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PREDATION OF BIRDS BY AN ENDANGERED PRIMATE SPECIES, *CALLICEBUS COIMBRAI*, IN THE BRAZILIAN ATLANTIC FOREST

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João Pedro Souza-Alves

The world faces a significant environmental crisis, in which continuous natural environments are being reduced to disturbed fragments (Ladle and Whittaker, 2011). Some species can take advantage of this process, but the majority of biodiversity is threatened by human activities (IUCN 2012). Ecological plasticity is regarded as a characteristic that favors species' survival when habitat becomes degraded (McKinney, 1997). Most primates have generalist diets and show some behavioral plasticity (Garber, 1987); however, current knowledge is concentrated on some well-studied species, while there is a lack of information for other primates.

Titi monkeys (*Callicebus* spp.) are regarded as primarily frugivorous primates, which complement their diets with invertebrate prey and other plant parts, such as leaves, seeds and flowers (Bicca-Marques and Heymann, 2013; DeLuycker, 2012; Heymann and Nadjafzadeh, 2013). These primates tolerate disturbed habitat (Heiduck, 2002; Jerusalinsky et al., 2006; Souza-Alves et al. 2011a) and it has already been suggested that titi monkeys might show some dietary plasticity. For example, Santos et al. (2012) report that *C. nigrifrons* can take advantage of temporarily available items, such as masting bamboos. Neri (1997) describes a male *C. personatus* driving a dove away from its nest and allowing the female to eat its egg. Souza-Alves et al. (2011) verified a high consumption of insects (i.e., caterpillar) during the dry season by *C. coimbrai*. However, up to now, there are no reports of titis preying on vertebrates.

Here, the predation of birds by one subadult *C. coimbrai* in a large fragment of Atlantic forest in the northeastern Brazil is reported. The observation appears to be the first record of predation of birds by *C. coimbrai* and by titis in general. The events were recorded at the largest fragment of the Mata do Junco Wildlife Refuge - MJWR (10°32'S, 37°03'W), which encompasses 522 ha of Atlantic Forest in the Northeastern Brazilian state of Sergipe, municipality of Capela, Brazil. Systematic monitoring of the *C. coimbrai* study group has occurred since 2011 until the present time (Chagas et al., 2013). Between January and March 2014

– when the event was recorded – quantitative behavioral data were collected in scan samples at 5-min intervals. On March 2014, when the event was observed, the study group was composed of a breeding pair, one subadult/adult, two juveniles and one infant.

On March 5th 2014, at approximately 14:50 h, one subadult *Callicebus coimbrai* was observed preying on a nestling Pale-breasted Thrush (*Turdus leucomelas*, Turdidae). The nest was localized among the branches and foliage at 3 m of height and fixed on a branch of a Guapira opposita tree. The titi monkey grabbed its prey with the right hand and started eating it one meter away from the nest. Two other individuals of *T. leucomelas* - probably the nestling parents - were observed vocalizing intensively nearby. Afterwards, one of the birds tried to mob unsuccessfully the titi away from its nest by attacking the titi's head. The birds continued vocalizing near the nest for approximately four minutes. The titi monkey seemed distressed with the approach of one MJWR employee and moved away from the area after dropping the rest of the nestling body to the ground (Fig. 1).

One day later, at approximately 10:30 h, the same individual was observed preying on another *T. leucomelas* nestling in the same nest. Once again, the titi held its prey with the right hand and ate it at the exact same place. The consumption of the prey lasted for approximately six minutes; meanwhile two *T. leucomelas* individuals flew and vocalized some eight meters away, without approaching the titi. After eating the nestling, the titi moved away from the area together with other group members. Curiously, one adult male of the same *C. coimbrai* group was also observed destroying abandoned nests on two occasions at Mata do Junco (JP Souza-Alves, pers. comm.) and during the monitoring in March 2014, the same individual of the records above was observed preying on eggs in the nest of an unidientified bird species (pers. obs.).

The predation of birds by primate species has been widely recorded in the literature. Marmosets (*Callithrix* spp.) were observed preying on bird eggs and nestlings of at least 15 species, including *T. leucomelas* (Mendes Pontes and Soares, 2005; Lyra-Neves et al., 2007; Begoti and Landsemann, 2008; Gomes and Lima-Gomes, 2011; Alexandrino et al., 2012). In addition, capuchins (*Cebus* spp.) were also observed preying on *Harpiprion caerulescens* and *Ictinia plumbea* (Olmos, 1990). Other birds, such as hawks, kites, toucans, and jays; arboreal snakes; and mammals, such as coatis, opossums, and primates are among the potential predators of bird eggs and nestlings in forest fragments (Morre and Robinson, 2004).

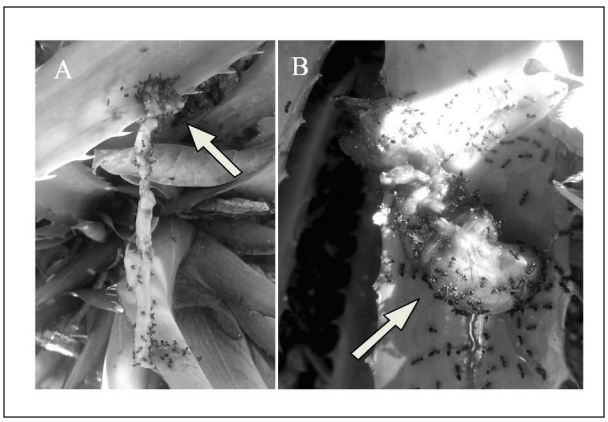

Figure 1. Photograph of the remains of two individuals of *Turdus leucomelas* preyed by *Callicebus coimbrai* at the Mata do Junco Wildlife Refuge.

In the literature, titi monkeys have been commonly regarded as prey of other vertebrates. For example, there are records of predation of *Callicebus* spp. by crested eagles (*Morphnus guianensis*, Terborgh, 1983), capuchin monkeys (*Cebus* spp., Sampaio and Ferrari, 2005; Lawrence, 2003), ocellot (*Leopardus weidii*, Bianchi, 2001; Bianchi and Mendes, 2007), *Boa constrictor* (Cisneros-Heredia et al., 2005), margays (Defler, 2004) and harpy eagles (*Harpya harpyja*, de Luna et al., 2010). Nest predation can negatively impact bird richness and diversity (Argel de Oliveira, 1995); however, given its rarity, predation of birds by titis seems likely to have little effect on bird populations.

The study group have a diet based mainly on fruits and vegetative plant parts (Chagas et al., 2013), which is typical for the genus (Bicca-Marques and Heymann, 2013). However, there are two possible explanations for the absence of other reports of bird predation by titis. Firstly, other titi groups may also prey opportunistically on birds, but this may not have been observed by other researchers given the rarity of these events. Secondly, bird predation may be a response of the study group to habitat degradation. Both potential explanations highlight the possible plasticity and opportunism of titis monkeys, and help our understanding of the persistence of these monkeys in highly degraded landscapes, such as the Atlantic Forest of Northeastern Brazil.

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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