Seasonal Variation in the Positional Behavior of Red Howling Monkeys (*Alouatta seniculus*)

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**ABSTRACT.** Recent studies on the positional behavior of primates reveal that significant seasonal variation occurs in both locomotion and postures that is related to changes in diet and foraging techniques. Howling monkeys (genus *Alouatta*), which also have a seasonally varied diet, are predicted to have correspondingly varied positional behaviors. Two groups of red howling monkeys were studied in a primary rain forest in French Guiana during the dry and wet seasons. During the dry season, when howler diet is based mainly on leaves, howlers traveled more frequently by quadrupedal walking on large supports, a mode of progression that is probably inexpensive energetically and relatively stable. During feeding, quadrupedal and tripedal stand contributed considerably, a posture probably associated with the equal distribution of leaves within a tree crown. In contrast, during the wet season, when fruit was abundant, howlers fed very frequently by sitting on large supports, probably because fruit consumption required more time for special manipulation. However, most seasonal changes in feeding postures, and in travel and feeding locomotion, were difficult to associate directly with dietary shifts. These behavioral changes may be more highly correlated with slight modifications in microhabitat use (horizontal and vertical daily ranges, similar and alternative arboreal pathways) that are not considered in this paper.

**Key Words:** *Alouatta seniculus*; Red howling monkey; Locomotion; Postures; Variation; French Guiana.

**INTRODUCTION**

Knowledge of the positional behavior of extant primates is important for inferring patterns of positional behavior, habitat use, and foraging strategies of fossil primates. However these inferences require reliable form-function-behavior associations. Most ecological and behavioral parameters show seasonal fluctuations, usually associated with seasonal variation in the environment (such as type, amount, or distribution of resources and potential predators). Since positional behavior is an important means of obtaining access to resources and avoid predators, such variations are likely to cause variation in primate positional behavior (CROMPTON, 1984; DAGOSTO, 1995).

A number of recent studies have shown that primates are indeed characterized by personal variability in their positional behavior, mostly associated with changes in diet (CROMPTON, 1984; GEBO & CHAPMAN, 1995; DAGOSTO, 1995). In these studies, the variation observed was highly significant during feeding locomotion, postural behavior, and support size and orientation. These differences are most likely related to the different structural features of the different resources exploited partially during certain seasons, and requiring different foraging techniques (CROMPTON, 1984; DAGOSTO, 1995).

Howlers, genus *Alouatta*, although almost exclusively vegetarian, show significant seasonal variation in their diet, usually tracking resource availability (MILTON, 1980; ESTRADA, 1984; JUILLOT & SABATIER, 1993; GUILLOTIN et al., 1994). During the dry season, when fruit availability is reduced, howlers tend to rely almost entirely on leaves, spend most of their daylight
hours resting, and have short daily ranges (Milton, 1980; Estrada, 1984). In the rainy season, when more fruit is available, they travel more and farther, and fruit represents a very important proportion of their diet. Thus, it is reasonable to predict that these different strategies are associated with different patterns of positional behavior.

In this paper, I analyze and compare quantitative data on the positional behavior of red howling monkeys (Alouatta seniculus) in French Guiana, collected during two different seasons (wet and dry) in two successive years (1992, 1993). The questions addressed are (1) Is there any seasonal variation in positional behavior, and if so, which behaviors and parameters are most affected; and (2) Are the most seasonably different behaviors and parameters associated with dietary shifts?

STUDY SITE, CLIMATE, AND PHENOLOGY

Data in both seasons were collected at the Station des Nouragues, a primary lowland wet rain forest site in French Guiana (4°05'N, 52°40'W). The study site is mainly characterized by high forest, where the dominant plant families are Sapotaceae, Lecythidaceae, Chrysobalanaceae, Ceasalpiniaceae, and Burseraceae (Sabatier & Prevost, 1990).

The equatorial climate of French Guiana is characterized by a relatively short dry season extending from August to November. The rest of the year is the long wet season, generally interrupted by a short dry period between February and March. Annual rainfall varies from 3,000 to 3,250 mm, and the mean temperature is 26.1°C. The study site is described in detail by Juillot and Sabatier (1993) and Zhang (1995).

In the study site, seasonal fruit availability was strongly correlated with rainfall (Zhang, 1995). There is a peak in fruit production starting in February and extending until April. Afterwards, fruit abundance declines gradually, reaching a minimum in August and September (Juillot & Sabatier, 1993; Zhang, 1995). These results are further substantiated by data from other sites in French Guiana, where the fruit peak was found to be between February and May, and least available fruit between August and October (Guillotin et al., 1994).

SUBJECTS AND DATA COLLECTION

I conducted focal animal instantaneous sampling (Altman, 1974) on adult individuals of red howling monkeys (Alouatta seniculus). The same two adult males and two adult females were sampled in both seasons. They all belonged to groups A and B studied by Juillot and Sabatier (1993), and were entirely habituated. A focal individual was followed for 15 min, and then I shifted to another individual. If the focal individual was lost from view before the 15-min period ended, I shifted to another individual.

Locomotor behavior during traveling (movement from and to sleeping sites and between feeding sites) and feeding (movement within the same or adjacent feeding trees) was recorded at 20-sec intervals. This interval was adequate for recording the following variables: locomotor mode, behavioral context, support size, support inclination, and forest layer where the animal was located. Feeding postural behavior was recorded by time bouts (Cant, 1987). A bout ended when one of the recorded variables changed. The variables recorded were: posture, behavioral context, support size, support inclination, and forest layer. Locomotor modes recorded were: Quadrupedal walk (horizontal quadrupedal progression above and along a single support), Climb (upward or downward vertical quadrupedal progression along a single support), Clamber