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neotropical primates in "Chapter XXV. On the little monkey cats" (*Capítulo XXV. De los Gatos Monillos*). In this, he described how monkeys throw objects such as branches and stones at the "Christians", and recounts their variety in colors and shapes, from ones as small as a human hand to some as large as a Great Dane (Fernández de Oviedo, 1996). He also reported that monkeys use tools as follows "Some of these cats (monkeys) are so astute that many things they see men do, they imitate and also do. In particular, there are many that when they see how to smash a nut or a nutpine with a stone, do it in the same way and, when leaving a stone where the cat (monkey) can take it, smash all that are given to them. They also throw a small stone, of the size and weight of their strength, as would be thrown by a man" [*Algunos de estos gatos (monos) son tan astutos, que muchas cosas de las que ven hacer a los hombres, las imitan y hacen. En especial hay muchos que así como ven partir una almendra o piñón con una piedra, lo hacen de la misma manera, y parten todos los que les dan, poniéndole una piedra donde el gato (mono) la pueda tomar. Asimismo tiran una piedra pequeña, del tamaño y peso que su fuerza basta, como la tiraría un hombre*] (Fernández de Oviedo, 1996).

This is probably the first report (1526) of tool use by New World monkeys. Since Fernández de Oviedo traveled mainly in the Darien region, it would seem likely that the specific reference could have been to *Cebus capucinus*, a neotropical primate of a genus with the greatest potential to manipulate objects. This historic occurrence agrees with recent known examples of tool use by *Cebus* in the wild, including that of Fernandes (1991) to open oysters, and nut-cracking using stones reported by Langguth and Alonso (1997), and specifically for *Cebus capucinus*, with the use of stones to open oyster shells by J. Hernández-Camacho and R. Cooper (in Moynihan, 1976), the use of a club against a snake (Boinski, 1988), and the recent report of object-use for extractive foraging (Panger, 1998).

Bernardo Urbani, Escuela de Antropología, Universidad Central de Venezuela (UCV) and Departamento de Antropología, Instituto Venezolano de Investigaciones Científicas (IVIC). *Address for correspondence:* Apartado 47.028. Caracas 1041-A. Venezuela. Tel/Fax: (+58 2 987 0621, e-mail: <urbani@cantv.net>.

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AN EARLY REPORT ON TOOL USE BY NEOTROPICAL PRIMATES

Bernardo Urbani

Some of the early reports of tool use in *Cebus*, dating from the 18th and 19th Century, were summarized by Visalberghi (1990). Here I bring attention to probably the earliest report of such behavior, coming from the writings of Gonzalo Fernández de Oviedo y Valdés (1478-1557), born in Madrid, Spain. He first arrived in the New World with the expedition of Pedrarias Dávila (Miranda, 1996) and lived mainly in the Darien region (today Panama and northwestern Colombia). For his services to the Spanish Crown, Fernández de Oviedo was appointed Chronicler of the Indies by King Carlos V, who ordered him to "rest and write". This was a satisfactory arrangement for Fernández de Oviedo who in his retreat in Santo Domingo (today the Dominican Republic) occupied his time writing the "General and Natural History of the Indies" (*Historia General y Natural de Indias*), the first part of which was published in 1535 (Miranda, 1996).

Another, poorly known but no less important, work of his, the "Summary of the Natural History of the Indies" (*Sumario de la Natural Historia de las Indias*), was also written by order of King Carlos V, who requested a book on zoological and botanical aspects of the New World. The first edition was published in Toledo, Spain, on 15 February, 1526, and contains one of the first accounts of

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VERTEBRATE PREDATION IN COMMON MARMOSETS

Leslie Digby
Cláudio Embirussu Barreto

Marmosets are sometimes characterized as "gumivores" or "gumivore-insectivores" (Rylands and de Faria, 1993). This is a fitting description given that some species may spend as much as 70% of their feeding budget on gums and maintaining tree gouges (*Callithrix penicillata*; Fonseca and Lacher, 1984, *C. jacchus*; unpubl. data). Similarly, marmoset species spend between 24-30% of their overall activity budget foraging for insects (Rylands and de Faria, 1993). However, in addition to these key food items, marmosets exploit a wide variety of different food sources, including fruits, seeds, flowers, fungi, nectar, spiders, snails, and vertebrate prey (Stevenson and Rylands, 1984; Ferrari *et al.*, 1996). It is the ability to adopt an opportunistic and varied diet that, in part, allows marmosets to survive in such habitats as the highly unpredictable *caatinga* (dry thorn scrub) and *cerrado* (bush savanna), in addition to rich coastal and Amazonian forests.

Here we focus on the role of vertebrate prey in the diet of the common marmoset (*Callithrix jacchus*). Three common marmoset groups were studied for a total of 36 "group-months" at EFLEX-IBAMA, an experimental forestry station at Nísia Floresta, Rio Grande do Norte, Brazil. Two groups occupied ranges in a 70 ha Atlantic forest reserve, while the third lived in a plantation area. Data were collected using both 30-minute focal-animal samples (during periods when there were no infants less than 2 months old) and all-day scan sampling using a 5-minute interval (when infants were present). Rare behaviors, including vertebrate predation, were recorded *ad libitum* (for details see Digby and Barreto, 1993).

Vertebrate predation was rare in common marmosets, resulting in less than 0.1% of all feeding records (0.6% of all animal prey records). Nevertheless, marmosets were seen eating a wide variety of vertebrate prey, including lizards (n = 1), tree frogs (n = 1), bird's eggs (n = 2 nests), nestlings (n = 1), and infant mammals (n = 1).

The predation of an infant mammal is of particular note as it is the only case reported, that I am aware of, in the wild. It was flesh colored, almost hairless, and estimated to have been 3-4cm long, not including its long tail, and was probably a rodent, but more specific identification was impossible as the head had already been consumed when first sighted. The remainder of the corpse was eaten within a couple of minutes of the first sighting. During the consumption of this prey item, other group members vocalized excitedly and tried, without success, to steal a part of the infant mammal for themselves. Though this is the first mammalian predation by a callitrichid reported for a free ranging marmoset group, at least three captive studies have noted that callitrichids will readily eat infant mice that are fed to them (*C. jacchus* - Stevenson and Poole, 1976; *L. rosalia*: Brown and Mack, 1978; *Callimico goeldii*: Heltne, 1981). Both the wild and captive marmosets eat the head of the prey item first. Craniocervical bites are the typical method of killing used by marmosets (and most mammals) to subdue relatively large prey (Steklis and King, 1978; pers. obs.).

The consumption of lizards and frogs is widespread among callitrichids (see Table 1), but the extent to which they are preyed upon varies between species. Neyman (1978) observed a single predation on a frog in 750 hours of observation of the cotton-top tamarin, *Saguinus oedipus*, and Yoneda (1984) recorded saddle-backed tamarins, *S. fuscicollis*, eating just one frog and one lizard over the course of six months. Similarly, lizards and frogs are only rarely eaten by common marmosets. Alonso and Langguth (1989) observed predation on lizards on three occasions over 13 months, and Maier *et al.* (1982) a single lizard predation during 100 hours of observation. In contrast, frogs and lizards constitute almost 16% of the animal diet of the buffy-headed marmosets, *C. flaviceps* (Ferrari 1988; n = 195 lizards and frogs over a 13 month period). Terborgh's (1983) study of tamarins in Peru indicates that interspecific variation in predation can occur even in sympatric species which presumably have similar access to prey items. He reported that 13% of the saddle-back tamarin diet was comprised of frogs and lizards compared to only 2% for the emperor tamarin, *S. imperator*. Stephen Ferrari (pers. comm.) is currently making a detailed analysis of interspecific variation in vertebrate predation by marmosets and tamarins.

The consumption of lizards, frogs, and small mammals appears to be rare and opportunistic in common marmosets. In contrast, the hunting of bird's eggs and nestlings, though also rare, appears to be more deliberate. Marmosets were seen on 10 different occasions to seek out and inspect bird nests (typically those of caciques, *Cacicus cela*, and kiskadees, *Pitangus sulphuratus*). On several occasions, one group member after another would approach and inspect a nest, sometimes manipulating openings in order to look inside. Kiskadees, caciques, gnat-catchers (*Poliioptila plumbea*), and other birds were observed mobbing marmoset groups on at least seven occa-