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Brief Communication:

Predation on an Endemic and Endangered Tana River Mangabey (*Cercocebus galeritus*) by a Sympatric Yellow Baboon (*Papio cynocephalus*) in Tana River National Primate Reserve, Kenya

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INTRODUCTION

Predation plays a significant evolutionary role in shaping primate behavior as a crucial selective force (Isbell 1994; Stanford 2002; Hart 2007; Mitani *et al.* 2012). Besides humans, carnivorous mammals, reptiles, and raptors are the major predators to most nonhuman primates (Sherman 1991; Tsukahara 1993; Vasquez & Heymann 2001; Gursky 2002; Hart 2007; Oliveira & Dietz 2011; Fichtel 2012). Systematic and consistent predation by other nonhuman primates has rarely been observed with exception of well documented cases of chimpanzees (*Pan troglodytes*) hunting of red colobus monkeys, with baboons, blue monkeys and redtailed monkeys killed at lower rates (Wrangham & Riss 1990; Stanford *et al.* 1994).

Baboons (*Papio* spp.) on several occasions have been reported to include meat in their diet (Hausfater 1976; Whiten *et al.* 1991; Fichtel 2012; Altmann *et al.* 2013; Palombit 2013). Their common prey species include hares and young antelopes (Whiten *et al.* 1991). Though they rarely prey on other nonhuman primate species, some cases of baboon predation on vervet monkeys and related guenons (*Chlorocebus* spp.) have been reported (Struhsaker 1967; Hausfater 1976; Seyfarth *et al.* 1980). Baboon predation on the endangered Tana River mangabey (*Cercocebus galeritus*) has never been previously reported making the incident reported here of special interest.

Predation in wild nonhuman primates remains difficult to study since it is rare and unpredictable in occurrence (Oliveira & Dietz 2011). Consequently, there are very few cases reported in Tana River National Primate Reserve (TRNPR) despite continuous research over the last four decades. Condit and Smith (1994) reported lion (*Panthera leo*) predation on yellow baboons (*Papio cynocephalus*) while Wieczkowski *et al.* (2012) attribute possible predation of Tana River mangabeys to African crowned eagles (*Stephanoaetus coronatus*). Other potential predators for the Tana primates include leopards (P*anthera pardus*), spotted hyenas (*Crocuta crocuta*), crocodiles (*Crocodylus niloticus*), and pythons (*Python sebae*) (Condit & Smith 1994; Malonza *et al.* 2006; Wieczkowski *et al.* 2012).

Primates have diverse anti-predation strategies which include polyspecific associations (Gautier-Hion *et al.* 1983). There are five diurnal nonhuman primate species inhabiting the Tana riverine forests (Butynski & Mwangi 1994), yet there have been no documented cases of nonhuman primate predation on other primates there. Here I report the first incidence of a wild male yellow baboon killing and eating a Tana River mangabey in the Mchelelo riverine forest fragment in TRNPR.

METHODS

Study area

The incidence reported here took place in the Mchelelo west forest fragment in TRNPR in Kenya. The reserve is 171 km^2 and it lies between 1°40' to 2°15´S and 40° 07´ - 40° 10´ E, in southeastern Kenya. The forest stretch utilized by the observed yellow baboons and the mangabey groups in Mchelelo west is about 63 ha (Bentley-Condit 2009). Beside baboons and mangabeys, three other diurnal primates are found in TRNPR, which include Sykes' monkeys (*Cercopithecus albogularis albotorquatus*), vervets (*Chlorocebus pygerythrus*) and Tana River red colobus (*Piliocolobus rufomitratus*) (Butynski & Mwangi 1994; de Jong & Butynski 2012; Butynski *et al.* 2013). The area receives a mean annual rainfall of about 400 mm and daily temperature ranges between 30-38°C (Hughes 1990).

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Study subjects

The primary subjects of this report are yellow baboons and Tana River mangabeys. The two species have been studied in TRNPR over the last three decades. The major focus has been on niche overlap between the two species, dietary ecology, ranging patterns, habitat use, threats, conflict with humans, food resource dynamics and population trends (Butynski & Mwangi 1994; Wahungu 1998a, 1998b; Wieczkowski 2004; Moinde-Fockler *et al.* 2007; Bentley-Condit 2009; Kivai 2010). The Tana River mangabey is considered endangered while the yellow baboon is of least concern (Butynski *et al.* 2008; IUCN 2013).

Observation approach

The observation reported here was made during group follows of Tana River mangabeys. The focal group had been habituated and followed by different researchers in the Mchelelo forest over the past. The yellow baboon troop encountered during the mangabey monitoring was also the subject of previous behavioral studies and was seemingly semi-habituated. Two observers followed the mangabeys while doing focal sampling to understand their feeding behavior and its linkages with crop raiding. The mangabeys were approachable to a distance of approximately five meters, while the baboons were approachable to a distance of about ten meters. Even though visibility was not measured, at least about 50% of the members of the mangabey group were visible during the predation event. The mangabey group consisted of approximately thirty individuals while the yellow baboon troop had fifty individuals. The mangabey follows started at 07:00h and continued for four hours before they were joined by yellow baboons at 11:00h and shortly thereafter by a group of Sykes' monkeys. Observation involving the co-occurrence of the mangabey and baboons lasted for about 105 minutes before the attack took place.

RESULTS

The predation incident was observed on January 31, 2010, while following a group of Tana River mangabeys in the Mchelelo forest fragment. One mature male yellow baboon attacked, killed and consumed a sub-adult mangabey individual whose sex could not be established as the baboon tore apart and consume it. Prior to the predation event, mangabeys emitted alarm calls accompanied by a change of their travel direction. The mangabey group had spread widely by then so that the two observers were not at a close range to determine what was happening. However, the baboons appeared to continue moving and foraging in the same direction with the mangabey group.

The two primate species involved in the incident moved and foraged together on the ground for over 200 m following their merger and from the point of predation. During the attack the mangabey individuals being followed started resting and engaging in terrestrial grooming activity. Within a distance of 10-15m from the observer, there were two adult male yellow baboons but they had not attracted the observers' attention. At that time, many individuals of the mangabey group had aggregated and were not far away from each other. At around 12:45 h loud alarm calls were heard from the mangabeys followed by a commotion as they escaped into the trees. Immediately, the mangabeys were observed retreating and emitting distress calls while moving away and gazing at the bushes behind the observers. One of the observers approached to see what was happening and spotted the two adult male yellow baboons which had then moved behind a bush. One was eating some meat while the other sat about 2 m away observing the other feeding baboon. Moving closer, the male ran away carrying something. Moving to the spot which the baboon just left, the observer noticed that it had fed on a sub-adult mangabey based on the bone and paw remains shown in Figure 1. The second baboon male moved to the spot where the male that had killed the mangabey had been consuming it and proceeded to consume the remains that had been left behind. It is likely that the baboon that dominated the carcasses killed the mangabey and perhaps was high ranking since cooperative hunting of prey is rare in baboons (Hill 1982).

DISCUSSION

This report documents a rare observation of predation involving two sympatric African cercopithecines, yellow baboons and Tana River mangabeys. These two primate species have large overlap in their diets and utilize the same habitat in TRNPR, especially when food resources are scarce (Wahungu 1998a). Baboon predatory behavior targeting other nonhuman primates is known but uncommon, and has not previously been reported from the TRNPR despite long term behavioral studies on mangabeys and baboons in the area.

This predation event brings up two pertinent research questions: (1) What are the factors driving the observed predatory behavior, and (2) What are the possible conservation implications on the endemic and endangered Tana River mangabey? The predation incident reported here occurred following the long drought experience in Kenya and the region in 2009. Consequently, the baboons foraged more in the forest where food resources were relatively more abundant compared to the dry woodland habitats where they predominantly forage (Bentley-Condit 2009). Since the food resources in the forests had also declined following the drought, it was likely that food competition was high between the two species given their high dietary overlap (Wahungu 1998a). Even though baboons are opportunistic feeders (Altmann *et al.* 2013), this predation behavior might

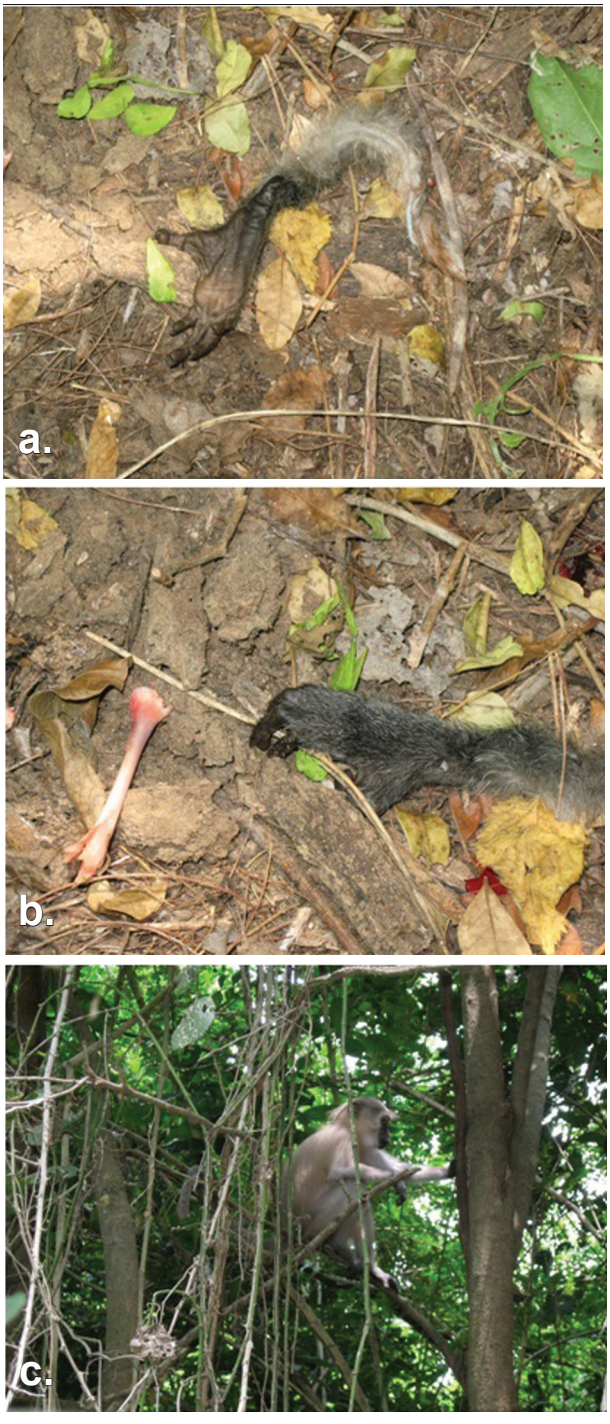

Figure 1. Remains of sub-adult Tana River mangabey preyed upon by an adult yellow baboon male (a, b,) and another sub-adult mangabey taking cover after the incidence (c).

have been triggered by possible nutritional deficiencies. This could partly be supported by observation that olive baboon predation on small invertebrate species increases with decline in food resources, especially during the dry period (Whiten *et al.* 1991).

Previous studies have indicated that Tana River mangabeys avoid areas occupied by baboons while foraging (Wahungu 1998b; Bentley-Condit 2009). In addition, mangabeys are more adapted to feeding on a mechanically challenging diet and utilize hard food items with high fracture toughness, compared to the yellow baboons and other sympatric primates (Wahungu 1998a; McGraw *et al.* 2011). As a result, food competition between the two species might be minimal given the reported mangabey foraging adaptations. Hence, foraging avoidance could possibly be attributed to the observed predatory behavior. This incident suggests that baboon predatory behavior acting cumulatively with habitat destruction and the killing of mangabeys as crop pests and for bush meat (Moinde-Fockler *et al.* 2007; Kivai 2010) might exacerbate the threat to the long term survival of the Tana River mangabeys. Although these other threats are more frequent and well documented with respect to Tana mangabey conservation, predation by yellow baboons and its threat severity remains poorly understood and warrants further monitoring to understand its causes, magnitude, and conservation consequences.

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