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## ANTHROPOGENIC CHANGE AND PRIMATE PREDATION RISK: CRESTED CARACARAS (*CARACARA PLANCUS*) ATTEMPT PREDATION ON MANTLED HOWLER MONKEYS (*ALOUATTA PALLIATA*)

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### Introduction

Anthropogenic change in primate habitats may be an important factor in predation risk. Predation is often considered a principle selective pressure in primate evolution, and thus an important determining factor for grouping behavior, travel patterns, and choice of sleeping sites (van Schaik, 1983; Isbell, 1994; Treves, 2002; Shultz *et al.*, 2004). Predation events are rarely witnessed in the wild due to their rarity, short duration, and the effects of observer presence. Reports of failed predation attempts or even the absence of predation events (Boinski *et al.*, 2000) will broaden our understanding of this important issue. With our currently limited scope on primate predators and risk factors, we may be missing the impact of human habitat alteration on predation risk and rates. This paper reports a presumed predation attempt by two crested caracaras (*Caracara plancus*) on infant mantled howler monkeys (*Alouatta palliata*) in Costa Rica. Crested caracaras are generally associated with human activity

(Rodríguez-Estrella *et al.*, 1998; Morrison & Humphrey, 2001), suggesting that habitat disturbance at this site may alter predation risks for these monkeys.

Large-bodied, arboreal howler monkeys should have fewer potential predators than many other primate genera (Di Fiore, 2002). Researchers have confirmed predation by jaguar (Peetz *et al.*, 1992; Chinchilla, 1997), puma, *Puma concolor* (Chinchilla, 1997; Ludwig *et al.*, 2007), ocelot, *Leopardus pardalis* (Miranda *et al.*, 2005; Bianchi & Mendes, 2007) and harpy eagles, *Harpia harpyja* (Sherman, 1991) on wild howler monkeys. Predation attempts by black hawk-eagles, *Spizaetus tyrannus* (Miranda *et al.*, 2006), crested eagles, *Morphnus guianensis* (Julliot, 1994), and tayras, *Eira barbara* (Phillips, 1995; Asensio & Gómez-Martín., 2002) are also reported in the literature. While incidences of snake predation on Ateline primates have not been documented, large snakes may also be considered a potential threat to juvenile howlers because they prey on many other Neotropical primates (Di Fiore, 2002). Birds are the most common predators for many monkey species, both in the Old and New Worlds. Only a few Neotropical birds, including the Harpy eagle (*Harpia harpyja*), the crested eagle (*Morphnus guianensis*), and the hawk eagle (*Spizaetus* spp.), are believed large enough to capture adult Atelines (Julliot, 1994; Miranda *et al.*, 2006). Infant howler monkeys, however, are certainly reasonably sized prey for many Neotropical raptors (Di Fiore, 2002).

In the observed incident, an apparent predation attempt on infant howler monkeys (*Alouatta palliata*) was made by two crested caracaras (*Caracara plancus*). The crested caracara ranges from the southern United States to Tierra del Fuego and the Faulkland Islands (Travaini *et al.*, 2001; Henderson, 2002; Vargas *et al.*, 2007). It is a medium-sized raptor in the falcon family (Falconidae), weighing approximately 1 kg and with a wingspan of 120–130 cm (Henderson, 2002). While they are mostly known as a scavenging species, caracaras are opportunistic hunters that feed on a variety of invertebrate and vertebrate prey (Travaini *et al.*, 2001; Vargas *et al.*, 2007), and may in fact consume more fresh meat than carrion (Richmond, 1976). Mammals account for nearly one quarter of crested caracara prey (Vargas *et al.*, 2007). Although the majority of mammalian preys are rodents, caracaras are known to prey on larger animals, such as skunks and young rabbits (Henderson, 2002). While caracaras are not confirmed predators on even small monkeys, a taxidermized caracara did elicit alarm responses from captive marmosets (*Callitrhix penicillata*) in an experimental setting (Barros *et al.*, 2002). Caracaras are particularly suited to act as active predators of monkeys in anthropogenic environments yet pose relatively little risk in more forested habitats. As open-habitat species (Morrison & Phillips, 2000), caracaras thrive in areas with little tree cover, such as natural clearings and man-made pastures. They are highly tolerant of human activity, and are often found hunting and scavenging on farms or along roadways (Rodríguez-Estrella *et al.*, 1998; Morrison & Humphrey, 2001). Like many open-area raptors, caracaras seek out fragmented habitats, using the forest cover for nesting while hunting in the fields (Rodríguez-Estrella *et al.*, 1998; Sánchez-Zapata & Calvo, 1999). Habitat changes that favor caracara activity may place local wildlife confined to narrow forest fragments at risk of heavy predation (Morrison & Phillips, 2000).

## Study Population and Observation

The observed event took place at the Refugio Nacional de Vida Silvestre Curú, a 1,500 ha private "hacienda" and wildlife refuge in western Costa Rica (9°47'43"N, 84°55'15"W) (for a complete description of the site see Baker & Schutt, 2005). The incident was witnessed during data collection of a long-term project concerning the impact of human disturbance on mantled howler monkey (*Alouatta palliata*) and white-faced capuchin (*Cebus capucinus*) ecology and social behavior. Curú is an ideal site for such studies, as it incorporates a variety of man-made and natural habitats including primary and advanced secondary forest, mangrove swamp, mango, banana, coconut, and African oil palm plantations, and open pastures with living fences. The refuge has a high density of howler monkeys, with some troops found in entirely anthropogenic habitats, others completely removed from human interaction, and many troops living in territories between these two extremes. The study troop of mantled howlers presented here ranges through riparian forest, living fences, mango and banana plantations, and secondary forest. The troop is fully habituated to human observers, and regularly encounters tourists, vehicles, and domestic animals. At the time of this observation, the troop consisted of 30 individuals—5 adult males, 16 adult females, and 9 immatures. Comparable troop sizes are common at Curú; the relevance of such large groups at this site is not yet clear. The events were recorded through *ad libitum* observation and continuous focal animal samples (Altmann, 1974) and were witnessed by two researchers and two volunteers.

The interaction with the caracaras took place at approximately 8:25 am on December 12, 2007. The monkeys were traveling and foraging through a strip of riparian forest between a cattle pasture and a dirt road. Two females with small infants crossed a gap in the canopy on an exposed horizontal branch 12–15 meters in height and approximately 5 meters long. Such exposed areas are risky for arboreal primates (Isbell, 1994), and these females were traveling quickly and in the presence of an adult male. Both infants were riding dorsally and appeared 4–6 weeks of age. The two raptors approached across the open pasture as the females were in the center of the branch, and swooped at the monkeys. The birds did not make contact or land on the branch. Both females ducked as the birds passed overhead, then hurried along the branch to cover. The entire interaction lasted less than 30 seconds.

There were few overt anti-predator behaviors from the females or other troop members. Anti-predator behaviors in howler monkeys typically include descent and dispersion, vocalization, and grouping quietly high in the trees (Eason, 1989; Julliot, 1994; Phillips, 1995; Miranda *et al.*, 2006). In this incident, the nearest adult male howled for about 15 seconds shortly after the event, but a truck was passing at the same time, so it is unclear whether the vocalization was in response to the birds or to the motor. After the interaction with the caracaras, the troop continued to forage and settled down in the same area for their midday rest. A second observer recorded a single caracara flying through the trees at 12:36 pm. In this case, there were no interactions or responses from the monkeys. This is the only predation-related event observed for this monkey troop over a period of 491.25 hours of data collection. This represents a predation-related event rate of 0.002 events/hour. Even though the young howlers survived this interaction, caracaras should now be considered and monitored as a potential threat to infant monkey survival in edge habitats.

## Discussion

Anthropogenic change means much more than habitat loss for non-human primates. The effects of human disturbance are pervasive, impacting parameters like foraging patterns, social interactions, and predation. Seidensticker (1983) proposed a consideration of predation when discussing disturbance, noting that primate predation by big cats depends largely on the availability of livestock. In the 25 years since, little has been made of human alteration and predation, and the few reports that have considered the idea are contradictory. Some authors suggest that predation rates decrease with close proximity to humans (Isbell & Young, 1993; Stanford, 2002), while others point out that certain types of predation may be favorable in anthropogenic habitats (chimpanzees: Grieser Johns & Grieser Johns, 1995; leopards: Ludwig *et al.*, 2007). Domestic dogs are now reported in the literature as effective monkey predators (De Oliveira *et al.*, 2008; Raguet-Schofield, 2008), and some wildlife may seek out anthropogenic habitats as well. Certainly human factors impact predation, but the nature of the change will be site specific. While we cannot account for every impact human disturbance places on a primate community, it is important to realize that wild primates face different challenges than they would in the absence of human encroachment. Predation rates may be impacted in a number of ways, namely: (1) predators may be adverse to human altered habitats, reducing predation risk; (2) anthropogenic habitats may encourage certain predators, increasing predation risk; or (3) the predator assemblage of a habitat changes, with potentially drastic effects on endemic wildlife that lack the experience and selection-driven behavioral patterns necessary to avoid these predators. As primate habitats become increasingly anthropogenic, their predation risks — and potential predators — are bound to change.

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# Early Behavioral Development of a Free-Ranging Howler Monkey Infant (*Alouatta guariba clamitans*) in Southern Brazil

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## Introduction

In comparison with other mammals, the offspring of primates undergo a relatively long period of behavioral development and dependency upon their mothers. During this period, the mother is a secure base from which the infant is able to explore the environment and engage in social behavior (Vochteloo *et al.*, 1993), acquiring the ecological skills of the species and the social traditions of the family troop (Southwick and Siddiqi, 1974). Independence is the result of a long period of increasing self-sufficiency in activities such as locomotion and feeding, as well as growing sociability and distance from the mother (Altmann, 1980; Odalia-Rímoli, 1992). Mother-infant ties constitute one of the most intense types of social relationship in primates (Harlow and Zimmermann, 1958, Altmann, 1959), and have a positive effect on infant survival and development.

Howler monkeys (genus *Alouatta* Lacépède, 1799) are the most widely-distributed Neotropical primates (Chapman and Balcomb, 1998), and are also the best studied in the wild. They occupy a variety of habitat types, and are well-adapted to anthropogenic fragmentation (Crocket, 1998), although some species are declining rapidly in the wild and have been classified as threatened (IUCN, 2009). Howlers have been translocated and re-introduced at a number of