M. Luinstra, J.P. Cragg, E. Murillo-Chacón and M. L. Briceño for contributions in the field, and to G. Laird and G. Bridgett for technical support. We also acknowledge our funding sources: University of Calgary, Province of Alberta, Sigma Xi (KV), National Science Foundation Postdoctoral Fellowship (JAK), the Canada Research Chairs Program and an NSERC Discovery Grant (LMF). All research described in this study was conducted in accordance with the protocols approved by our university's animal care committees and all research adhered to the national laws of Costa Rica, where the research was conducted.

Kim Valenta, Department of Anthropology, University of Calgary, 2500 University Drive N.W. Calgary, AB, T2N-1N4, Canada. E-mail: <klvalent@ucalgary.ca>, **Jeffrey A. Klemens**, Department of Biology, University of Pennsylvania, 102 Leidy Laboratories 433 S University Avenue, Philadelphia, PA 19104 USA. E-mail: <jklemens@alumni.upenn.edu> and **Linda M. Fedigan**, Department of Anthropology, University of Calgary, 2500 University Drive N.W. Calgary, AB, T2N-1N4, Canada. E-mail: <Fedigan@ucalgary.ca>.

References

Chapman, C.A. 1989. Primate seed dispersal: The fate of dispersed seeds. *Biotropica* 21 (2): 148–154.

Chapman, C.A., and Russo, S.E. 2007. Primate seed dispersal: Linking behavioural ecology and forest community structure. In: *Primates in Perspective*. C.J. Campbell, A. Fuentes, K.C. MacKinnon, M. Panger, and S. Bearder (eds.), pp.510–525. Oxford University Press, Oxford.

Clark, D.A. and Clark, D.B. 1984. Spacing dynamics of a tropical rain forest tree: Evaluation of the Janzen-Connell model. *Am. Nat.* 124 (6): 769–788.

Condit, R., Hubbell, S.P. and Foster, R.B. 1992. Recruitment near conspecific adults and the maintenance of tree and shrub diversity in a Neotropical forest. *Am. Nat.* 140 (2): 261–286.

Estrada, A. and Coates-Estrada, R. 1985. A preliminary study of resource overlap between howling monkeys (*Alouatta palliata*) and other arboreal mammals in the tropical rain forest of Los Tuxtlas, Mexico. *Am. J. Primatol.* 9 (1): 27–37.

Fragaszy, D., Visalberghi, E. and Fedigan, L.M. 2004. *The Complete Capuchin: The Biology of the Genus* Cebus. Cambridge University Press, Cambridge.

Harms, K.E., Wright, S.J., Calderón, O., Hernández, A., and Herre, E. A. 2000. Pervasive density-dependent recruitment enhances seedling diversity in a tropical forest. *Nature* 404: 493–495.

Howe, H.F. 1990. Survival and growth of juvenile *Virola surinamensis* in Panama: Effects of herbivory and canopy closure. *J. Trop. Ecol.* 6: 259–280.

Howe, H.F. 1989. Scatter-and clump-dispersal and seedling demography: Hypothesis and implications. *Oecologia* 79 (3): 417–426.

Julliot, C. 1997. Impact of seed dispersal by red howler monkeys (*Alouatta seniculus*) on the seedling population in the understorey of tropical rain forest. *J. Ecol.* 85 (4): 431–440.

Rowell, T. and Mitchell, B. 1991. Comparison of seed dispersal by guenons in Kenya and capuchins in Panama. *J. Trop. Ecol.* 7 (2): 269–274.

Russo, S. E. and Augspurger, C. K. 2004. Aggregated seed dispersal by spider monkeys limits recruitment to clumped patterns in *Virola calophylla*. *Ecol. Letters* 7:1058–1067.

Smith, S. 2004. A preliminary study of seed dispersal by white-faced capuchins (*Cebus capucinus*) and mantled howlers (*Alouatta palliata*) in Costa Rica. *Am. J. Phys. Anth.* 123 (Supplement 38): 184.

Valenta, K. and Fedigan, L. M. 2008. How much is a lot? Seed dispersal by white-faced capuchins and implications for disperser-based studies of seed dispersal systems. *Primates* 49: 169–175.

Valenta, K. and Fedigan, L. M. 2009a. Effect of gut passage, feces and seed handling on latency and rate of germination in seeds consumed by capuchins (*Cebus capucinus*). *Am. J. Phys. Anth*. 138 (4): 486–492.

Valenta, K. and Fedigan, L. M. 2009b. Spatial patterns of seed dispersal by white-faced capuchins (*Cebus capucinus*): Evaluating distant-dependent seed mortality. In Press, *Biotropica*.

Wehncke, E. V., Hubbell, S. P, Foster, R.B. and Dalling, J.W. 2003. Seed dispersal patterns produced by white-faced monkeys: Implications for the dispersal limitation of Neotropical tree species. *J. Ecol.* 91: 677–685.

Wehncke, E.V. and Dalling, J.W. 2005. Post-dispersal seed removal and germination selected tree species dispersed by *Cebus capucinus* on Barro Colorado Island, Panama. *Biotropica* 37 (1): 73–80.

Possible Evidence of Male Dispersal in Common Woolly Monkeys (*Lagothrix lagotricha*)

Angela Maldonado
Sergio Botero

Introduction

The genus *Lagothrix*, the woolly monkeys, contains four closely related species, formerly considered subspecies (Groves, 2005). *Lagothrix spp.* are known to have female-biased dispersal (Nishimura, 2003; Di Fiore and Campbell, 2007), but genetic evidence suggests that male dispersal also occurs (Di Fiore and Fleischer, 2005). Through long term field studies, female dispersal has been observed in the wild (Stevenson *et al.,* 1994; Nishimura, 2003; Di Fiore and Campbell, 2007), but to date no observations of male dispersal have been recorded. Solitary adult males of *Lagothrix poeppigii* have been observed trying to join existing groups, but have been expelled by resident males (Di Fiore

and Fleischer, 2005). Here we report the acceptance of a newcomer three-year-old male into an existing group of *Lagothrix lagotricha*. This observation should be interpreted with caution since it concerns a captive raised individual reintroduced to the wild.

Observations

In 1996, a 5 to 8 month old male woolly monkey (*L. lagotricha*) that was being kept as a pet was confiscated by local authorities. The monkey's origin is not certain, but may have been the Putumayo region, Colombia. The regional environmental authorities had no adequate infrastructure to house this individual, so the infant was given to Angela Maldonado, who raised the monkey until 1998 in her household, in Bogotá, Colombia. The woolly monkey's lower lip had a scar, presumably generated during its capture from the wild. The monkey's diet consisted of fruit and vegetables, and he was taken every weekend to nearby forests in order to allow the development of normal climbing behavior.

On April 2nd 1998 Maldonando brought the captive raised woolly monkey to the Caparú Biological Station in Vaupés, Colombia (for a more detailed description of the site refer to Defler and Defler, 1996), where a semi captive free-ranging group of primates was kept for rehabilitation and reintroduction purposes. The group consisted of eight common woolly monkeys (*Lagothrix lagotricha*: four adult females, one sub-adult female, two infant females, and one juvenile male), two white-fronted capuchins (*Cebus albifrons albifrons*: one male and one juvenile female), one sub-adult female long-haired spider monkey (*Ateles belzebuth*), and three mottled-faced tamarins (*Saguinus inustus*: two adult females and one sub-adult male). The monkeys there foraged freely in the station area and were fed once daily. On April 3, 1998, a wild group of woolly monkeys passed near the station, and in response, the captive-raised male performed an aggressive display, including branch shaking. Although an adult male stopped and observed the new male, and some other members of the group paid attention to the display, they performed no aggressive displays, and continued on their way, seemingly unperturbed. The captive-raised male followed the group until dusk and then returned to the station.

When first introduced to the primate group of the Caparú Biological Station, the captive-raised male was approximately 3 years old, and interacted normally with the other individuals of the group for his age. He was, however, rejected by one of the adult woolly females, and after this interaction all of the adult females were aggressive to him. On two occasions, this caused the captive-raised male to escape into the forest and remain alone overnight. The most aggressive female was the lowest ranking in the group, had no offspring in the group, and was also the most aggressive towards humans. On April 12, after 3 days of enforced separation by the Caparú staff, the aggressive female and the captive-raised male were allowed near each other again and the aggression continued. This time the male escaped into the forest and did not return to the station. He was observed foraging the next 2 days with a wild group. On the second day (April 14th) the male responded and approached the observer. On April 26 the same group was encountered, and the male responded when called by his pet name, but he did not approach the observer. Maldonado then left the Amazon station and returned to Bogotá. The male was observed once during the month of May by a field assistant and answered when called but did not approach the observer. It is not known if the group he joined was the same that tolerated the aggressive display on the 3rd of April, but it is likely, given the group's home range. Just over one year later, on June 26, 1999, Maldonado followed a wild group of woolly monkeys, presumably the same one the captive-raised male had joined. A male came particularly close to her during the observations and responded when called by his pet name, but because he had matured she was unable to recognize him unequivocally. She then followed the male until his identity was confirmed through the scar on his lower lip.

Discussion

The present case shows that a social mechanism exists for the acceptance of a new male into an existing group of *Lagothrix lagotricha*, and thus supports Di Fiore and Fleischer's (2005) molecular data suggesting some level of male dispersal in woolly monkeys. However, this particular male's upbringing differed significantly from wild individuals, as he remained isolated from conspecifics for an important part of his development. The fact that the introduced male was not an adult might suggest that only juvenile or sub-adults can be accepted into existing groups, but this remains to be determined. Observations of sub-adult or juvenile males dispersing from their natal groups are lacking to confirm the existence of male dispersal in *Lagothrix*.

Acknowledgments

The authors would like to thank S. Bennett for her invaluable assistance during fieldwork, T. R. Defler and D. González for the logistic support. We also thank A. Nishimura, P. Stevenson, S. K. Bearder, L. Cortés and one anonymous reviewer for their valuable comments on this manuscript.

Angela Maldonado, Oxford Brookes University, Department of Anthropology and Geography. Gipsy Lane, OX3 0BP, Oxford, UK. E-mail: <lllugens@yahoo.co.uk> and **Sergio Botero**, Universidad de los Andes, Departamento de Ciencias Biológicas, Laboratorio de Ecología de Bosques tropicales y Primatología. Bogotá D. C., Colombia, and Rockefeller University. New York. U.S.A. E-mail: <sbotero@rockefeller.edu>

References

Defler, T. R. and Defler, S. E. 1996. The diet of a group of *Lagothrix lagotricha* in the NW Amazon. *Int. J. Prim*. 17: 161–190.

Di Fiore, A. and Fleischer, R. C. 2005. Social behavior, reproductive strategies, and population genetic structure of *Lagothrix poeppigii. Int. J. Prim*. 26: 1137–1173.

Di Fiore, A. and Campbell, C. J. 2007. The Atelines: variation in ecology, behavior, and social organization. In: *Primates in Perspective*, C. J. Campbell, A. Fuentes, K. C. MacKinnon, M. Panger, and S. K. Bearder (eds.), pp.155–185. Oxford University Press, New York.

Groves, C. 2005. The Primates. In: *Mammal Species of the World. A Taxonomic and Geographic Reference* (3rd edition), Wilson D. E. and D. A. M. Reeder (eds.), pp.111–184. Johns Hopkins University Press, Baltimore.

Nishimura, A. 2003. Reproductive parameters of wild female *Lagothrix lagotricha*. *Int. J. Prim*. 24: 707–722.

Stevenson, P. R., Quiñones, M. J., and Ahumada, J. A. 1994. Ecological strategies of woolly monkeys (*Lagothrix lagotricha*) at Tinigua National Park, Colombia. *Am. J. Prim.* 32: 123–140.

Predation on Small Mammals by Capuchin Monkeys, *Cebus cay*

Marja Zattoni Milano
Emygdio Leite Araújo Monteiro-Filho

Introduction

Capuchin monkeys forage opportunistically and exploit highly diverse feeding resources that encompass a wide variety of vegetables and animal prey, including reproductive and non-reproductive plant parts, invertebrates and small vertebrates (Terborgh, 1983; Fedigan, 1990). Vertebrate prey includes birds, eggs, lizards, frogs, young coatis, bats, rodents and even other monkeys (Izawa, 1978; Newcomer and De Farcy, 1985; Fedigan, 1990; Galetti, 1990; Rose, 1997; Ferreira *et al.*, 2002; Resende *et al.,* 2003; Fragaszy *et al.*, 2004; Sampaio and Ferrari, 2005). The foraging patterns of capuchin monkeys involve strenuous and persistent activity, search for hidden prey, manual dexterity and an explorative approach (Fedigan, 1990; Janson and Boinski, 1992; Fragaszy *et al.*, 2004), but little is known regarding how they find and kill their prey. Here we report the behavior of *Cebus cay* (Illiger, 1815) (*Cebus libidinosus* sensu Groves, 2001; Rylands *et al.*, 2005) preying upon arboreal rodents (*Rhipidomys* sp.2 *sensu* Tribe, 1996) trapped during a study on small mammal population ecology.

Methods and Study Site

During a capture-mark-recapture study of small rodents and marsupials, the researchers were frequently followed by a group of capuchin monkeys. On these occasions, the monkeys' behaviors were recorded *ad libitum* (Altmann, 1974). Trapping sessions, lasting from six to ten days, were conducted every month from March to August 2006 using live-traps. The study was conducted in Cabeceira do Prata Private Reserve, state of Mato Grosso do Sul, central Brazil (21° 27' S; 56° 26' W), an area of 307.5 ha covered with seasonal forest and cerrado (Brazilian Savanna). The region has a dry season from May to September and a wet season from October to April. The Reserve is intensely visited throughout the year by tourists, who walk in small, guided groups through the forest. There is no direct interaction between the animals and the tourists. However, reserve officers keep artificial feeding sites along the trails, baited daily with corn to attract animals to facilitate wildlife watching. All observations reported here were conducted in an area of seasonal alluvial forest that is cut by a tourist trail.

Results and Discussion

From the first fieldwork session in March 2006, the traps attracted the attention of capuchin monkeys, who began to follow the trapping activities almost every day. The first observation involved a capuchin running after another animal in the forest canopy on the morning of March 3rd. It was not possible to identify the chased animal, which was the size of an opossum (*Didelphis albiventris* Lund, 1840) and had a long and naked tail. The outcome of this interaction was not observed. On March 21st at around 7:00 a.m., a juvenile capuchin was found vocalizing loudly, trapped inside a trap set on the ground. Other capuchins were watching nearby when it was released. On April 19th a male climbing mouse, *Rhipidomys* sp. (weight = 65 g), was captured by a capuchin just after it was released from the trap. On this occasion the group of capuchins observed the activities of the researchers from canopy branches at a distance of about 10 m. When the rodent was released a subadult capuchin quickly approached, grabbed it as it climbed a tree in the understory, and killed it using the craniocervical bite, a widespread killing strategy adopted by other primate genera (Steklis and King, 1978). The monkey remained in the understory for about 2 minutes, licking the blood from the neck of the prey and looking at the researchers, before moving to the canopy. It was not possible to observe whether it ate the prey or not. This incident took place after a 28-day interval between trapping activities, a time when the traps had remained closed.

On August 25th another male *Rhipidomys* sp. (weight = 105 g) was captured by an adult male capuchin after the rodent was released from a trap. As in the previous case, capuchins observed the researchers from a distance, and when the rodent was released, one individual quickly approached. At this time, the capuchin chased the rodent on understory branches, but the *Rhipidomys* fell to the ground and hid inside a hole in a fallen log. The capuchin descended to the forest floor, extracted the rodent from the log and took it to a branch about 3 m above the ground (Figure 1a). The rodent didn't attempt to escape. The monkey killed