



University of
Chester



Human-wildlife conflict in golden monkeys (*Cercopithecus mitis kandi*) of the Volcanoes National Park, Rwanda.



Eric Ndayishimiye, Department of Biological Sciences, University of Chester, UK

endayishimiye@gorillafund.org, a.fletcher@chester.ac.uk

Awarded a PSGB Conservation Grant in 2018

Primate Society of Great Britain



Introduction: Human-wildlife conflict (HWC), mainly crop-raiding, is a challenging issue for conservationists worldwide (Dickman, 2010) and primates are among crop-raiders in many protected areas across Africa (e.g., Warren, Buba, & Ross, 2007; Tweheyo, Hill, & Obua, 2005). Crop-raiding affects farmers' livelihoods and thus, by reducing farmers' tolerance, could result in adverse effects on the conservation of problem species (Engeman et al., 2010; Siex & Struhsaker, 1999). An understanding of primate crop-foraging behaviour (Hill, 2017) and considering consultative views of conservation stakeholders (Treves, Wallace, & White, 2009) can help us design effective mitigation measures to reduce HWCs thereby minimizing associated negative effects.

Golden monkeys (*Cercopithecus mitis kandti*) are endangered (IUCN) and endemic to the Albertine Rift (Plumptre et al., 2007). Crop-raiding by golden monkeys is frequent and an increasing challenge around the Volcanoes National Park (VNP) in Rwanda (Tuyisingize et al., 2016). The aim of this study was to investigate HWC specific to golden monkeys around the VNP, with the following objectives: (1) to investigate the impact of this conflict on farmers and on golden monkeys; (2) to explore alternative mitigation measures to reduce golden monkey's crop-raiding; (3) to identify golden monkeys' behaviour changes when foraging outside the park; and (4) to test out the feasibility of using taste aversion as a possible mitigation method.

Workshop: We organised a workshop to discuss alternative measures that can help to mitigate crop-raiding by golden monkeys around the VNP. Twenty people, representative of conservation "stakeholders" in Rwanda, participated in the workshop discussions (Figure 1).

Crop-guarding, currently the most commonly used measure to reduce monkeys' raiding around the VNP, was thought by participants to be the most effective crop-raiding mitigation method (although it has its limitations) and further use of co-operatives along with potential government support of these was suggested as a way forward. As golden monkeys challenge the existing measures, participants argued that novel methods need to be tested to reduce crop-raiding, and an unpalatable cash crop buffer zone was favoured. Views of conservation stakeholders are key in designing effective HWC mitigation measures (Treves, Wallace, & White, 2009) and workshop feedback was very positive. One important outcome of the workshop has been to provide information which is helping to guide the development of a conservation action plan for golden monkeys.



Figure 1: Workshop participants sharing views on measures to reduce golden monkeys' crop-raiding around the VNP

Survey: We conducted a structured questionnaire survey, involving 45 local farmers with fields within 100 m of the forest, asking their opinions and experiences of monkeys and their crop-raiding. The questionnaire indicated that 95% of participant farmers had visits from golden monkeys with 86% of them experiencing raids. Fifty eight percent of these farmers had a decreased potato yield at the end of the season. Though neutral feelings about monkeys were predominant, harmful methods were sometimes used to stop raiding with some cases witnessed of adverse impacts on monkeys. This shows that crop-raiding by golden monkeys contributed to a reduction in crop yield within the study area and may have negatively affected farmers' tolerance to them.

Behavioural observations: We used continuous *ad libitum* sampling (Martin & Bateson, 2007) to collect behavioural data on monkeys of Kabatwa group both when inside and outside the park. From 87 hours of behavioural observations, Mann-Whitney tests indicated that frequencies were significantly higher inside the park than outside for grooming, self-grooming, playing, suckling, "boom" and "pyow" vocalisations. In contrast, mean frequencies were observed to be significantly higher when monkeys were outside for behaviours indicative of tension: scan bipedally

(Figure 2), aggression and screaming. The observed behaviour differences suggest that monkeys may perceive a higher level of risk when they are outside the park boundary (Hill, 2017).



Figure 2. Monkeys scanning bipedally while foraging outside the park

Taste aversion experiment: We smeared potatoes with chilli pepper oil to examine the feasibility of using aversive conditioning to reduce the attractiveness of potatoes as a food source. Monkeys left the park on two occasions when chilli-potatoes were available; a total of 9 monkeys visited the experimental area. Only one of these tried a shallow bite on a chilli-potato while others sniffed but avoided them perhaps due to the smell and ample availability of untainted potatoes. Due to such a low level of exploration of chilli-potatoes by monkeys, this was deemed not to be a useful method to pursue further.

Conclusion: This study was the first to investigate crop-raiding conflict specific to golden monkeys of the VNP. Its overall findings showed that there is clear evidence of risk to monkeys and harm to farmers' livelihoods due to crop-raiding. This issue needs urgent attention to find solutions and thus ensure local cooperation within conservation of this endangered species.

References

- Dickman, A. (2010). Complexities of conflict: The importance of considering social factors for effectively resolving human-wildlife conflict. *Animal Conservation*, 13(5), 458-466.
- Dytham, C. (2011). *Choosing and using statistics: A biologist's guide* (3rd ed.). Oxford: Wiley-Blackwell.
- Engeman, R. M., Laborde, J. E., Constantin, B. U., Shwiff, S. A., Hall, P., Duffiney, A., & Luciano, F. (2010). The economic impacts to commercial farms from invasive monkeys in Puerto Rico. *Crop Protection*, 29(4), 401-405.
- Hill, C. (2017). Primate crop feeding behavior, crop protection, and conservation. *International Journal of Primatology*, 38(2), 385-400.
- Martin, P., & Bateson, P. P. G. (2007). *Measuring behaviour: An introductory guide* (3rd ed.). Cambridge: Cambridge University Press.
- Plumptre, A. J., Davenport, T. R. B., Behangana, M., Kityo, R., Eilu, G., Ssegawa, P., Ewango, C., Meirte, D., Kahindo, C., Herremans, M., Peterhans, J. K., Pilgrim, J. D., Wilson, M., Languy, M., Moyer, D. (2007). The biodiversity of the albertine rift. *Biological Conservation*, 134(2), 178-194.
- Siex, K. S., & Struhsaker, T. T. (1999). Colobus monkeys and coconuts: A study of perceived human-wildlife conflicts. *Journal of Applied Ecology*, 36(6), 1009-1020.
- The IUCN Red List of Threatened Species. Version 2018-1. <www.iucnredlist.org>. Downloaded on 06 September 2018.
- Treves, A., Wallace, R. B., & White, S. (2009). Participatory planning of interventions to mitigate human-wildlife conflicts. *Conservation Biology*, 23(6), 1577-1587.
- Tuyisingize, D., Caillaud, D., Eckardt, W., Ndagijimana, F., Vecellio, V., Stoinski, T.S. (2016). Influence of bamboo shoot availability on ranging patterns of two primate species from Volcanoes National Park, Rwanda. [Abstract 603]. *International Primatological Society Congress*, Chicago.
- Tweheyo, M., Hill, C.M. & Obua, J. (2005). Patterns of crop raiding by primates around the Budongo Forest Reserve, Uganda. *Wildlife Biology*, 11(3):237-247.
- Warren, Y., Buba, B., & Ross, C. (2007). Patterns of crop-raiding by wild and domestic animals near Gashaka Gumti National Park, Nigeria. *International Journal of Pest Management*, 53(3), 207-216.