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Authors: Vinhas, Luana, and Souza-Alves, João Pedro

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## BIRD PREDATION BY AN ENDANGERED PRIMATE SPECIES, *CALLICEBUS COIMBRAI*, IN THE BRAZILIAN ATLANTIC FOREST

Luana Vinhas  
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 that 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 been suggested already 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 synchronous production of seed bamboo (=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.* (2011b) verified a high consumption of insects (i. e., caterpillars) during the dry season by *C. coimbrai*. However, up to now, there are no reports of titis preying on vertebrates.

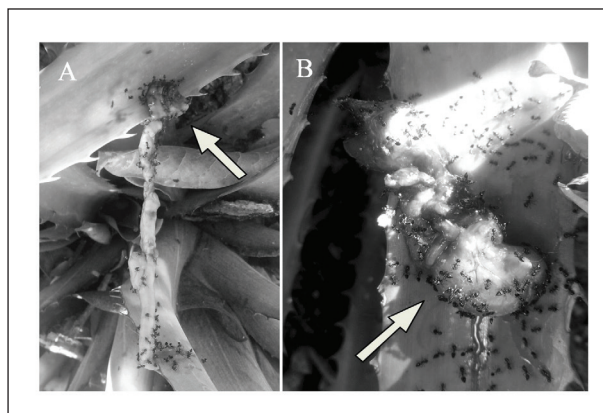
Here, we report bird predation by one subadult *C. coimbrai* in a large fragment of Atlantic forest in the northeastern Brazil. The observation appears to be the first record of predation of birds by *C. coimbrai* and by titis in general. The events occurred in the largest fragment of the Mata

do Junco Wildlife Refuge - MJWR (10°32'S, 37°03'W), which encompasses 522 ha of Atlantic Forest in the municipality of Capela, state of Sergipe, in northeastern 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. In March 2014, when the events were observed, the study group was composed of a breeding pair, one subadult/adult, two juveniles and one infant.

## Results

On March 5<sup>th</sup> 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 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 1 m away from the nest. Two other individuals of *T. leucomelas* – probably the nestling parents – were observed vocalizing intensely nearby. Afterwards, one of the birds tried unsuccessfully to drive 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 around and vocalized some 8 m 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 observed



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

destroying abandoned nests on two occasions at Mata do Junco and during the monitoring in March 2014, the same individual of the records above was observed preying on eggs in the nest of an unidentified bird species.

## Discussion

The predation of birds by primate species has been recorded widely 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 (*Sapajus* spp.) were also observed preying on *Harpiprion caerulescens* and *Ictinia plumbea* (Olmos, 1990) and specifically *S. apella* was observed in 24 predation events (Ferreira *et al.*, 2002). Woolly monkeys captive (*Lagothrix lagotricha*) has been recorded preying birds in 15 events (Stearns *et al.*, 1988). Estrada and Estrada (1977) have recorded bird predation by stump-tail macaques (*Macaca arctoides*) and, also chimpanzees (*Pan troglodytes schweinfurthii*) preyed 15 birds species or their eggs at Mahale Mountains, Tanzania (Nishida and Uehara 1983). 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).

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 (*Sapajus apella*, Sampaio and Ferrari, 2005; *Cebus* spp., Lawrence, 2003), ocelot (*Leopardus pardalis*, Bianchi, 2001; Bianchi and Mendes, 2007), *Boa constrictor* (Cisneros-Heredia *et al.*, 2005), margay (*Leopardus wiedii*, DeFler, 2004) and harpy eagles (*Harpy 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. First, 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 titi 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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**Luana Vinhas**, Universidade Católica do Salvador. Av. Prof. Pinto de Aguiar, n° 2589, Pituacu, CEP 41740-090, Salvador, Bahia, Brazil, and **João Pedro Souza-Alves**, Universidade Federal de Sergipe, Departamento de Ecologia, Cidade Universitária Prof. José Aloísio de Campos, Av. Marechal Rondon, s/n Jardim Rosa Elze, CEP 49100-000. São Cristóvão, Sergipe, Brazil. E-mail: < souzaalves1982@gmail.com>.

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