Primates

Red-tailed monkeys (Cercopithecus ascanius) prey upon and mob birds in the Issa Valley, western Tanzania

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Title: Red-tailed monkeys (*Cercopithecus ascanius*) prey upon and mob birds in the Issa Valley, western Tanzania

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Abstract

Interactions between monkeys and birds are rarely observed and consequently, rarely described in scientific literature. We recorded two encounters between birds (*Prionops plumatus* and *Strix woodfordii*) and red-tailed monkeys (*Cercopithecus ascanius*) in a woodland-mosaic habitat in western Tanzania. We observed a male red-tailed monkey consume a small bird in its entirety. Although only a few feathers remained, we provisionally identified the bird as a white-crested helmetshrike. We also observed a group of red-tailed monkeys mobbing, but not killing, an African wood owl on the forest floor. This is the first reported observation of this kind. These encounters suggest that guenons may generalize large bodied avians as threats and small bodied avians as potential prey. Hetero-specific encounters such as these provide insights into primate diet and anti-predatory behavior.

Key words**: Anti-predator behavior, Guenon, Meat-eating, Predation, Savanna-woodland mosaic**

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Introduction

Primates commonly exhibit anti-predation behavior in response to birds of prey, but direct observations of avian predation on primates are rare (Cordeiro 1992; Shultz 2001; Paciência et al. 2017). One example of primate anti-predator behavior is mobbing, defined as following, approaching, or harassing an animal, either as an individual or collectively as a group (Crofoot 2013). Mobbing serves two primary functions. First, mobbing can allow individuals to rescue group members already captured by a predator (Crofoot 2013). Second, mobbing can prevent predation by deterring predators and spoiling potential ambushes (Crofoot 2013). Reporting observations of anti-predation behavior, including mobbing, is important for improving our understanding of which species and behaviors may be perceived as threats by primates. Furthermore, these observations can highlight rarely-exhibited behaviors, such as tool use when mobbing predators (e.g. white-faced capuchin monkeys, *Cebus capucinus*, using sticks to attack snakes – Chapman 1986; Boinski 1988). In cases of primates mobbing birds, underlying motives are often unknown.

Although relatively uncommon, primate predation on birds does occur. For example, chimpanzees (*Pan troglodytes*) are known to eat birds (Toshiyuki and Shigeo 1983; Hockings et al. 2012) and vervet monkeys (*Cercopithecus aethiops*), white-faced capuchins (*Cebus imitator*), blue monkeys (*Cercopithecus mitis*), red-tailed monkeys (*C. ascanius*), and several other guenon species have also been observed hunting and consuming birds (Struhsaker 1967; Fedigan 1990; Cordeiro 1994; Furuichi 2006; Kingdon et al. 2013). Chimpanzees have also been observed capturing and killing birds for play (Carvalho et al. 2010).

Here, we describe two encounters between red-tailed monkeys and birds in the Issa Valley, western Tanzania. The first is an observation of a red-tailed monkey capturing and

consuming a single individual of *Prionops plumatus*. The second observation describes red-tailed monkeys mobbing an owl (*Strix woodfordii)* – the first recorded observation of this kind.

Methods

The Issa Valley is located in the Tongwe East Forest Reserve in western Tanzania. The study site is characterized as a mosaic of miombo woodland, dominated by *Brachystegia* and *Julbernardia* spp., and small strips of riverine forest (Piel 2018). Mean annual rainfall since 2012 is ~1250mm, and daily mean temperatures in forest range from 10-33ºC throughout the year (McLester et al. 2019).

Red-tailed monkeys were first habituated at Issa in 2012 (Tapper et al. 2019; McLester et al. 2018), with groups followed for 5-10 days each per month as part of long-term data collection. Potential predators most frequently encountered by red-tailed monkeys at Issa include birds of prey (crowned hawk-eagles, *Stephanoaetus coronatus*) and chimpanzees (*Pan troglodytes schweinfurthii*). When Observation 1 occurred in 2016, one group (K0) comprising *ca.* 50 individuals was being followed. When Observation 2 occurred in 2018, K0 had fissioned into two daughter groups of *ca.* 31 individuals (K1) and *ca.* 16 individuals (K2).

Observations

Observation 1

On 4 January 2016 at 13.50, EM and a field assistant (PH) were following K0 as the group travelled in riparian forest. The forest strip was approximately 80m wide and surrounded by miombo woodland on both sides. PH observed an adult male red-tailed monkey holding a dead bird after jumping into a tree. The bird was later identified as a juvenile white crested helmet

shrike (*Prionops plumatus*; D. Moyer personal communication). The monkey consumed the bird immediately and finished eating at 13:57. No vocalizations were heard from the monkey or the bird, and we did not observe any interest by conspecifics towards the interaction. The only remains that we recovered were feathers and blood, which were found on the ground immediately underneath the tree. The monkey left the tree immediately after finishing eating it.

Observation 2

On 18 October 2018 at 12:45, CL was following K1 in riparian forest. CL observed 8-10 monkeys surrounding a juvenile adult African wood owl (*Strix woodfordii*) on the ground approximately 5m from a dried riverbed. The monkeys were subadults and juveniles and remained between 0-3m from the owl for the entire encounter. All monkeys were either on the ground or on nearby lianas, watching the owl and producing chirps and ka-trains (Marler, 1973). For approximately one minute, several individuals took turns jumping on the owl (primarily using their back feet) at least four times and pulling the owl's wings with their mouths and hands at least two times. The owl did not vocalize or attempt to escape, even when it was not restrained. At 12:54, a monkey dragged the owl by its wing into the nearby riverbed (approximately a 1.5m drop) where they were obscured from view. However, at least three monkeys followed down into the riverbed. By 12:55, all monkeys had ceased interacting with the owl, and most individuals had begun playing on the forest floor approximately 10m away from the owl. At that point, the owl was observed sitting upright with wings slightly askew but did not attempt to fly. For the next two minutes, three monkeys remained on lianas overlooking the owl and watched it while foraging on *Dracaena mannii*. CL twice observed a monkey look at and move towards the owl while remaining on the liana. The last individual left at 13:00, at which

point CL photographed the owl for later species identification. When CL last observed the owl, it was alive, and although it was not observed to fly away, the owl had disappeared into the foliage within two minutes of the monkeys' departure. Throughout the observation, those group members that did not interact with the owl (>20 individuals) foraged, rested, and by the end of the observation had begun travelling further away from the mobbing location.

Discussion

Despite >4000 hours of group follows of Issa's red-tailed monkeys from 2012 – 2018, these observations represent the only two observations of red-tailed monkeys mobbing and preying upon birds at Issa. The rarity of these interspecies encounters is consistent with the relative paucity of direct primate-avian interactions reported in the literature. Red-tailed monkeys have only once been reported to hunt and consume birds (Furuichi 2006). In that interaction, two blue monkeys harassed a red-tailed monkey that had captured a green pigeon (*Treron calva*). While red-tailed monkeys have not been recorded to eat vertebrate prey besides the aforementioned birds, a *C. mitis* x *C. ascanius* hybrid and blue monkeys were observed consuming bats (*Pteropodidae* and *Molossidae*) on 13 occasions over 6.5 years in Kenya and Tanzania (Tapanes et al. 2016). In addition, several guenon species have been observed to consume vertebrates, including spurfowl chicks (*Pternistis leucoscep* – Struhsaker 1967), galagos (*Galago* spp. – Butynski 1982), flying squirrels (*Anomalurus derbianus jacksonii* – Fairgrieve 1997), and mice (presumed *Muroidea spp.* - Wahome et al. 1988). The flying squirrel predation occurred during the driest part of the year when food abundance was the lowest, indicating hunting may be an attempt to compensate for nutrient deficiency (i.e. the "nutrient shortfall hypothesis" – Oftedal, 1991; Mitani & Watts, 2001). As such, direct observations of attempted and successful predation

of birds and mammals by monkeys can be important when contextualizing the role of vertebrate tissue in primate diet against seasonal resource availability.

Our observation of red-tailed monkeys mobbing a wood owl is the first of its kind. Wood owls are typically insectivorous, but will hunt small mammals, like shrews (Chittenden et al 2016). However, there is no evidence that they hunt monkeys. If monkeys are not preyed on by wood owls, why would they risk injury by mobbing them? Cords (1987**)** proposed that monkeys may generalize large bodied birds as threats. If so, our observations of monkeys playing subsequent to the initial attack suggests that they (1) may not have seen it, (2) may have seen it but noticed it was injured and no longer a threat, or (3) do not perceive the owl as a threat. Carvalho et al. (2010) suggested that bird attacks can be initiated through chance encounters and simply persist out of novelty. Therefore, our observation may have been an aggressive form of play. Another possibility is that the attack was initiated out of redirected aggression. Goldberg et al. (2006) described a mobbing event near Kibale National Park, Uganda, when three red colobus monkeys (*Procolobus tephrosceles*) mobbed an owlet (*Glaucidium perlatum*) after a raptor sighting. The authors suggested that the resulting vigilance amongst the group contributed to increased arousal that eventually resulted in the (re-directed) killing of the owlet. A final possibility is that the observation was an attempted predation event. For example, Rudran (1978) observed a subadult male blue monkey eating a wood owl following a suspected live capture. However, the underlying motivation in our observation remains unclear. More direct observations of monkey-bird interactions are needed to understand the range of possible responses within intra-species encounters, as well as improve our understanding of diet and feeding ecology.

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