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On-primate Cameras Reveal Undocumented Foraging Behaviour and Interspecies Interactions in Chacma Baboons (*Papio ursinus*)

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Introduction

Historically, direct observation by human observers has been the primary method for studying primate behaviour. However, human observation may alter the behaviour of even habituated primates and that of other animals in their environment (LaBarge *et al.*, 2020). Observers may miss rare or subtle behaviours, particularly if maintaining recommended observation distances (Moll *et al.*, 2007). Remote methods, including on-animal cameras, can overcome some of these limitations.

Cameras have been deployed on a range of animals to study behaviour, although primarily on larger-bodied species. However, the use of cameras on primates has been limited (Fuentes *et al.*, 2014). Yet on-animal cameras have the potential to reveal important aspects of primate behaviour from a "primate-eye perspective", with cameras collecting data continuously, close-up, and at high resolution. The method thus has the potential to give exciting and novel insights into primate behaviour.

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We deployed custom-made, high-resolution, primate-borne video cameras on chacma baboons (*Papio ursinus*) in South Africa to gain insights into their behaviour and foraging in an agricultural landscape and to illustrate the potential advantages of this method, with a focus on undocumented foraging behaviours and interspecific interactions. Chacma baboons are omnivorous and occasionally prey on small antelope. Their flexible diets also may incorporate alternative anthropogenic food resources from agricultural areas (Walton *et al.*, 2021). Although previously studied by using bio-loggers (Walton *et al.*, 2021), these were without integrated video recording.

Methods

We deployed four collar cameras on unhabituated chacma baboons on a farm in the Blouberg District Municipality, South Africa, aided by a registered vet (collar mass ~ 300 g, < 3% of body mass). Collars recorded video continuously from 07:30 am the following day, with a drop-off mechanism deployed 24 h after collar attachment. We provide full collaring methods and collar specifications in the Supplementary Materials (Online resource 1). We recovered two of the four collars, both from adult females. All authors viewed videos from collars for behaviours of interest. An experienced guide identified the scat that appeared in the videos (further details in Online resource 1).

Ethical Note

The University of Durham Animal Welfare Ethical Review Board (August 3, 2017), Department of Anthropology Ethics and Data Protection Committee (June 12, 2017), and Limpopo Provincial Government Department of Economic Development, Environment, and Tourism (August 1, 2017) approved all methods.

Results

The first adult female's camera recorded continuous video for 8 h 40 min. The baboon engaged in unreported foraging behaviour, consuming antelope faeces in 19 separate events for 5 min 19 s. It consumed the faeces of multiple antelope species, mostly from common duiker (*Sylvicapra grimmia*), but it also ate greater kudu (*Tragelaphus strepsiceros*), impala (*Aepyceros melampus*), and gemsbok (*Oryx gazella*) faeces. The baboon was selective in which individual faeces were consumed; it broke some open and inspected the contents before ingestion (Fig. 1a–c). It rejected others after inspection. The camera also recorded separate interspecific encounters with a group of banded mongoose (*Mungos mungo*), two impala, and a nyala (*Tragelaphus angasii*).

The second baboon's camera recorded for 8 h 54 min. This female also engaged in coprophagy, consuming common duiker faeces in one event lasting 23 s. The

Fig. 1 Baboon (**a**) breaking open and (**b**) inspecting kudu faeces, and (**c**) transporting common duiker faeces to mouth between finger and thumb. (**d**) Baboon close to a common duiker. Videos recorded on chacma baboons in Blouberg District Municipality, South Africa, August 2017.

baboon picked up and ate the individual droppings rapidly, with no evidence for selection or inspection. The camera also recorded one encounter with a common duiker (Fig. 1d). Supplementary materials include further video recordings of these behaviours (Online resources 2–4).

Discussion

Although the recovered cameras only collected data on two baboons and for less than 9 h each, both cameras recorded coprophagy and close encounters with other species. This suggests that both are likely to be common occurrences, certainly in this population at this time of year.

Several primate species have been recorded consuming their own faeces or that of the same species (Soave & Brand, 1991). Records of primates consuming the faeces of other species, however, are rare and examples of baboons consuming the faeces of other species are absent from the literature despite being a well-researched primate taxon. The frequency of this type of coprophagy recorded in our videos suggests that its absence from the literature may reflect the limitations of data collected by human observation. Even with habituated animals, it may be difficult or unethical to get close enough to primates to establish exactly what food items are being consumed. Our high-resolution cameras on the animals allowed close, detailed, and continuous recording of their feeding behavior such that infrequent, but important, events were recorded. Low food availability is a possible explanation for our observations as data collection took place towards the end of the dry season, when natural food availability was likely to be low.

The frequency of encounters with other species in a short time also is notable. It is unlikely that the interactions presented here would have been recorded in the presence of human observers, given that neither the baboons nor the species they interacted with were habituated to humans. Researchers may deter unhabituated species leading to erroneous conclusions about the frequency of interspecific interactions (LaBarge *et al.*, 2020). This has particular implications for the study of primate-predator interactions, as unhabituated predators may be deterred, leading to subsequent behavioural changes in prey species (LaBarge *et al.*, 2020).

In future research, we anticipate cameras being beneficial in the study of primates in the absence of human observers for purposes including but not limited to: 1) identifying rare and unanticipated behaviours when recording continuously, 2) studying interspecific interactions, including predator–prey interactions, with primates as both predators and prey, 3) studying intraspecific interactions including social behaviour and mate choice, 4) accurately quantifying activity budgets and energy intake, through continuous recording, 5) understanding the attention of wild primates by recording from a primate-eye perspective, 6) creating and validating models linking accelerometer data to behaviours, and 7) public engagement in research. Combining cameras with other technology, such as accelerometers, can allow cameras to record only specific behaviours, triggering them when that behaviour is likely to be occurring. Machine learning can reduce video coding time, which is otherwise labour intensive, and battery improvements will increase recording durations.

This research highlights some of the potential benefits of detailed and continuous data collection through on-primate video cameras. We hope that this work can act as a primer for researchers considering using on-animal cameras for studying primate behaviour.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10764-024-00423-9.

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Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

References

Fuentes, A., Klegarth, A., Jones-Engel, L., Abernathy, K., Cortes, J., Gumert, M., Lee, B., Marshall, G., Pizarro, M., & Shaw, E. (2014). "Seeing the world through their eyes": Analyses of the first national geographic crittercam™ deployments on macaques in Singapore and Gibraltar. In *Abstract - AAPA presentations* (p. 122). https://bioanth.org/documents/44/2014_AAPA_meetings_supp.pdf

LaBarge, L. R., Hill, R. A., Berman, C. M., Margulis, S. W., & Allan, A. T. L. (2020). Anthropogenic influences on primate antipredator behavior and implications for research and conservation. *American Journal of Primatology, 82*(2). https://doi.org/10.1002/ajp.23087

Moll, R. J., Millspaugh, J. J., Beringer, J., Sartwell, J., & He, Z. (2007). A new "view" of ecology and conservation through animal-borne video systems. *Trends in Ecology and Evolution, 22*(12). https://doi.org/10.1016/j.tree.2007.09.007

Soave, O., & Brand, C. D. (1991). Coprophagy in animals: A review. *The Cornell Veterinarian, 81*(4), 357–64. https://babel.hathitrust.org/cgi/pt?id=coo.31924051143075&seq=379

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 and Evolution*, *11*(2). https://doi.org/10.1002/ece3.7114