



## Antipredator Behavior of Brown Howlers Attacked by Black Hawk-eagle in Southern Brazil<sup>1</sup>

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*In field studies between 2002 and 2004 in southern Brazil, we recorded antipredatory behaviors (N=9) of brown howlers (*Alouatta guariba clamitans*) under attack by the black hawk-eagle (*Spizaetus tyrannus*). We observed 2 types of behavioral responses: the descent to the understory followed by the dispersion of the group and immobility and silence. Brown howlers displayed behaviors specific to evading aerial predators, which are similar to the ones in other Neotropical primates.*

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**KEY WORDS:** *Alouatta guariba clamitans*; Araucaria Pine Forest; *Spizaetus tyrannus*.

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### INTRODUCTION

Although records of predation events on Neotropical primates are rare, the existence of antipredator behaviors indicates that the primates might not be free from their potential predators (Galetti, 1996; Heymann, 1990; Miranda *et al.*, 2005; Stanford, 2002; Treves, 1999). Galetti (1996) described several antipredator behaviors for *Alouatta guariba* such as escape, excretion, and distraction by adult male and deimatic displays. It is unlikely that enough generations have passed for the howlers to lose their instinct to

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respond to potential predators, even if predators are now absent from their habitat.

Several falconiforms prey on primates: harpy eagle (*Harpia harpyia*), crested eagle (*Morphnus guianensis*), ornate hawk-eagle (*Spizaetus ornatus*), and black hawk-eagle (*S. tyrannus*) (Defelr, 2004; Gilbert, 2000; Heymann, 1990; Julliot, 1994; Sherman, 1991; Sick, 2001; Vasquez and Heymann, 2001). *Spizaetus tyrannus* is a large-bodied Acciptridae that flies above the canopy, preying on rodents, bats, birds, lizards, snakes, and primates, which one can capture either on the ground or in trees (Sick, 2001).

We describe the antipredatory behavior of *Alouatta guariba clamitans* under attack by *Spizaetus tyrannus*, given that such a record is scarce in the literature (Heymann, 1990).

## STUDY AREA AND METHODS

We conducted the study in the Center for Environmental Education and Support for Research of the Chácara Payquerê, in the District of Bugre, Municipality of Balsa Nova, State of Paraná, Southern Brazil (25°29'52''S and 49°39'24''W). The vegetation in the area belongs to the Araucaria Pine Forest biome, and is part of the Environmental Protection Area of the Devonian Scarp. We recorded antipredatory behavior in brown howlers in a field book *ad libitum* (Altmann, 1974).

## RESULTS AND DISCUSSION

We observed brown howlers since February of 2002 (Miranda, 2004; Miranda and Passos, 2004, 2005) for a total of 1376 h. We recorded 9 possible predation attempts by *Spizaetus tyrannus* on howlers either by 1 ( $N=6$ ) or 2 ( $N=3$ ) hawk-eagles (Table I). We observed 2 types of responses of howlers under attack by the black hawk-eagle: the descent to the understory followed by the dispersion of the group and immobility and silence.

Black hawk-eagles forage via flights above the forest canopy which, in the case of assaults on brown howlers, they follow with a fast dive into the canopy using agile maneuvers, at times reaching the understory.

Black hawk-eagles usually attacked when brown howlers performed long calls ( $N=6$  of 9 observations; *sensu* Oliveira, 2002), which possibly facilitated their localization by the raptors. During long calls, when a member of the group noticed the approach of *Spizaetus tyrannus* because of an undetermined vocalization, the individual alarmed the rest of the group, which abruptly ceased to vocalize, descended to the

**Table I.** Behavioral interactions between brown howler monkeys and black hawk-eagles

	Antipredator behavior	Behavior of howlers before attack	Black Hawk-eagle attack	Behavior of Howlers after attack
1	Descent to the understory and dispersion	Long calling (all group)	Dive through the canopy until reaching the understory (two hawk-eagles)	Foraging
2	Descent to the understory and dispersion	Long calling (all group)	Dive through the canopy until reaching the understory	Foraging
3	Descent to the understory and dispersion	Long calling (all group)	Dive through the canopy until reaching the understory (two hawk-eagles)	Foraging
4	Descent to the understory and dispersion	Long calling (all group)	Dive through the canopy until reaching the understory	Locomotion
5	Descent to the understory and dispersion	Foraging (all group)	Dive through the canopy until reaching the understory (two hawk-eagles)	Foraging
6	Descent to the understory and dispersion	Locomotion (all group)	Dive through the canopy until reaching the understory	Locomotion
7	Descent to the understory and dispersion	Long calling (all group)	Dive through the canopy until reaching the understory	Foraging
8	–	Long calling (two adult males)	Fly in circles and go away (two hawk-eagles)	Long calling (two adult males)
9	Immobility and silence	Resting (all group)	Land on a neighboring tree	Resting

understory, and dispersed in different directions. We observed the descent and dispersion response 7 times. The behavior differed from the usual slow and gradual decrease in vocalizations in brown howlers. Contrarily, when howlers flee from a terrestrial threat, e.g., humans, dogs, felids, the usual response is to ascend to the canopy and to remain still for 5–15 min to avoid detection. When howlers are even more distressed, they escape in a more organized fashion, roughly forming a line, such that an adult individual travels ahead of the group. Occasionally the escape involves a strategy of distraction by an adult male (mobbing) while other members of the group escape. Galetti (1996) described various forms of escape and distraction. We describe the descent and dispersion behavior in *Alouatta guariba clamitans* for the first time; it corresponds to behavior Heymann (1990) observed in *Saguinus fuscicollis* and Defelr (2004) in *Cebus albifrons*.

Another manifestation of antipredatory behavior was immobility and silence, which we observed after the interruption of long calls. On 1 occasion, we observed a group of howlers resting on the dense canopy of a tree at about 25 m above the ground, and a black hawk-eagle landed on a neighboring tree. The predator landed successively on 3 different branches, getting closer to the tree with the howlers. However, the eagle was ca. 3 m above the howlers and apparently failed to locate them because they remained motionless. The howlers showed signs of increased alertness when the eagle landed close to them.

On another occasion, when only 2 adult male *Alouatta* were present (vocalizing at each other), a *Spizatus tyrannus* flew low above them. Even though the males apparently detected the hawk-eagle, as they stopped vocalizing momentarily, they apparently ignored it afterwards. The black hawk-eagle circled the area twice and then left, which might indicate that it poses a threat only to juveniles or other small individuals. The results of Treves *et al.* (2003) are consistent with the hypothesis, showing a negative correlation between infant age and the mother's vigilance time. Conversely, vigilance decreased when the young individual was close to adult males, indicating that the infant would be safer against predation.

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