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OBSERVATION OF WEAPON USE IN A GROUP OF SEMI-FREE TUFTED CAPUCHINS (*SAPAJUS* SPP)

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Introduction

There have been many studies about the use of tools by capuchins (*Cebus* and *Sapajus* spp.) particularly during the last two decades of the 20th century including experiments in captive settings and to a lesser degree in semi-free and wild conditions (Fragaszy et al., 2004; Ottoni and Izar, 2008; Visalberghi and Fragaszy, 2012). Capuchins have been observed manipulating objects either out of curiosity or as a means to extract food (Fragaszy et al., 2004). There is very limited documentation, however, as to the use of objects as weapons either in response to a threat or as an aggressor. Wild capuchins have been reported to flail branches or drop objects on intruders (Chevalier-Skolnikoff, 1990; Fragaszy et al., 2004) and Boinski observed a male white-faced capuchin (*C. capucinus*) use a branch to strike a boa constrictor pinned to the ground beneath a fallen branch (Boinski, 1988). Cooper & Harlow (1961) reported a tufted capuchin (*C. a. fatuellus*) in a laboratory struck a white-fronted capuchin (*C. albifrons*) with a stick in defense of food and the same tufted capuchin used a stick to defend himself when surrounded by a group of rhesus monkeys (*Macaca mulatta*) although he failed to hit any of them.

Throwing objects is less often reported. Vitale et al. (1991) reported observing a group-living tufted capuchin throw (unspecified) light objects a short distance towards a model snake as part of a mobbing event. Westergaard and Suomi (1994) showed that captive tufted capuchins could throw stones with good aim 20 cm away into a bucket following practice, but in this case the outcome was receipt of a reward. More recently Falotico & Ottoni (2013) reported observing female bearded capuchins (*Sapajus libidinosus*) throwing stones at males during their proceptive phase, seemingly to gain the males' attention. Here we report the use of a large stick and a stone by a female *Sapajus* spp. in a seemingly unprovoked attack on a tortoise in a semi-free environment.

Study Site

The study site is a primate sanctuary situated in Plettenberg Bay, Western Cape, South Africa named Monkeyland, created in 1998 as a sanctuary for captive primates where they could live semi-free in a more natural environment.

The sanctuary encompasses an area of 12 hectares of natural indigenous forest surrounded by a 6 meter fence, and is now home to 10 species of primates including capuchins (*Sapajus* spp.), squirrel monkeys (*Saimiri boliviensis*), black howler monkeys (*Alouatta caraya*), sakis (*Chiropotes chiropotes*), vervet monkeys (*Chlorocebus pygerythrus*), langurs (*Trachypithecus obscurus*, *Semnopithecus entellus*), lar gibbons (*Hylobates lar*), ring-tailed lemurs (*Lemur catta*) and black and white ruffed lemurs (*Varecia variegata variegata*). Along with unwanted pets, some of the primates are retired from laboratories or zoos and many more were born here. There are now approximately 450 free-ranging primates living sympatrically in the forest. Together with the primates are approximately 30 Mountain (or Leopard) tortoises (*Stigmochelys pardalis*), native to South Africa, as well as some other native South African fauna.

Monkeyland is open to the public for guided tours of the forest. Although the monkeys and apes are habituated to humans, there is no interaction between humans and the other primates. All primates go through a period of rehabilitation prior to their release into the forest in order to wean them off of human dependency. There are 15 feeding stations throughout the forest and the primates are fed twice daily a variety of fruits, vegetables, proteins and carbohydrates. Aside from eating provisioned foods, the primates feed on leaves, flowers, fruits, insects, invertebrates and birds that they obtain by foraging in the natural forest. Food is abundant.

Conflicts occasionally occur between the different species; however, these rarely result in serious injury. Apart from the occasional snake (puff adder (*Bitis arietans*), night adder (*Causus rhombeatus*) and boomslang (*Dispholidus typus*) there are no natural predators. Small raptors reside in the area but are rarely seen above the Monkeyland forest. A series of natural paths of varying widths link the feeding stations, and tourists are restricted to these paths. Currently there are approximately 100 capuchins divided into three groups, each with an alpha male. Conflicts between the groups are minor and are generally limited to vocal and visual displays when the groups meet. The observer, Claire Hamilton, worked at Monkeyland for two years prior to this event and previously spent a year in Bolivia working with and amongst wild, semi-free and captive capuchins where wild tortoises were also present.

Observations

On 7th November 2012 Claire Hamilton was on a routine walk through the Monkeyland forest. Shortly after entering the forest she heard something rushing through the undergrowth and she observed two capuchins (*Sapajus* spp.) heading out from the forest onto a wide path. Both were making the 'open mouthed threat face' and giving alarm vocalizations. Apart from another capuchin resting in a tree and a few squirrel monkeys (*Saimiri boliviensis*) foraging on the forest floor, no other monkeys could be seen and the



Figure 1. In chronological order from left to right.

- a) 14:51:49 The female capuchin showing her bared teeth. She is following the male who has crossed the path and is out of sight.
- b) 14:51:49 Just prior to her picking up a branch.
- c) 14:51:53 The branch just as it was making contact with the tortoise.
- d) 14:51:55 The branch is visible to the left of the tortoise and the female is (presumably) searching for another weapon.
- e) 14:52:00 The female has thrown the rock which can now be seen mid-air.
- f) 14:52:00 The rock is landing to the right of the tortoise who is still retracted into its shell.
- g) 14:52:04 The tortoise makes a hasty retreat and the rock can be seen on the ground to the right of the tortoise.

only other animal visible was a medium sized mountain tortoise (approximately 35 cm long x 23 cm wide) which was making its way along the path towards Hamilton. The male capuchin crossed the path, followed by the female, making threat faces and vocalizations. It became apparent that the object of their alarm was the tortoise. While the male remained to the side of the path, the female took hold of a broken branch measuring approximately 59 cm long x 4 cm diameter and whilst holding this she struck the tortoise across its shell once before dropping the branch. The tortoise reacted by retracting into its shell. The female capuchin then took up a rock measuring approximately 8 x 5 x 4 cm and threw it with such precision and force that it bounced off the tortoise's back and landed over a meter in front and to the side of it. She stood bipedally erect and watched the tortoise make a hasty departure, heading towards Hamilton. She then resumed normal quadrupedal posture and watched until the tortoise was at least 3m away. The male remained in the forest to the side of the path and his reaction was not observed. The tortoise suffered a slight chip to its shell. The whole incident lasted approximately 15 seconds. Hamilton obtained a series of photos of the incident, shown in Figure 1.

Discussion

All the primates in the forest are familiar with Hamilton's presence but have never associated her with the provision of food or other favors and there is no apparent explanation for the capuchins' behavior toward the tortoise during this

incident. The female was not in estrus, nor was she showing any outward signs of pregnancy. Following the incident the male was identified as 'Joey', a high ranking male subordinate to and an ally of the alpha male of this group. The female was identified as 'Lindy' (aged 12), the alpha female of the group who spends the majority of her time with the alpha male and Joey. Both Joey and Lindy were born at Monkeyland and have lived in the forest all (Lindy) or most (Joey; from 7 months) of their lives. Neither Joey nor Lindy had shown particularly aggressive tendencies prior to this incident although Lindy had displayed resourceful behavior, such as using a long stick to 'fish' out pieces of apple which were out of reach behind a fence.

The Mountain tortoises are the largest (30-60 cm, 8-20 kg) of the South Africa tortoises and the most widely distributed. They are often (illegally) taken as pets and many get injured on the roads. These tortoises are confiscated by 'Cape Nature' and generally passed to sanctuaries as they cannot be released back into their natural habitat for fear of unknown pathogens which may seriously affect the wild tortoises. Monkeyland has been home to rescued mountain tortoises for many years. The primates have always co-existed peacefully with the tortoises, which roam freely through the forest and regularly feed off fallen food from the feeding platforms. They are on occasion the object of curiosity by capuchins and Hamilton has observed the capuchins sniffing, poking and slapping sleeping tortoises. Since Monkeyland opened in 1998 there have been no other observed instances of threatening or defensive behaviour directed by

monkeys towards a tortoise. The capuchins do, however, steal and eat the tortoises' eggs.

The incident shows that capuchin monkeys will spontaneously throw a stone hard enough to cause a potential competitor or threatening animal to move away. It also provides a new case of a capuchin using a stick to strike another animal in an aggressive/defensive context. Once again, we are reminded that capuchins use objects effectively and creatively to achieve a goal.

Acknowledgements

We would like to thank Tony Blignaut and Lara Mostert of Monkeyland for their permission to publish this report; Lara Mostert and Christian Schauerte for their invaluable assistance in identifying the capuchins involved and supplying their history.

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TWO CASE STUDIES USING PLAYBACKS TO CENSUS NEOTROPICAL PRIMATES: *CALLICEBUS DISCOLOR* AND *ALOUATTA PALLIATA AEQUATORIALIS*.

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A solid understanding of wild population status is needed to monitor biodiversity for conservation (Milner-Gulland & Rowcliffe, 2007), but as time and money are seriously limited in conservation projects, investigators should try to get accurate results whilst minimizing costs. The minimum number of observations required for accurate census results are often difficult to obtain (Marsden, 1999): species may behave cryptically and so are less audible and visible to those conducting surveys, or habitats can be densely vegetated with low visibility, increasing the effort required to achieve minimum number of observations. In order to increase detection in these circumstances, playbacks of conspecific calls have been used for a variety of Neotropical primate species. Playbacks have been used to determine the presence of primates (e.g. *Ateles fusciceps* Peck et al., 2011) and to estimate primate density using a combination of playbacks and distance sampling (e.g. *Callicebus discolor* Dacier et al., 2011), or strip transects (e.g. *Saguinus oedipus* Savage et al., 2010). Here we focus on the use of playbacks to estimate population densities, though some of the content will be of interest for those using playbacks to survey primate presence. We review the requirements to conduct playbacks censuses with Neotropical primates and present assessments of the utility of this method for two Ecuadorian species: red titi monkeys (*Callicebus discolor*) and Ecuadorian mantled howler monkeys (*Alouatta palliata aequatorialis*). We review the utility of playbacks for Ecuadorian mantled howler monkeys and compare the cost and time for three different census methods for red titi monkeys; line transects, passive point transects; and playback point transects.

Using playbacks in combination with distance sampling methods is relatively common in birds (e.g. Alba-Zúñiga et al., 2009), but has been slow to be adopted in primates. Distance sampling is the most widely used method to determine abundance and density of animal populations (Buckland et al., 2001), and is a popular method for sampling primates (Buckland et al., 2010). Censusing primates using distance sampling has been reviewed by Buckland et al. (2010) so will not be repeated here. Instead, we discuss the pre-census checks before using playbacks to determine which if any method, can be used to census a particular species.