them to spend much time digesting large amounts of low-quality plant material, making them more sedentary and less socially active than many other species (Baldwin and Baldwin, 1978). Our results show a clear difference in the activity budget and tail-use of immatures and adults. While playing, immatures exhibited a wide range of tail-use but most often hung only by their tails. This confirms previous findings that as howler infants mature into more skillful juveniles, they spend more time playing while hanging by the tail, which allows them to grapple with a play partner from any angle with less effort than a sitting animal expends (Baldwin and Baldwin, 1978). Their play allows young howlers to gain motor and behavioral experience that may later be helpful for hanging from small branches while they eat and for learning how to use their tails efficiently for other purposes, such as locomotion, resting, or sleeping.

While feeding, juveniles hung by their tails more often than adults, but showed less tail-use overall. The former result agrees with findings by, for example, Bicca-Marques and Calegaro-Marques (1993), who recorded that smaller individuals use an extended reach gained by hanging more often, making them more competitive with larger individuals. On the other hand, immatures often failed to use their tails more than adults, especially when traveling or resting. One might think that inexperienced young howlers would be cautious, and so use their tails for extra support and security. Their low rate of tail-use may be because immatures are uncertain as to what they can do with their tails, while still acquiring behavioral experience and knowledge.

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Predation of a Bearded Saki (*Chiropotes utahicki*) by a Harpy Eagle (*Harpia harpyja*)

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The predation of primates is rarely observed in the wild (Cheney and Wrangham, 1987; Stanford, 2002). The main predators are birds of prey (Eason, 1989; Sherman, 1991; Julliot, 1994; Vasquez and Heymann, 2001), reptiles (Corrêa and Coutinho, 1997; Burney, 2002; Gursky, 2002; Tello *et al.*, 2002; Ferrari *et al.*, 2003), and an array of predatory mammals (Stanford, 1989; Peetz *et al.*, 1992; Tsukahara, 1993; Condit and Smith, 1994; Wright *et al.*, 1997). According to Stanford (2002), primate males tend to be preyed upon more often than females. The predation of females and young has been recorded by Corrêa and Coutinho (1997), Vasquez and Heymann (2001), Burney (2002), and Ferrari *et al.* (2003). Here we report on the predation of an adult male bearded saki (*Chiropotes utahicki*) by a harpy eagle (*Harpia harpyja*) in the eastern Amazon. A necropsy was carried out, which provided additional information about the animal and clues as to the exact cause of death.

The attack took place at the Estação Científica Ferreira Penna (ECFPn), Melgaço, Pará (01°42'30"S, 51°31'45"W), an area of 33,000 ha in the Caxiuanã National Forest. The incident was observed during a mammal survey being conducted by two researchers, each walking simultaneously on parallel paths 200 m apart in a 100-ha plot (#4) (01°45'13"S, 51°31'15"W), one of the Tropical Ecology, Assessment and Monitoring (TEAM) Initiative monitoring sites at Caxiuanã (Fig. 1).
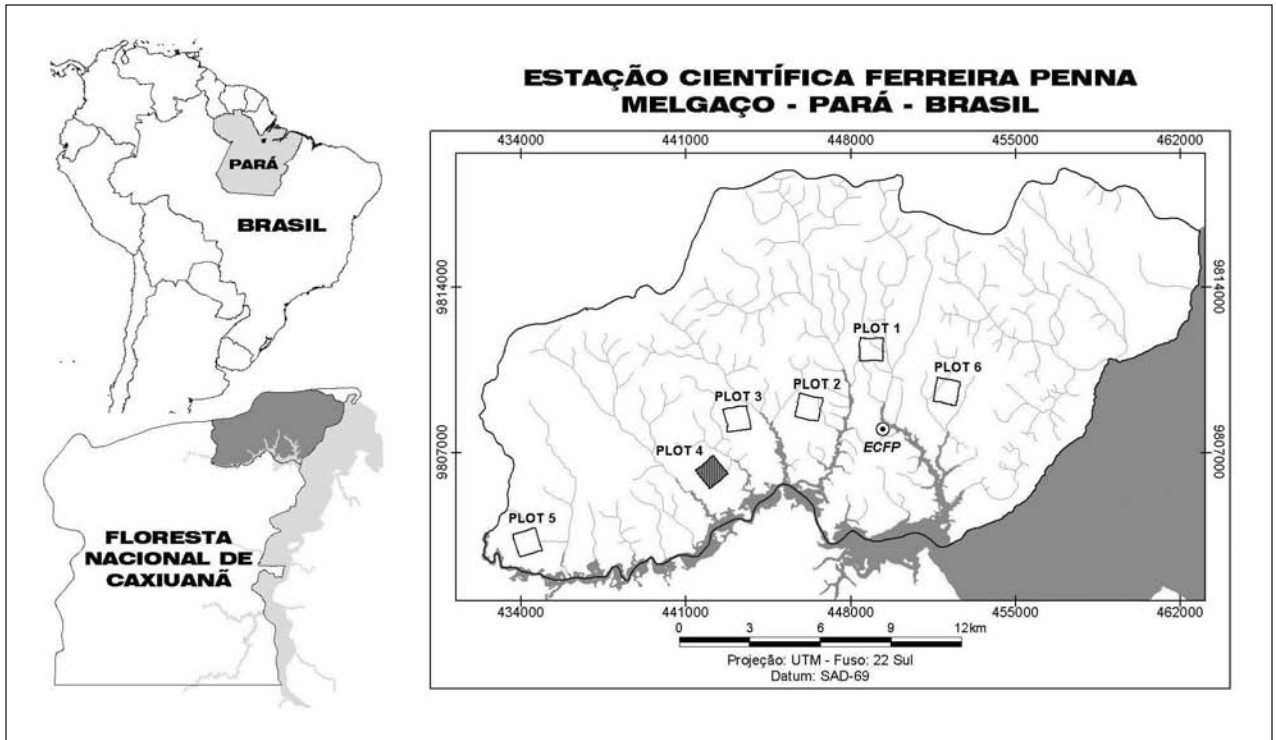
Figure 1. The plots of the TEAM Initiative in the Estação Científica Ferreira Penna. Plot 4 is where the harpy eagle attack occurred.

On 18 April 2004, at 14:50, one of the researchers (SSM) located a group of more than twelve bearded sakis. Only minutes later the group was attacked by a harpy eagle. The group was moving away when it happened, and, as is the case of most recorded attacks on primates, there was intense long-calling by all of the group members, who subsequently scattered over 200 m from the site of the attack. Minutes after the start of the vocalizations, the second researcher (EML) on the parallel trail saw two adults, one of them female, move towards her in the canopy and then descend a liana to the ground. The sakis ran silently about 30 m straight towards her, bounding (synchronized movements of the front and the back legs) with their tails held upright. Their fur was fluffed up (piloerection), and even when they saw the researcher about 10 m away, they ran on without changing direction.

After the attack, the harpy eagle noticed the presence of the first researcher (SSM), flew about 40 m with a saki in its claws, but then dropped it from a height of about 10 m. The entire incident lasted about four minutes. The saki, an adult male of 3.5 kg, was found dead on his back beside a fallen tree, with his arms folded and hands tightly fisted, clutching some feathers, which indicated that his demise had not been instantaneous. The muscles of the saki's mouth were contracted in a grimace, and its tongue was forced between its left canines and premolars. Nearby we found a bush about 2 m high with a broken branch and some of the eagle's feathers, indicating a struggle.

The attack took place in a stretch of quite open primary forest with a sparse, broken canopy at about 40 m. Spacing between the uppermost branches enabled good light pen-etration and visibility. Although it was the rainy season, the temperature was approximately 30°C, and it was dry. These conditions, we believe, favored the eagle's attack.

Four other primates have been recorded in the area of this TEAM site: the silvery marmoset (*Mico argentatus*), the black-handed tamarin (*Saguinus niger*), the tufted capu-chin (*Cebus apella*), and the red-handed howling monkey (*Alouatta belzebul*). While some have been the subject of previous field research (Jardim, 1997; Veracini, 1997, 2002; Bobadilla, 1998; Pinna, 1999; Souza, 1999; Tavares, 1999; Martins *et al.*, 2005), this is the first incidence of primate predation recorded there.

The bearded saki was taken to the field station laboratory, its biometric measurements were taken, and we tried to assess the way it had been captured. A necropsy was performed in order to ascertain the cause of death, and it was later taxider-mized and placed in the collection of the Museu Paraense Emílio Goeldi (MPEG – 36084). The wounds consisted of punctures and both superficial and deep cuts. The superfi-cial wounds broke only the epidermis, the dermis, and the hypodermis, but the deep ones affected the muscle tissue. The superficial punctures were in the abdomen and on the dorsum and right flank of the thorax. The deep perfora-tions were in the left ventral thoracic region and abdomen and had provoked internal hemorrhaging. Nine internal organs were perforated. Superficial cuts were also found on the right side of the braincase and on the back of the right forearm. Deep cuts were found on the central crown of the skull (between the cerebral hemispheres), which had caused encephalic cranial traumatism with internal and external hemorrhaging. As no other organs were affected and no

Figure 2. The adult male bearded saki, *Chiropotes utahicki*, killed by the harpy eagle. Note the feathers still in the hands.

bones of the postcranial skeleton were broken, the cerebral wounds would seem to have been the cause of death and were probably caused by the beak.

Apart from the recent wounds, we also observed old, darkened scars resulting from perforations, along with a broken articulation (held together only by skin) between the proximal and middle phalanges of the little finger on the left hand. The distal phalanx of the indicator finger on the left hand was missing. These findings may have been wounds from fighting other males in the group.

According to Stanford (2002), adult males are preyed upon more frequently than other sex-age classes, probably because they are generally larger and as such, are more obvious targets. In many species, adult males position themselves strategically to defend the group. During an attack, they may try to distract or confront the predator so that the rest of the group can disperse and escape; therefore, they are more exposed and vulnerable (Cheney and Wrangham, 1987; Gursky, 2002; Tello *et al.*, 2002).

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The Near Extinction of a Population of Northern Muriquis (*Brachyteles hypoxanthus*) in Minas Gerais, Brazil

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Introduction

The muriqui (*Brachyteles*) is the largest Neotropical primate and the largest mammal endemic to Brazil (Fonseca *et al.*, 1994). It is restricted to the southeastern Atlantic Forest where forest destruction is widespread and human activities inimical to wildlife are intense. Its populations are threatened by habitat destruction and fragmentation and, despite prohibitions, there is still hunting in this region of Brazil (Mittermeier *et al.*, 1982, 1987, 1989; Mittermeier and Konstant, 1990; Auricchio, 1997; Cosenza and Melo, 1998).

Adult male and female muriquis can weigh up to 12–15 kg (Aguirre, 1971). Their original range extended from the southern part of the state of Bahia to southern São Paulo (25°S), including the states of Espírito Santo, Minas Gerais, and Rio de Janeiro (Aguirre, 1971; Strier, 1992; Strier and Fonseca, 1996-1997). Muriquis also occur in northern Paraná (Martuscelli *et al.*, 1994). Aguirre (1971), who conducted the most complete survey of the muriqui's distribu-

tion, considered their preferred habitat to be primary and secondary forests between 600–1,800 m above sea level.

Despite the well-documented growth of the muriqui population at the Estação Biológica de Caratinga in the Feliciano Miguel Abdala Private Natural Heritage Reserve (RPPN-FMA) (see Strier *et al.*, 2002) and recent discoveries of some new populations (see Melo *et al.*, 2002; Chiarello *et al.*, 2005), the northern muriqui, *B. hypoxanthus*, is classified as Critically Endangered on the *IUCN Red List of Threatened Species* (IUCN, 2004). All known populations are small and occur in isolated forest fragments. One of the smallest inhabits the 42-ha forest at Fazenda Esmeralda (FE), in Rio Casca, Minas Gerais.

In his visit to the Fazenda Esmeralda in 1964, Aguirre (1971) estimated 7–8 individuals surviving there. Subsequent studies of this population over a 20-year period, from 1983 to 2003, recorded an increase to a maximum of 18 individuals, followed by a subsequent and steady decline (Fig. 1). As of June 2003, there were only three muriquis remaining, two adult males and an adult female, all three of them old. This population is not considered to be viable over the long term. We report here on a survey of primates in the forest fragments in and surrounding the Fazenda Esmeralda.

Study Site and Methods

Study site
Fazenda Esmeralda (FE) is about 30 km north of the town of Rio Casca, Minas Gerais, at 20°04'16"S, 42°44'22"W (Fig. 2; Location number 1). The forest is seasonal semideciduous and surrounded by farmland and pasture. The climate is tropical humid according to the classification of Köppen (Gilhaus, 1986, cited in Stallings and Robinson, 1991). The peak rainy months are from November to February, and
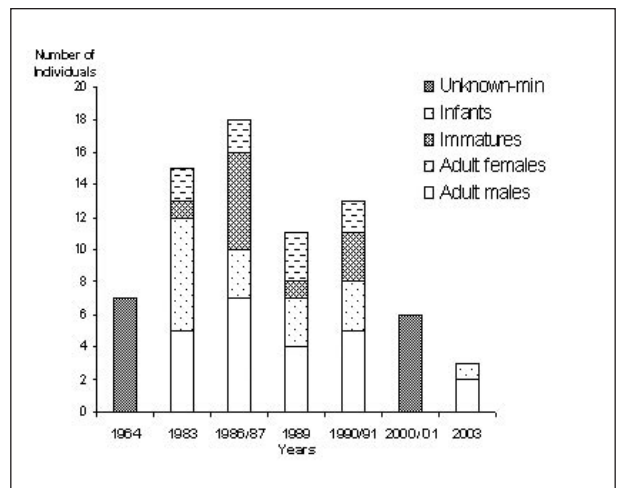

Figure 1. Size and composition of the muriqui population at Rio Casca, Minas Gerais. Sources are as follows: 1964 (Aguirre, 1971); 1983 (Fonseca, 1985); 1986/87 (Lemos de Sá, 1988); 1989 (Brozek, 1991); 1990/91 (Andrade, 1996); 2000/01 (S. L. Mendes, pers. comm.); 2003 (this study). With kind permission of Karen B. Strier.