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Introduction

Tool use, the use of a free object in the environment as a functional extension of one's own body (Beck, 1980), has been reported in invertebrates, fish, birds, and mammals, including primates (Alcock, 1989). However, tool use is not common or widespread in nonhuman primates. It has been observed in a small number of species including chimpanzees, bonobos, gorillas, orangutans, some macaques and baboons, and capuchin monkeys (van Schaik *et al.*, 1999). Captive capuchin monkeys (*Cebus* spp.) were long reported to use tools in a variety of contexts (Visalberghi, 1990; Urbani, 1999). Recently, however, a growing body of evidence shows that semi-captive and free-ranging capuchins in several populations and species use tools, including the use of stones as hammers and anvils to crack and open nuts (Ottoni and Mannu, 2001; Fragaszy *et al.*, 2004; Moura and Lee, 2004; Waga *et al.*, 2006). Tool-making is a cognitively complex process that involves an intentional modification of the tool for improving its efficiency (Beck, 1980). Reports of non-human primate tool-making have been restricted to the great apes (Boesch and Boesch, 1990; Fontaine *et al.*, 1995; Tomasello and Call, 1997; Schick *et al.*, 1999; van Schaik *et al.*, 2003) with the exception of a few experimentally induced cases in captive capuchins (Westergaard and Suomi, 1994, 1995; Westergaard *et al.*, 1995). Here we report a case of spontaneous tool-making by a captive capuchin monkey.

Methods

A group of capuchin monkeys (*Cebus* sp.) composed of an adult male, two adult females and three immature males living in an enriched enclosure 7.0 m long × 8.7 m wide × 2.9 m high at the Sapucaia do Sul Zoological Park, State of Rio Grande do Sul, Brazil, was opportunistically (*ad libitum*) observed and video-taped in January and February 2007. The enclosure included sand on the floor, trees, stones, and perches for the monkeys. For enrichment purposes, food was concealed inside ice cubes, PVC pipes, and bags.

Results

On 12 January 2007, an adult female (putative *Cebus nigritus*) was observed banging a twig with a piece of stone against a larger stone, licking/chewing and likely extracting something from it with her mouth. She was then observed probing an unseen structure (probably a hole in the enclosure's drinking fountain) with the modified twig (Fig. 1). This sequence of events occurred very rapidly. The latency

Figure 1. Adult female capuchin monkey (putative *Cebus nigritus*) using a hammer stone and an anvil stone to pound on a twig that was then inserted into a crevice (photos from video frames).

Figure 2. Adult female using a stone to crack open an ice cube with food inside.

between the end of banging and the start of probing was 3 to 4 seconds, during which time the female moved from the banging site to the probing site. After this observation, the group was monitored for 15 days and no additional cases of tool-making were observed. The capuchins, however, often used stones as hammers to crack nuts and other foods, including ice cubes containing food (Fig. 2).

Discussion

Although we do not know what happened immediately prior to this behavioral sequence and could not see whether the female acquired anything as a result of probing, the speed at which this sequence of events occurred is highly suggestive of a causal understanding during object manipulation and seems to qualify as a case of spontaneous tool-making. Future research will focus on confirming the capuchin monkeys' capability to make tools, an ability that would suggest less cognitive difference than is presently thought to exist between capuchins and the great apes (Visalberghi, 1990, 1997; Urbani and Garber, 2002). In addition to suggesting that capuchin monkeys understand cause and effect relationships during object manipulation, these findings strengthen the argument that the maintenance of captive animals in enriched environments is an important strategy to allow the expression of the species' fullest behavioral repertoire. A previous study of the same group (200 hours during 2002–2003) in this enclosure, but with minimum enrichment (paved ground, a single swing and no feeding enrichment), failed to record any case of tool use (D.B. Montano, personal observation). Environmental enrichment serves an important function in improving capuchin monkeys' welfare by reducing boredom and eliciting tool use.

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Power Lines and Howler Monkey conservation in Porto Alegre, Rio Grande do Sul, Brazil

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Introduction

Urban growth affects ecosystems in several ways**,** leaving them more vulnerable (Alberti and Marzluff, 2004). In Porto Alegre, the combined effects of human presence including deforestation, hunting and other indirect effects are reducing howler's area distribution with consequences still unknown (Lokschin *et al.*, 2005). Human density within a primates' geographical area should be considered by the World Conservation Union (IUCN) in the evaluation of species status (Harcourt and Parks, 2003). The southern brown howler monkey (*Alouatta guariba clamitans*, Cabrera 1940) is considered an endangered species in Rio Grande do Sul (Marques, 2003); in Brazil and globally it is considered near threatened (Machado *et al.*, 2005; Rylands *et al.*, 2006).

There are many species of Neotropical primates living close to urban areas, including: *Alouatta clamitans* (Buss, 1996), *Alouatta caraya* (Codenotti *et al.*, 2002), *Callicebus nigrifrons* (Oliveira *et al.*, 2003), *Saguinus leucopus* (Poveda and Sánchez-Palomino, 2004) and *Saguinus bicolor* (Vasconcelos *et al.*, 2005). Problems and threats linked to urbanization, such as danger from vehicles when crossing roads, predation by dogs and electric hazard, are already documented for *A. clamitans* (Printes, 1999; Alonso *et al.*, 2005)*, C. jacchus* (Menezes, 2005) and *S. bicolor* (Vasconcelos *et al.*, 2005). Ecosystems close to urban areas are important for wildlife (Dickman, 1987) and measures must be taken to guarantee their existence. Howler monkeys (*A. g. clamitans*) utilize areas of forests close to urban developments and are suffering from contact with several electric hazards. Here we describe a way to mitigate the occurrence of such accidents around Porto Alegre.

Methods

Porto Alegre is the capital city of the state of Rio Grande do Sul, Brazil (Fig. 1), with a population of 1.4 million (IBGE, 2006). Approximately 10% of the municipal area is natural semi-deciduous seasonal forest, influenced by Atlantic rainforest (Brack *et al.*, 1998; Velez *et al.,* 1998). The southernmost area of the municipality (Fig. 2) is a rural landscape containing a number of small villages. The most important natural areas are also in this zone, which is also the most important area for howler monkeys (*Alouatta guariba clamitans*) (Romanowski *et al.*, 1998; Lokschin *et al.*, 2005). Lami Biological Reserve, the only biological