

to go to the ground to travel between forest patches, also increasing the probability of infestation. The effects of fragmentation on parasite loads and rate of infection should be considered in the management (especially reintroduction and translocation) of species such as *Alouatta caraya* in Argentina.

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A STUDY OF SPIDER MONKEYS (*ATELES GEOFFROYI VELLEROSUS*) IN THE FOREST OF THE CRATER OF SANTA MARTA, VERACRUZ, MÉXICO

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Although studies at Sierra de Santa Marta, Veracruz, Mexico, have documented the situation of primates inhabiting the forest fragments of the slopes of the mountainous massif (e.g., Benítez-Rodríguez, 1989; Silva-López, 1987; Silva-López and García-Orduña, 1984; Silva-López *et al.*, 1986, 1988, 1993), little is known of the primate groups inhabiting the crater of Santa Marta. Santa Marta is an extinct volcano located to the south of the Los Tuxtlas region, and harboring one of Veracruz's larger continuous tracts of tropical rainforest. Los Tuxtlas, including Sierra de Santa Marta, was recently decreed a Biosphere Reserve by the Federal Executive (23 November, 1998) (Enrique Portilla Ochoa, pers. comm.), which was endorsed and supported by the several studies conducted throughout the years on its rich fauna and flora (Andrle, 1964; Rappole and Warner, 1980; González Ch. *et al.*, 1987; González Soriano *et al.*, 1997). Based on this study and on recent visits made by Domingo Canales Espinosa (pers. comm.), it can be safely assumed that no major changes have occurred to the vegetation of the crater in the 4–5 years since the original survey.

The walls and bottom of the crater are covered by high evergreen rainforest, and encompass an area of approximately 5,000 ha. According to Mario Vázquez Torres (unpubl. data; see also Benítez-Rodríguez *et al.*, 1992), vegetation in both the forest and the forest fragments of the Sierra's eastern slopes is very similar in structure and species composition, with *Pseudolmedia oxyphyllaria*, *Guarea glabra*, *Cymbopetalum penduliflorum*, *Inga* spp., *Sapium lateriflorum*, *Brosimum alicastrum*, *Dendropanax arboreus*, *Ficus* sp., *Rheedia edulis*, *Terminalia amazonia*, and *Nectandra ambigens* among the dominant species. Due to the steep slopes of the crater walls

(>60° in some places), we restricted our study area to the bottom, which has a width of 40 to 130 m, and an altitude of 700m. The Río Tecuanapa crosses the bottom of the crater (average width of 25 m). Protected by the crater's walls and stimulated by the continuous formation of clouds in the upper portions of the Sierra (approximately 1,500 m above sea level), rainfall indices are higher in the bottom of the crater (Andrle, 1964).

Benítez-Rodríguez *et al.* (1992) made the first assessment of spider monkeys in the area. They set up, and repeatedly walked, two transects (an area of approximately 26.96 ha) and recorded information from both, which were then combined to obtain the following results: Sixty-eight individuals were tallied during the survey, including 30 adult males and 33 adult females (a sex ratio of 1:1.1). Mean foraging party size was 3.33 (range of 1–7 individuals/party). Based solely on the transect area, it was possible to estimate a very high density of 2.52 individuals/ha. However, taking into account the entire area covered by forest in the crater, density was estimated to be 0.01 individuals/ha or 1/100 ha.

On the basis of this preliminary study, we established a third transect in the same area. This time, 24 monkeys were individually recognized, and included a total of four adult males (AM), 13 adult females (AF), one immature male (IM), and six immature females (IF). Mean foraging party size was four, and mean party composition was 0.67 AM, 2.17 AF, 0.17 IM, and 1.0 IF. The AM-AF ratio was 1:3.25, while the IM-IF ratio was 1:6.0. The adult-infant ratio was fixed at 1:0.41 and the number of infants per reproductive female was estimated to be 0.5. A raw density estimate obtained from the transect area was low (0.66 individuals/ha) when compared to the previous study, but I believe no conclusions should be made on this result due to the small number of censuses made over the same census route ($n = 19$). Group fission was common. The most commonly observed subgroups were males traveling with females and young (50%), solitary females with an infant (33.3%), and adult males and females (16.7%). Solitary males were never recorded in the crater, as have been occasionally observed in forest fragments of the slopes of the Sierra (Silva-López, 1995). Howler monkeys (*Alouatta palliata mexicana*) were commonly heard in both studies, but no attempt was made to find them.

The results differ in some aspects from those of Silva-López *et al.* (1995) for the forest fragments of the Sierra's eastern slopes. For example, group size recorded in the fragments was larger, ranging from 2 to 16 individuals and with a mean of 5.7 individuals/group (SD ± 3.5 , $n = 17$). The proportion of adult and immature males was more conspicuous in the fragments, where average group composition was 1.71 AM, 2.6 AF, 1.33 IM, and 1.63 IF. The previously reported female-biased ratio (Chapman *et al.*, 1989), which was observed in the crater's second study, was also recorded in the fragments. There the bias was in the adults (1:1.34, $n = 17$) and the immatures (average of 1:1.5, $n = 17$), and was in accordance with the male-female ratios reported at sites with

a high habitat productivity (Chapman *et al.*, 1989). The ratio was higher, however, in the crater, where figures were 1:3.25 (AM-AF) and 1:6.0 (IM-IF). Likewise, in the fragments, adults were present in a higher proportion than immatures (average of 1:0.44, $n = 17$). The data shows the relationship was more consistent with respect to the overall adult female-immature ratio (1:0.76), than with the adult male-immature ratio (1:1.03), suggesting that there tend to be more immatures than adult males in any given group. This result was consistent with the records at the crater, where the AM-I was 1:1.75. As Silva-López (1995) observed, group fission was not common in the fragments, except for groups of 10 or more individuals.

These results suggest that spider monkey group characteristics are different in varying environmental situations. The nature of the factors influencing this difference needs to be examined looking at various factors (e.g., availability of food, size of the available habitat, activity patterns, group size, and age-sex characteristics of individuals in a group) before more conclusive remarks can be made.

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SYMPATRY AND NEW LOCALITY FOR *ALOUATTA BELZEBUL DISCOLOR* AND *ALOUATTA SENICULUS* IN THE SOUTHERN AMAZON

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In September 1999, when beginning a research project on *Alouatta* ecology at Paranaíta, northern Mato Grosso, Brazil, we discovered two distinct howler species, *Alouatta belzebul discolor* and *Alouatta seniculus*, living in neighboring and partially overlapping home ranges. The study site (9°34.197 S; 56°19.381 W; Fig. 1), located on the left bank of the Rio Santa Helena, a tributary of the Rio Teles Pires, comprises part of the legally conserved vegetation of the Fazenda Universal cattle ranch, and is contiguous with the protected vegetation of neighboring ranches, forming approximately 10,000 ha of continuous forest. The regional climate is type AW1 (Köppen), tropical rainy with a marked dry season, with a mean annual temperature of 26°C. The dry season is from May to August. In some years total rainfall surpasses 2,800 mm (Empaer, 1999).

A. belzebul discolor occurs south of the Amazon River in the states of Maranhão, Pará e Mato Grosso (Hill, 1962). At

Pavanaita, we are studying activity pattern, diet and use of space. The study group has seven individuals, all with pelage characteristics typical for the species (Emmons and Feer, 1990): one adult male, three adult females, two juvenile females and one infant male.

A. seniculus is widespread north of the Amazon river which bends southwestward to the Rio Guaporé basin (Hill, 1962; Setz, 1991) and the only previous record from the north of the state of Mato Grosso, is at Aripuanã, on both banks of Aripuanã River (Ayres, 1981). The *A. seniculus* group observed had five individuals: one adult male, two adult females, one sub-adult female and one juvenile male. During a period of 140 days between September and May 1999, we observed the *A. seniculus* group on four occasions at the edge of the *A. belzebul discolor* group's home range. Twice in October 1999, agonistic interactions occurred when both groups attempted to use the same feeding tree. The encounters were accompanied by agitated vocalizations during 34 and 10 minutes respectively, once in the morning (starting at 9:30 am) and another in late afternoon (starting at 6:15 pm), by the adult males of both groups. In both events the adult male *A. belzebul discolor* actively pursued *A. seniculus* group members.

We observed four other *A. seniculus* groups in forest contiguous with the study area, and also found a dead adult male, which will be deposited in the Museu de Zoologia of the Universidade de São Paulo. It was not possible to obtain a specimen of *A. belzebul discolor*, but based on geographical distribution and pelage characteristics of the group members, R. Gregorin (pers. comm.) confirmed the species' identification. As is apparently the case with other primate species (see Hershkovitz, 1977), we expected that the Rio Teles Pires would present a natural barrier to *Alouatta* dispersal, and that *A. belzebul discolor* would occur only on its right (east) bank. However, this river has numerous islands, and some animals might cross the river in periods of marked dryness.

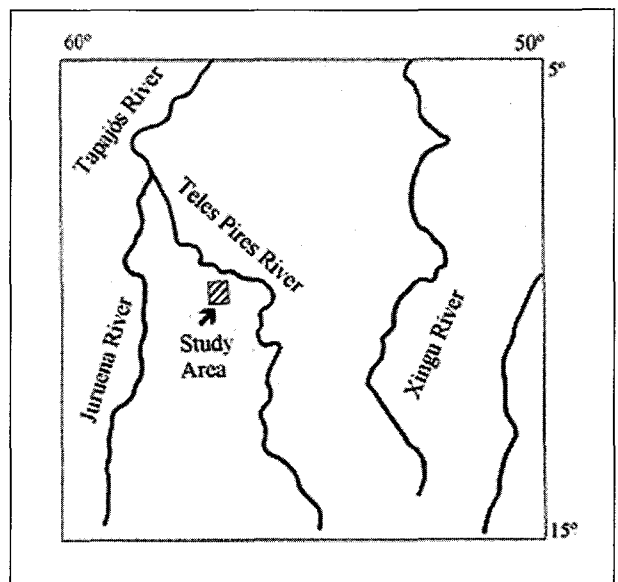


Figura 1. Location of the study area, in southern Amazon, Brazil.