in natural areas both within and outside the Peninsula.

Further analyses on baboon land use patterns and landscape attributes indicated that all space is not equal. For example, baboons showed a clear preference for low lying land (0–400 m) which has higher NDVI values associated with higher plant primary production. Land above 400 m is actively avoided by the baboons suggesting that large parts of the Table Mountain chain should not be included in estimates of carrying capacity.

In closing, Tali emphasised the need for research to determine the spatial ecology and population dynamics, which together provide density estimates that can be used to explore whether numbers are below or above the current space available. These represent essential steps in managers determining whether the population needs active management of numbers or not, and further to determine whether specific habitat types favour or discourage baboon presence and relative abundance.

The conflict mitigation toolbox: Lessons from the Peninsula applied to pine plantations in Mpumalanga. (*Bentley Kaplan*)

Bentley Kaplan identified the prime drivers of human-wildlife conflict as being livestock depredation, human mortality and crop raiding/damage. The prime driver for baboon–human conflict is that of crop raiding/damage, operating at three levels namely; subsistence, economic and territorial/emotive. The response to baboon-human conflict can be characterised by deterrents, relocation of the offending animal/s, fertility manipulation (both male and female), problem animal removal (usually single animals) and culling of multiple animals (whole troops or herds).

Examples of the various baboon conflict mitigation techniques used in the Cape Peninsula were reviewed by Bentley. The efficacy, costs and ethical concerns of each technique was also reviewed. Mitigation techniques reviewed included the use of:

- Baboon monitors (adult men whose job it is to physically deter animals from entering certain areas by hand clapping, whistling and shouting);
- Reflective prisms – light aversion (mirror plated prisms that reflect light and intended to disturb and disorientate baboons);
- Bull whips – sound aversion (cattle whips used by monitors. Baboons are NOT physically hit but the noise intended to intimidate the baboons);
- Bear-bangers – sound aversion (a deployed gas capsule that produces a loud bang);
- Provisioning – incentivising (artificial feeding in an attempt to lure them away from particular areas);
- Baboon proof bins – reducing raiding incentives (modified rubbish bins with lockable lids) and others.

In summarising his presentation, Bentley highlighted the challenges facing the control of baboons which needed to satisfy a number of parameters including:

- Cost;
- Ethical acceptability vs. deterrent ability;
- Long term efficacy;
- Local acceptance of the method to be used.

Samango monkeys and timber plantations in Limpopo Province. (*Birthe Linden*)

Birthe “Bibi” Linden, from the University of Venda, outlined her research on the interaction between samango monkeys, timber plantations and natural forests in the Limpopo Province. She was particularly interested in understanding the impacts that plantation forests have on the movement of samango troops between natural forests. More specifically, in her research she asked whether the presence of a plantation stand has a positive or negative influence on the movement of this listed protected species.

Her preliminary findings have indicated that 70% of observations of samangos in pine plantations were of solitary males, but more data is required to confirm this pattern. Bibi’s research was actively welcomed by the affected forestry companies, as her findings could have positive implications as to how the forestry industry manages the riverine protected areas, and other conservation land under their control.

Environmental laws and the control of damage causing animals. (*Dries Pienaar*)

Dries Pienaar, from the Mpumalanga Tourism and Parks Agency (MTPA), gave a presentation on the National Environmental Management (NEM): Biodiversity Act, which is the principal Act that protects species and ecosystems that warrant national protection. At the provincial level, the Mpumalanga

Conservation Act 10 of 1998 drives the implementation of the NEM: Biodiversity Act, specifically the Wildlife Protection Services housed within MTPA.

The Biodiversity Act notes that the provincial department responsible for the conservation of biodiversity in a province must determine whether an individual of a listed threatened or protected species can be deemed to be a damage causing animal.

Dries presented various examples of why animals are removed, e.g. buffalo to prevent the spread of bovine TB and foot and mouth disease, crocodiles where there is risk to human life or in response to a fatality, and problem animals in the farming community, such as lions and hippos.

He reviewed the conservation status of primates and drew attention to the fact that the level of threat differs among the five primate species. For example, the Samango monkeys are an endangered species and listed as such in terms of section 56(1) of the NEM: Biodiversity Act, while vervet monkeys and baboons are common and widespread species, with no recognition in law as being threatened or in need of protection.

With respect to baboons as problem animals in farming communities vs. commercial forestry and agriculture, Dries outlined the following disparities in terms of their control:

Farming communities	Commercial forestry
Thousands killed each year on an <i>ad hoc</i> basis No reporting structure Very little control on the process	Numbers culled controlled by a permit system Accurate reporting system Strictly controlled process through baboon protocol
Very little research Population densities low Low cost factor Losses relatively low	Constant research and investigations Populations densities high High cost factor Losses amounting to millions

He alluded to the fact that MTPA had passed the control of baboons to the Forestry Company, and it was the industry itself that had requested a permit control system to be implemented, despite the fact that there was no legislation in place to support this request. Currently, there is no charge to process the permit application, but, nationally there is a move to charge a cost for administering permits. But if the permits are not legally required (as in the case of baboon control), then MTPA cannot issue permits for animals that fall outside the permit system.

The role of FSA, the BDWG and the FSC in the search for a long-term solution to baboon conflict in commercial plantations. (Dr John Scotcher)

Dr John Scotcher, the current Chairperson of the Baboon Damage Working Group (BDWG) outlined the role of Forestry South Africa (FSA) in seeking an acceptable outcome to the control of baboons, so that the sustainability and profitability of its members in the growth and development of the forest

industry can be secured. John further discussed the role that the Institute for Commercial Forestry Research (ICFR) will play through the Integrated Pest Management (IPM) research area.

The role of the BDWG and its composition of representatives from timber companies, regulatory authorities and environmental NGOs were outlined. Its aim is to find suitable management options to limit the problem of baboon damage to commercial timber plantations and to co-ordinate and facilitate research to understand the damaging behaviour of baboons.

John noted that the National Forest Protection Strategy had identified the need to support the development of best management practices for damage causing animals (e.g. baboons, rodents, eland, bushbuck, and duiker).

The role of National and International laws was reviewed by John and focussed on:

- The National Forests Act – forests must be developed and managed so as to sustain the potential yield of their economic, social and environmental benefits;
- The National Environmental Management: Biodiversity Act – which, amongst its many requirements, contains a list of threatened or protected species, and draft regulations for the trapping of damage causing animals (baboons are not included in any national or provincial list of protected species);
- CITES – since there is no trade in baboons, this convention is not applicable.

As the FSC National Representative for South Africa, John also provided insight into the role that the local FSC could play in finding a solution. In doing so, he reviewed the formal complaint lodged with FSC International in January 2011, and briefly summarised the findings, viz. that the use of the “bait, trap and shoot” method as currently used is not an infraction of any of the FSC Principles and Criteria. John also indicated that the current method:

- Complies fully with legal requirements;
- Does not prejudice any listed threatened or protected species;
- Does not threaten any species with local extinction;
- Does not threaten the viability of existing native ecosystems;
- Respects the criteria dealing with pest management.

The FSC formal complaint report also included some recommendations to:

- Work towards providing guidelines for management of damage causing animals which are *not* threatened or protected species but cause significant problems for the achievement of environmental, social or economic objectives;
- There should be no moratorium on the control of baboons since there had been no infringement of FSC rules and there were no proven solutions that could be used effectively and efficiently to manage damage to trees during a moratorium;
- Develop an agreed code of practice for managing baboons in plantations;

- To undertake research to include
 - Impacts of baboons on biodiversity values at different densities,
 - Quantify the effects of baboon control on baboon populations and on damage to trees,
 - Evaluate the effectiveness, environmental and economic costs and benefits of baboon relocation as a method of baboon management and damage control.

In concluding his presentation, John summarised what the symposium needed to achieve, both immediately and into the future.

The type and extent of damage to Pine trees in select plantations within Mpumalanga.

(Thys de Wet)

The first presentation given by Thys de Wet provided a detailed overview on the type and extent of damage caused by baboons within Mpumalanga pine plantations, showing that damage was caused by both the biting and stripping of bark predominantly on pine trees but also on *Eucalyptus*, wattle and Casuarinas. Thys further noted that it could take up to four months from complete ring barking to death of the trees. Baboon damage has resulted in a lot of un-utilisable timber in addition to having other supply chain impacts that include the breaking of saw blades at the sawmill, rotten planks having to be sorted and tree growth retardation.

Thys discussed the results obtained from damage assessment surveys for which all pine species present were noted as being attacked by baboons. No evidence could be found to suggest that damage was due to nutritional use of pine. The data also revealed that no correlation could be found with tree type, pruning regime, growth conditions or tree age. The presentation was concluded with noting the monetary implications of baboon damage and the extent to which damage was occurring with levels being as high as 28% in some plantations.

The spatial ecology and demography of baboons living within a Komatiland plantation.

(Thys de Wet)

Thys de Wet presented the results of a study undertaken in Mpumalanga where he determined the home range and density of baboons in the Blyde plantation. The study involved the tracking of five adjacent troops that were noted to have an average home range of 16.38 km² and density of 2.94 baboons per km². The study further revealed that there are actually ten troops in total, equating to 455 baboons at a density of 6.7 baboons per km². The density of baboons within the plantation appears to be greater than in the natural areas adjacent to the plantation although it was agreed that further work on the latter population was needed. It was suggested that the baboons in the Blyde area showed a preference for plantations as they offer food, water, sleeping sites and abundant refugia, similar to the baboons in Tokai plantation in Cape Town, making it an ideal habitat for baboons relative to natural vegetation and other forms of agriculture in Mpumalanga.

Baboons spend a lower percentage of their time in planted compartments than the total percentage of area planted with pine in their home range, thus indicating that it is a combination of plantation forests and natural vegetation that offers the best habitat. Thys reported that there was seasonal variation in the usage of the plantation although on average baboons in plantations spent 40% of their day time activity foraging, compared to 60% of their time foraging in the adjacent natural areas. Proximity to natural vegetation (forest or grassland) does not prevent pine from being damaged.

The population sex ratio within the plantations was only slightly biased to females (1 male:1.2 females) while most natural populations have a sex ratio of 1:3. This suggests reduced male mortality and provides further evidence that baboons may be using plantations as a safe refuge from both natural and human predators and consequently they may experience reduced mortality. Thys further indicated that on several occasions he had encountered bachelor troops of baboons; a largely undocumented event. In addition, several toothless male baboons were noted and likely to have survived due to the availability of soft food sources.

Evidence was found that two of the troops studied had recently fissioned (split into two troops), with another troop in the process of fissioning; thus indicating healthy baboon populations.

In concluding his talk, Thys suggested that a detailed spatial analysis be conducted on his existing data to test his hypothesis that the worst damage to trees correlates positively with areas of home range overlap between neighbouring troops and thus damage may reflect displaced aggression or anxiety that results from inter-troop conflict.

General Discussion and Summary

Professor Justin O’Riain and Dr John Scotcher

Professor Russell Hill, as an independent scientific observer to the meeting, was asked to provide his perspective on the findings of the symposium and made the following points:

- The key question is – WHY do baboons strip bark. Russell explored priority research areas including:
 - The role of stress – if baboons do damage trees as a result of stress then what are the main driver(s) of this stress, i.e. the context in which baboons damage trees.
 - The demographics (age, sex and status) of baboons that exhibit bark stripping compared to those that don’t.

Professor Hill concluded new ideas are needed to assist in understanding this long standing problem, and that we must approach the challenge holistically and with good science. Following discussions amongst the stakeholders, the following aspects were carried over to the workshop the following day:

- A consistent method for damage assessment to be used by all forest owners;
- The need to determine whether there is a measurable pattern of baboon damage within a given plantation and between plantations;

- A need to look at the problem at a landscape level to understand how other forms of land use influence the baboons use of plantations;
- Behavioural observations are essential if we are to understand the context of baboon damage within plantations;
- The need to conduct a census of baboons within Mpumalanga to determine whether plantations were serving as a source or a sink to baboons in this province. This is essential to determine the impact culling is having or has had on baboon numbers both within and outside plantations. Biodiversity estimates within and adjacent to plantations were also identified as essential to our understanding of how plantations impact on species richness, distribution and relative abundance. A camera trap survey was proposed as a possible method for achieving this goal.

The environmental pressure group, GeaSphere, led by Philip Owen and accompanied by December Ndhlovu, Jan Quakernack, Colin Elsbernd and Janco Scott expressed their concern and objection to the numbers of baboons killed since the initiation of the baboon control programme by the forest industry. Baboons are an integral part of the environment and perform vital functions such as the dispersal of seeds of indigenous plant species. Philip indicated that there was very little known of the demographics of the troops in the Mpumalanga plantations and questioned how it was possible to continue to kill baboons in the absence of such basic information as the population numbers and population structure. He demanded a moratorium on the killing of baboons until this information was at hand. He also proposed that alternative non-lethal control methods be implemented in the event that baboon control was proven necessary.

Justin O'Riain responded that part of Thys De Wet's thesis would entail assessing the impacts of troop removal on the spatial ecology and damage to pines in the Blyde plantation. These data would go a long way towards understanding whether removing baboons, so that density was similar to that recorded for baboons in the adjacent Blyde River Canyon Nature Reserve, would reduce damage to the trees.

Further it was important to establish at a landscape level whether plantations serve as a refuge for baboons relative to other land use types in Mpumalanga and whether this explains the findings presented by Thys De Wet that baboon density and male numbers were higher in plantations than in natural areas.

Philip indicated that, when considering the damage caused by baboons to pine plantations, thought be given to the massive amount of damage caused by monoculture plantations of alien species upon the natural biodiversity and water supplies of our rivers and wetlands.

Justin O’Riain responded that all forms of agriculture impacted adversely on both biodiversity and water supplies and that the timber industry could not be singled out as being worse than any other. Indeed it appeared as though plantations were the one crop that baboons were welcome to live in even if causing damage to the trees. Wheat, maize, citrus and vegetable farmers had little to no tolerance for most forms of wildlife within their crops and all have a greater footprint in South Africa than Forestry (approx 1% land surface). The transparency of Forestry SA in how they are managing baboons is to be commended as is their willingness to fund research into possible means of mitigating baboon damage so that baboons can continue to persist within plantations. Lastly it is imperative to accept that if a solution to baboons damaging pines could be achieved that the baboons would be welcome to thrive within plantations. Our efforts thus need to be co-operative and not antagonistic as we all share the responsibility of attempting to derive the solution(s).

Philip also strongly criticised the certification of plantations by the FSC where lethal control of baboons was continuing, and mentioned that GeaSphere had rejected the report formulated by the FSC Formal Complaints Committee, citing irregularities in the process. GeaSphere has written to the FSC BOD regarding the matter and are currently awaiting a response.

At the end of the symposium, the crucial question of WHY baboons strip bark remained unanswered. The workshop the next day would be geared towards reviewing proposed solutions and identifying those that warrant future research over the next three year period.

Workshop: The search for sustainable solutions to human-wildlife conflict within commercial plantations in southern Africa

Workshop Objectives

- To summarise strengths and inadequacies in our current understanding of when and why baboons damage trees in commercial plantations.
- To prioritise research (over the next three to five years) by generating a list of testable hypotheses and the research required to support or refute each hypothesis.
- To identify where to perform what research when and to establish collaborative links and logistical support from the respective plantation managers and land owners.
- To identify potential collaborators including economists, social anthropologists and landscape ecologists for addressing broader issues (economic, social and conservation value of plantations versus other forms of agronomy) relevant to human wildlife conflict within plantations.
- To have an independent assessment of the current Baboon Damage Working Groups Protocols.
- To summarise and respond to the criticisms levelled at Forestry South Africa and the challenges to achieving the FSC Certification within southern Africa for plantation owners.

The workshop was chaired by Prof. Justin O’Riain. First to speak was Thys de Wet who presented a compiled list of 47 different control methods that have been proposed by forest managers, scientists, activists, welfare groups and other interested and affected parties, to mitigate damage to pines by baboons. These were reviewed by the workshop attendees and either rejected or approved for further investigation by means of a consensus vote.

These are in summary form and in no particular order:

1. **Chasing baboons with people on foot**

The extent of plantations precludes this as an effective method and it may further increase anxiety which may be one of the drivers of baboon damage to trees. Chasing could be used when there are physically discrete, high priority areas that need protecting for a short period (e.g. newly planted seedlings).

2. **Baboon minders**

(similar to 1 above) The extent of the plantations and the number of troops within plantations precludes assigning people to each troop to mind their behaviour, and it is uncertain whether such minders could prevent damage to trees when it commenced as minders would need to not be perceived as a threat to the troops in order to be able to mind them.

3. **Shock collars**

Ethical and practical concerns were raised. It is not possible to be with the animals at all times when they are damaging pines and thus aversive conditioning would be difficult to

achieve as baboons would achieve positive reinforcement by damaging without a shock. The cost of putting collars on all baboons would be prohibitive, and there is no option to charge batteries on free ranging wild animals.

4. Change the ranging pattern

Shift troops out of plantations by herding them. Similar to 1 above, this would only be useful for discrete areas requiring temporary protection. If this approach was adopted at the level of entire plantations then baboons could be displaced into neighbouring farmland most of which has a zero tolerance for baboons and thus the method would be tantamount to shifting the problem elsewhere, and would impact adversely on relationships with neighbouring property owners.

5. Conditioned fear of an area

Systematic scaring of baboons in select areas. Similar to 1 and 4, this requires constant presence and is logistically impractical at a landscape level.

6. Repel (chemicals on trees)

This is impractical given the scale of plantations and number of trees that would require constant application. Use of capsicum in Kenya was not shown to repel baboons. It may be an option to explore in small plantations or sensitive compartments within plantations.

7. Phytotoxic trees

This requires genetic modification and currently there are no known substances that could achieve toxicity levels required.

8. Conditioned taste aversion

It is possible that baboons do not damage trees because they are consuming it as food and thus CTA, which requires consumption of the item to create an aversion to it, would be completely ineffective.

9. Chase with dogs

Dogs are no match for baboons in a plantation who simply escape to the safety of the trees or seek steep broken terrain that dogs cannot easily follow them on. Further, dogs might greatly increase anxiety. and if troops are held in trees for extended periods by dogs then the baboons may resort to damaging the pines as a result of both boredom and/or anxiety.

10. Extra high pruning

Removal of the lower branches and thus making it more difficult for baboons to climb trees. This is not a viable option as baboons are perfectly capable of climbing trees without branches.

11. Supplementary feeding outside the plantations

Provisioning has many problems associated with it including increasing the fecundity and ultimately growth of troops and the local population. If damage is a by-product of elevated densities, then management methods that exacerbate the problem should be avoided. Provisioning of wildlife is further not sanctioned by conservation authority.

12. Plant food trees at plantation edge

The same argument applies as to 11 above. More food with few predators may lead to higher densities and more damage, should higher than normal densities be a contributing factor.

13. **Clearing all indigenous food plants from within the planted area**

These patches and strips of indigenous vegetation are almost certainly of value to other wildlife that frequent plantations and thus need to be retained for overall biodiversity value.

14. **Compensation for damage**

It is not clear who would compensate, but it is essential to recognise that land set aside for plantations has already been transformed and thus the objective should be to maximise yield on these transformed lands to assuage the demand for further land to be transformed for the same yield. Thus a scheme which rewards damage and does not attempt to mitigate it, will ultimately reduce the benefit relative to the cost of land transformation, and a lose-lose scenario will perpetuate.

15. **Sterilisation**

There is no evidence that level of fertility affects whether or not a baboon damages a tree or not. If sterilisation is for reducing population growth and density then the concern is that there may be unintended consequences of sterility on social structure such as the dissolution of troops and/or physiological changes that may exacerbate damage.

16. **Contraception**

Requires repeat administration of hormones to known ID individuals and has unknown social consequences (see 15 above) which may exacerbate damage.

17. **Capture and relocate troops out of plantations**

This merely creates a space for other troops to occupy the vacated land. The suggestion of capturing the whole troop and relocating it to a suitable area is problematic in that there is difficulty in finding a home for problem animals on private land, and national parks/nature reserves already have viable baboon populations, which would be socially disrupted following the introduction of an entire troop.

18. **Hunting**

Systematic shooting of baboons within plantations to create a landscape of fear that the baboons will learn to avoid. Hunters describe how troops flee after the first shot and thus it is not a practical means of reducing numbers. Random shooting may increase anxiety and lead to more damage.

19. **Night hunting at the roosting site**

Baboon troops seldom use the same roost site every night and thus this is difficult to organise. Similar to 18 above, baboons typically scatter once the first shot is fired and thus this not an effective means of reducing numbers.

20. **Sniping at the roost site**

This may be effective for a particular individual should the need arise but for the same reasons as detailed in 18 and 19 it cannot be considered to be an effective management method.

21. **Trap and remove individual animals**

This is more labour intensive than 20 and may cause more anxiety for trapped individual(s). It may be effective for the removal of for example excess males should this be discovered to be an issue.

22. **Hunting with dogs**

A problem legally and practically; baboons will move through the trees, and dogs on the ground.

23. **Poison**

Pre-bait and then poison the bait. Highly successful but unethical and contrary to the FSC principles.

24. **Fencing**

Permanently keep baboons out of plantations. This will impact adversely on other wildlife that use the plantations and would prove an expensive and largely impractical solution at such a large scale.

25. **Geo-fencing**

An activated electric wire around a sensitive area. This will be largely ineffective with baboons which are exceptionally agile and thus capable of traversing such simple fences.

26. **Hot wire**

For individual trees, this is not cost effective or practically implementable at the level of the entire plantation.

27. **Bait, cage capture and shoot**

This is the most effective way of catching and killing large numbers of individuals from a given troop. However there is a need to understand how troop removal impacts on the spatial ecology of neighbouring troops and whether, similar to 17 above, it will merely create a space for other troops from outside the plantation to move in. There is thus an urgent need to provide follow up data on the effects of culling completed to date to assess its impact on density, spatial ecology and damage to trees. If there is no change in damage levels then the method should no longer be used.

28. **Playback of alarm and challenge calls**

This may serve to increase stress and anxiety within troops and it is unlikely to cause baboons to leave plantations as they have evolved to respond to such calls from neighbouring troops.

29. **Leave baboon damaged compartments to baboons**

There is no evidence that baboons will return to a compartment if it is damaged and damage appears to be throughout plantations. Leaving dead trees increases fuel load for fires, reduces resources for existing trees, and encourages pest species which thrive in dead wood.

30. **Mineral additives**

Damage to trees as a result of certain mineral "shortages". However, research by Lorraine McNamara indicated there was no specific mineral "attraction" in the bark itself. It is possible

that there are other attractants in bark which may explain why baboons not only strip but also scrape the cambium with their nails and bite it. The question remains; what is there in the plantation that allows the baboons to exist in such high densities? Essential fatty acids could be an answer (attracts baboons into the plantation) and this density of baboons then spills over into errant behaviour.

31. **Eagle eye**

A rotating prism of mirrors which reflects sunlight light and acts as a form of a deterrent. This has been tested both within plantations and in urban areas and found to be completely ineffective.

32. **Do nothing**

Allow the population to self-regulate within plantations in response to varying food quality, food abundance, available water, roosting sites, natural predators, etc. This does not mitigate damage to trees. SAPPI has to date not actively managed baboons and has experienced a 1600% increase in baboon-induced damage in recent years.

33. **Remove bug weed**

Bugweed is an alien invasive species which produces prolific amounts of seeds as a possible food source for baboons. It is already being removed.

34. **Create indigenous plant corridors through the plantations**

This is already true of plantations which have corridors of natural vegetation running through them.

35. **Ashing**

Burning of baboon entrails and scattering the ash along the plantation boundary to serve as a deterrent to baboons. No evidence could be found as to why baboons would avoid the ash of dead conspecifics.

36. **Reduce the density of trees in plantations**

There is no evidence to suggest that tree density correlates with damage but this will be investigated in Thys De Wet's thesis. Currently tree density is designed to optimise production and hence provide a certain yield with the smallest land.

37. **Eliminate damaged trees by thinning**

There is no evidence to suggest that thinning reduces damage but it is accepted practice that once a compartment has less than 250 trees/ha, the compartment should be clear felled to waste.

38. **Reduce pruning and weeding in the plantation**

There is no evidence to suggest that this would reduce baboon damage to plantation trees.

39. **Limit the number of side branches on the trees that are strong enough to support the baboons' mass**

If baboons cannot roost/rest in the tree, then they will not damage it. Baboons can and do use even very thin branches and removal of almost all the branches would impact adversely on the trees productivity and survival.

40. **Plant other species or genera**

Currently damage has been recorded for all plantation species. Furthermore this approach contradicts the current best management practice of matching particular sites with particular species for optimal growth.

41. **Clearing and replanting**

The idea here is that new trees are not damaged which is patently flawed as often newly planted areas suffer the greatest damage.

42. **Planting larger compartments**

Although no reasons were advanced for this proposal it was felt that it would be very easy to test whether damage correlated with compartment size and this would be a variable included in the spatial analysis of damage.

43. **Integrate natural vegetation into the compartments**

In essence this translates into reducing the density of trees within plantations which in turn reduces the yield and thus for the same total volume of timber more land will be required. Further there is evidence from Blyde plantation that damage is higher in plantations adjoining natural vegetation.

44. **Harvest baboons as bush meat**

Baboons are considered a desirable source of food by certain local communities. However it is not part of the forestry mandate to supply such communities with a product that requires strict health and ethical regulations.

45. **Introduction of apex predators**

Pythons, leopards, crowned eagles and crocodiles are all known to consume baboons and should therefore be encouraged to thrive within plantations as a natural means of reducing numbers, density and possibly therefore baboon damage.

46. **Establish a baboon abattoir**

This is not considered to be relevant to the mandate of Forestry SA.

47. **Regular understory controlled burning**

Discussion

Workshop delegates then discussed each of the methods in terms of their efficacy and level of ethics, and concluded that the following methods deserved further investigation:

1. Explore options of chemical repellents e.g. deer repellents available in the USA;
2. Bait, capture and shoot (currently practiced) but ensuring understanding of the damage both before and after culling, in order to assess the effectiveness of this method on controlling the baboon damage. There is almost need to be in a situation where extensive damage is prevented by the implementation of a proactive management programme;
3. Introduction of apex predators;
4. Implementation of a standardised inter-company damage assessment method.

Research proposals

Based on the symposium presentations, discussions by stakeholders, and the workshop interaction, the following research proposals were agreed upon:

1. Landscape-level assessment of damage to plantations in Mpumalanga;
2. Plantation-level assessment of damage to plantations in Mpumalanga;
3. Detailed contextual behavioural observations on baboons damaging trees;
4. Landscape-level assessment of biodiversity within Mpumalanga;
5. Rigorous before and after experimentation on the effects of culling on baboon numbers, home range size, densities and damage to trees.

Way forward

1. The symposium and workshop summary will be published as an ICFR Bulletin (this document).
2. Professor Justin O'Riain will prepare full research proposals (including a budget) for each of the identified research projects to enable proper and prioritised planning for the research over the next three to five years.

Links to Forestry South Africa and the ICFR

In 2011, Forestry South Africa (FSA) initiated and funded the formation of the Damage Causing Animal Working Group (DCAWG) which is currently hosted within the Integrated Pest Management Programme (IPM) at the ICFR. The principle objectives of the Working Group include:

- To identify all damage causing animals;
- To co-ordinate research activities directed at reducing damage to timber plantations by animals;
- To document and evaluate all methods of damage causing animal control.

In South Africa, animals that have been known to cause damage to plantation forests include rodents, bushbuck, grey duiker, kudu, eland and baboons. Although the impact has largely been acceptable with minimal management intervention, in the last decade, damage caused by baboons has reached alarming levels. There is therefore a compelling argument that the DCAWG needs to initially focus efforts on baboon research. In addition, the Baboon Damage Working Group (BDWG) will continue as an operational committee focussed on assessing baboon damage and will report into the DCAWG, which is a sub-committee of Forestry South Africa's Environmental Management Committee.

Appendix: List of delegates who responded to the Symposium

Name	Company / Organisation
Andre Badenhorst	Woodmark/SABS
Andre Moller	Komatiland Forests
Andre van Tonder	Sappi
Andrew Bekker	TWK Forestry
Andrew Rosaak	WESSA
Bentley Kaplan	University of Cape Town
Birthe "Bibi" Linden	University of Venda
Cuthbert Katsvanga (Dr)	University of Bindura, Zimbabwe
Dave Malloch-Brown	York Timbers
David Everard (Dr)	Sappi
Donald Mlambo (Dr)	Border Timbers, Zimbabwe
Dries Pienaar	MTPA
Duane Roothman	Sappi Forests
Duncan Ballantyne	Sappi
Elsabe Coetzee	Sappi – media
Erwin Louw	York Timber
Esme Beamish	University of Cape Town
Etienne Nagel	Wood and Timber Times
Fred Favard	Working on Fire
Gerhard Nortje	SA Subtropical Growers Association
Gerrit Marais	SGS Qualifor
Glen Mitchell	York Timbers
Goodman Gcaba	Komatiland Forests
Hannes Vosloo	Sappi
Iaan du Toit	Private Consultant
Jan Huyser	Komatiland Forests
Johan Bester	Department of Agriculture, Forestry and Fisheries
Johan Eksteen	MTPA
John Scotcher (Dr)	FSA/Baboon Damage Working Group
Justin O'Riain (Prof.)	University of Cape Town
Kobus du Toit (Dr)	SA Veterinary Association
Lenin Maunganidzel	The Wattle Company, Zimbabwe
Mamelato Ngosheng	Department of Environmental Affairs
Marissa Coetzee (Dr)	MTPA
Mike le Grange	Timber Producers Federation, Zimbabwe
Nico Olivier	Komatiland Forests
Peta Hardy	
Phillip Hlongwane	Komatiland Forests
Ricky Pott	WESSA
Russell Hill (Prof.)	University of Durham
Ryan Nadel (Dr)	Institute for Commercial Forestry Research
Samora Chapman	SA Forestry –media
Stefan van Zyl	Sappi
Stephen Nyakanda	The Wattle Company, Zimbabwe
Thali Hoffman (Dr)	University of Cape Town
Theo Mol	MTPA
Thomas Mbedzi	Department of Environmental Affairs
Thys de Wet	University of Cape Town
Tim Snow	Endangered Wildlife Trust
Tshilidzi Muofhe	Department of Agriculture, Forestry and Fisheries
Willem Hollestein	Komatiland Forests