adicionales como la estructura del hábitat, la existencia de árboles con huecos para resguardo y forrajeo.

Es urgente que las corporaciones y entidades encargadas creen áreas de reserva para la protección y conservación de la especie. Son varios los bosques que pueden ser protegidos para asegurar la supervivencia de esta especie, ya que existen áreas extensas de bosque primario, primario poco intervenido, bosques secundarios de sucesión media y tardía, entre los cuales están los de Anorí, Liberia, Samaná, San Carlos, San Luis, Sonsón y Amalfi.

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Referencias

Cuervo, D. A., Hernández-Camacho, J. y Cadena, A. 1986. Lista actualizada de los mamíferos de Colombia. Anotaciones sobre su distribución. *Caldasia* 15(71–75): 472–501.

Emmons, L. H. y Feer, F. 1998. *Neotropical Rainforest Mammals, Second Edition. A Field Guide.* University of Chicago Press, Chicago.

Eisenberg, J. F. 1989. *Mammals of the Neotropics the Northern Neotropics, Volume 1. Panamá, Colombia, Venezuela, Guyana, Suriname, French Guiana.* The University of Chicago Press. Chicago and London.

Hernández-Camacho, J. y Cooper, R. 1976. The non-human primates of Colombia. In: *Neotropical Primates: Field Studies and Conservation,* R. W. Thorington, Jr. y P. G. Heltne (eds.), pp.35–69. National Academy of Sciences, Washington, DC.

Hernández-Camacho, J. y Defler, T. 1983. Algunos aspectos de la conservación de primates no humanos en Colombia. In: *La Primatología en Latinoamérica,* C. Saavedra, R. A. Mittermeier y I. B. Santos (eds.), pp.67–97. World Wildlife Fund, Washington, DC.

Vargas, T. N. y Solano, C. L. 1996. Evaluación del estado de dos poblaciones de *Saguinus leucopus* para determinar áreas potenciales de conservación en un sector del valle del Magdalena Medio, Colombia. *Neotrop. Primates* 4(1): 13–15.

Drinking by Howler Monkeys (*Alouatta fusca*) and Its Seasonality at the Intervales State Park, São Paulo, Brazil

Sandra Steinmetz

Introduction

Drinking is only infrequently observed in howler monkeys (Bicca-Marques, 1992; Bonvicino, 1988; Carpenter, 1934; Glander, 1975, 1978; Moynihan, 1976; Terborgh, 1983) and it is argued that their diet provides the majority of fluids they need (Glander, 1978). In this note I report on the occurrence of drinking in a population of southern brown howler monkeys, *Alouatta fusca*, observed during a study of their behaviour and ecology carried out at the Intervales State Park, São Paulo, from November, 1998 to October, 1999 (Steinmetz, 2000).

The Intervales State Park projects 49,888 ha of Atlantic rain forest in the state of São Paulo, Brazil (24°12'–24°25'S, 48°03'–48°30'W). The climate there is temperate, with an annual precipitation above 1.000 mm and no dry season. The average temperature is 18°C in the coldest month and 22°C in the hottest month (Petroni, 2000). During the year of study (November 98 to October 99) the average temperature was 16.2°C and the total precipitation was 1.707,82 mm (data collected in the Intervales State Park) (Fig. 1).

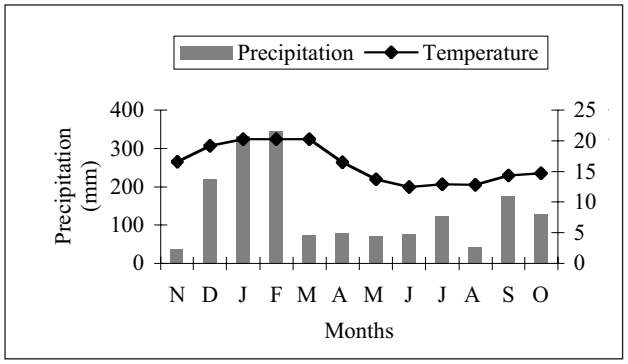

Figure 1. Monthly average temperature and cumulative precipitation registered at Intervales State Park, São Paulo, November and December of 1998 and January to October of 1999.

Methods

The activity budget and diet of a group of six individuals, composed of two adult males, one juvenile male, one female and one infant, were registered by monthly scan sampling from November, 1998 to October, 1999. Direct observations of the group totalled 918:30 hours or 92 days, of which 65 were full days. All observations of the howlers drinking water were noted. To verify differences between the light rainy season (April to August) and the heavy rainy season (September to March), the monthly percentages were compared using the Mann-Whitney "U" test. The Spearman coefficient was used for the correlations and significance was set at the 0.05 level.

Results and Discussion

Drinking was observed 79 times (Table 1). In all instances the howlers drank water accumulated in epiphytic bromeliads. They were seen drinking more often in the lighter rainy season (Mann-Whitney 'U' = 35.000; p = 0.0025) (Table 1). Occurrences of drinking were negatively correlated with precipitation and temperature (r = -0.642; p = 0.0244 and r = -0.6103; p = 0.0351, respectively). Drinking was positively correlated with the consumption of old leaves, and they drank less often when more fruit was eaten (Pearson correlation, r = 0.7231; p = 0.0079, r = -0.6208; p = 0.0312, respectively) (Figs. 2 and 3).

Table 1. Total number of observations, mean of observations per month and standard deviation (SD) of drinking of howler monkeys, *Alouatta fusca*, in two seasons, and throughout the study (November 1998 to October 1999) at the Intervales State Park, São Paulo.

Season	Number of observations	Mean	SD
Less rainy	69	13.80	9.36
Most rainy	10	1.43	1.13
Total	79	6.58	8.55

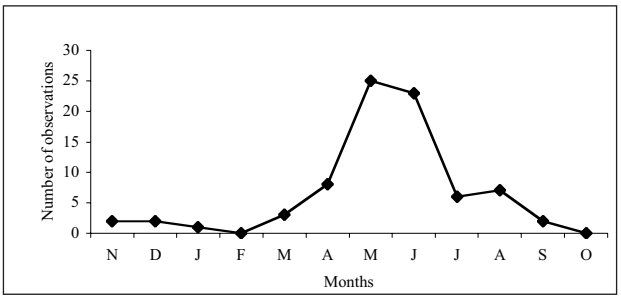

Figure 2. Monthly variation of the number of observations of drinking behaviour in howler monkeys, *Alouatta fusca*, between November 1998 and October 1999, at Intervales State Park, São Paulo.

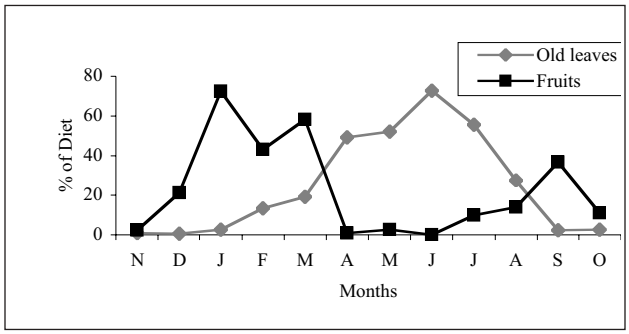

Figure 3. Monthly percentile of old leaves and fruits in the diet of howler monkeys, *Alouatta fusca*, between November 1998 and October 1999, at Intervales State Park, São Paulo.

Glander (1978) also found a seasonal pattern in drinking behaviour correlated with the consumption of old leaves. Besides a reduced availability of water, old leaves have more secondary compounds that, after the detoxification process, produce metabolites that require water for their elimination (Glander, 1978). At Intervales, the howlers have no difficulty in finding water because of the abundance of bromeliads and the absence of a defined dry season. Drinking seems to be related to the kind of food consumed: fruits have more water and less secondary compounds than old leaves. However, in Alegrete, Rio Grande do Sul State, Brazil, a place with drastic dry seasons, Bicca-Marques (1992) noted that howlers consumed more water in the rainy season, and that drinking behaviour was not related to diet.

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References

Bicca-Marques, J. C. 1992. Drinking behavior in the black howler monkey (*A. caraya*). *Folia Primatol.* 58(2): 107–111.

Bonvicino, C. R. 1988. Observações sobre a ecologia e o comportamento de *Alouatta belzebul* (Primates: Cebidae) na Mata Atlântica. Dissertação de Mestrado, Universidade Federal da Paraíba, João Pessoa.

Carpenter, C. R. 1934. A field study of behavior and social relations of howling monkeys (*Alouatta palliata*). In: *Naturalistic Behavior of Nonhuman Primates,* C. R. Carpenter (ed.), pp.3–92. Pennsylvania State Press, PA.

Glander, K. E. 1975. Habitat description and resource utilization: A preliminary report on mantled howling monkey ecology. In: *Socioecology and Psychology of Primates,* R. Tuttle (ed.), pp.37–57. The Hague, Mouton.

Glander, K. E. 1978. Howling monkey feeding behavior and plant secondary compounds: A study of strategies. In: *The Ecology of Arboreal Folivores*, G. G. Montgomery (ed.), pp.561–574. Smithsonian Institution Press, Washington, DC.

Moynihan, M. 1976. *The New World Primates*. Princeton University Press, Princeton.

Petroni, L. M. 2000. Caracterização da área de uso e dieta do mono carvoeiro (*Brachyteles arachnoides*, Cebidae-Primates) na Mata Atlântica, Serra de Paranapiacaba, SP. Tese de Doutorado, Universidade de São Paulo, São Paulo.

Steinmetz, S. 2000. Ecologia e o comportamento do bugio (*Alouatta fusca clamitans*, Atelidae - Primates) no Parque Estadual Intervales – SP. Dissertação de Mestrado, Universidade de São Paulo, São Paulo.

Terborgh, J. 1983. *Five New World Primates: A Study in Comparative Ecology*. Princeton University Press, Princeton, NJ.

Uso de Plantas Como Alimento por Monos Aulladores, *Alouatta palliata*, en el Parque Yumká, Tabasco, México

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Introducción

El estado de Tabasco en el sur de México resguarda poblaciones representantes de las tres especies de primates que existen en México: *Alouatta palliata, A. pigra* y *Ateles geoffroyi* (Smith; 1970, Horwich and Johnson 1986; Rylands *et al.*, 1995). Tabasco es el único estado de México,