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Primates of the Chapada das Mangabeiras, Piauí, Brasil: A Northern Extension to the Range of *Alouatta caraya*

Kevin Flesher

Introduction

Dissimilar range maps of the primates inhabiting the northern cerrado in three field guides reflect the ambiguity of species ranges for this poorly sampled area. Auricchio (1995) and Emmons and Feer (1997) show the range of *Alouatta caraya* extending north to 13° S, reaching the upper Tocantins and São Francisco watersheds. To the north of this, an area encompassing approximately 40% of the cerrado biome, Emmons and Feer (1997) place a question mark on the map, while Auricchio (1995) leaves this region blank. Eisenberg and Redford (1999) place a similar northern limit on *A. caraya* (12.5° S), but show *A. belzebul* inhabiting the northern cerrado. FURPA (1997) also list *A. belzebul* as the species present in the northern cerrado, citing it in the upper Parnaiba watershed at 10°S.

Auricchio (1995) uses the Rio Parnaiba watershed as the divide between *Callithrix jacchus* (inhabiting the east bank and extending into and encompassing the caatinga biome) and *C. penicillata* (inhabiting the west bank and extending through much of the southern cerrado). Eisenberg and Redford's (1999) maps for these two species are similar to Auricchio's (1995), but they place question marks over the shading on the northern cerrado region. Emmons and Feer (1997) place *C. jacchus* on the east bank as well, but leave the western bank of the Rio Parnaiba blank, with the northern limit of *C. j. penicillata* (different taxonomy referring to the same animal) being the border of Tocantins and Maranhão, just south of the Rio Parnaiba watershed. FURPA (1997), who sampled both sides of the river, cite *C. jacchus* as the only marmoset of the upper Rio Parnaiba. The three field guides and the FURPA APA (Área de Proteção Ambiental) report (1997) indicate *Cebus apella* as the third primate species of the northern cerrado, showing this as the only capuchin species occurring there.

Chapada das Mangabeiras

The Chapada das Mangabeiras is a series of sandstone plateaus extending approximately 300 km along the borders of Tocantins, Maranhão, Bahia, and Piauí (9-11° S and 45-47° W). These plateaus mark the divide between the São Francisco, Tocantins, and Parnaiba river drainages. The vegetation of the region has elements of both the cerrado and caatinga biomes with savanna as the predominant habitat, including densely wooded areas and open savannas with sparse tree and shrub cover.

The study site was located in the upper Rio Parnaiba watershed in the state of Piauí (Fig. 1). Here, the Serra da Tabatinga rises 200-400 m above a vast sandy plain, with steep cliffs reaching 700-800 m a.s.l. Springs rising at the base of these cliffs feed the many streams and rivers that course through the wooded savannas. Gallery forests, backed by buriti palm *(Mauritia flexuosa)* wetlands (*veredas*), grow along these waterways creating a latticework of extensive green corridors. The few rivers on the plateau cut deeply into the sandy soils creating tight ravines with narrow bands of gallery forest.

Methods

I visited the Chapada das Mangabeiras in June 1999 and for two weeks in July 2000. The aim of the visits was to census the medium and large mammals of the Fazenda Serra Vermelha (10°10'S, 45°32'W, a private reserve owned by the Fundação BioBrasil) and to make a general reconnaissance of the region (Fig. 1). Census methods consisted of hiking throughout the 4,000 ha property and recording any signs of wildlife. In addition, I interviewed several local hunters from the town of São Gonzalo who were familiar with the area. Day census hours totaled 129 hours for the two visits. I spent an additional 40 hours conducting censuses by car on the plateau of the Serra da Tabatinga in July 2000.

Results

Three species of primates inhabit the cerrado in this region: *Alouatta caraya*, *Cebus apella*, and *Callithrix jacchus*. The three species occur on Fazenda Serra Vermelha, and while I saw no primates on the plateau, a more thorough survey of the gallery forests along the rivers is necessary to determine whether they are present. *C. jacchus* also inhabit the towns in the region.

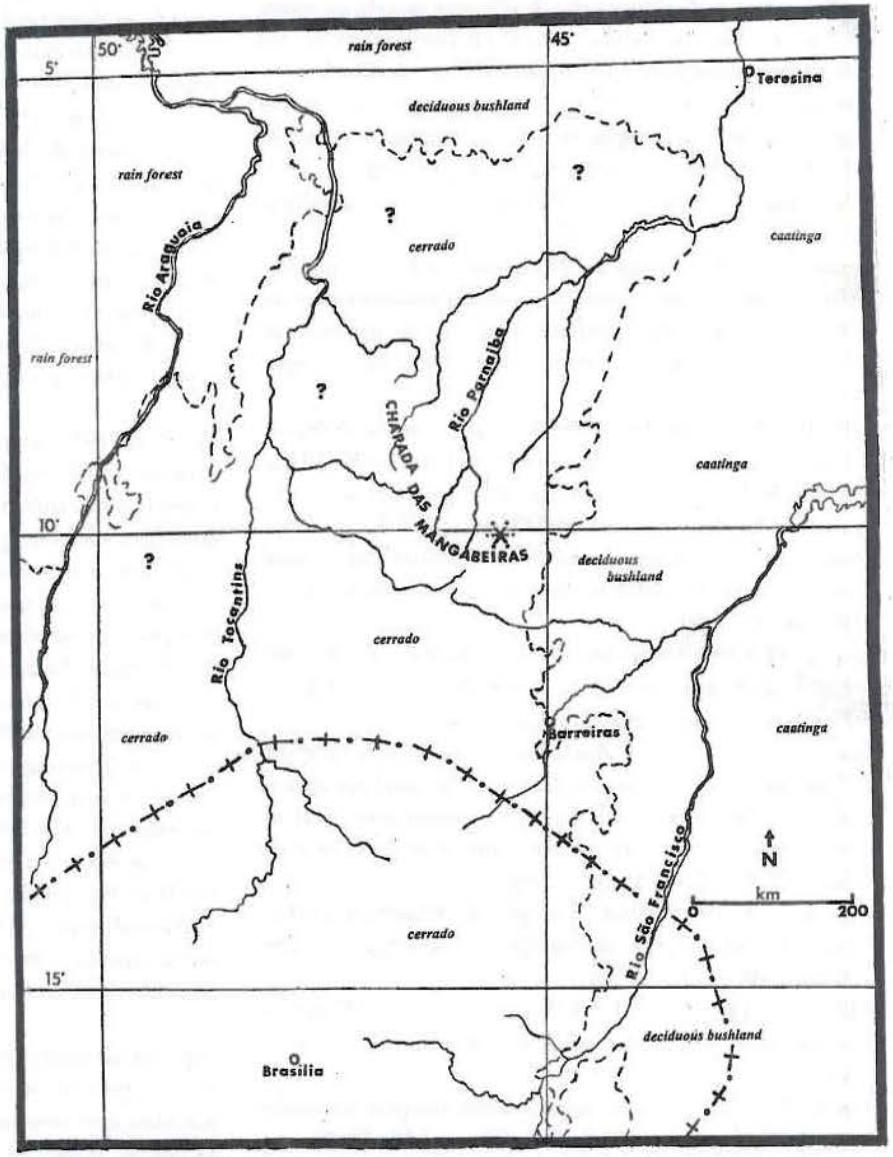

Figure 1. The expanded range of *Alouatta caraya* in the northern cerrado. The hatched line marks the limit of the cerrado biome (IBGE 1993); crosses and dots show the northern range limit of *A. caraya* according to Auricchio (1995), Emmons and Feer (1997), and Eisenberg and Redford (1999); the star marks the census area and the new northern limit of *A. caraya's* range. Question marks indicate areas where censuses are needed to clarify species ranges.

Alouatta caraya (guariba)
I saw a lone black male in the narrow (5-10 m) gallery forest of a seasonally dry stream in the Fazenda Serra Vermelha. Several of the local workers reported occasionally seeing a group of three howlers (two yellow females, one black male) and another group with 6-9 individuals in the gallery forest of the Rio de Ouro. I failed to see any howlers or howler feces along this river or in the gallery forest of the Rio Urucui, despite repeated attempts, and never heard howlers calling.

On a visit to the Fazenda Arucusão (several km S/SE from Barrieras de Piauí) in 1999, I saw a group of 5-6 howlers (one male, 2-3 females, and two sub-adults) in a gallery forest of a small stream. Another scientist saw a female of a second group in the same gallery forest, approximately 400 m from the first group. The adult male was black, while the females were yellow with orange "beards", and the sub-adults had yellow over-fur with black under-fur.

Callithrix jacchus (mico-estrela)
I saw marmosets twice in the gallery forest of the Rio de Ouro, a group of three and a single individual. The marmosets were gray with black stripes down the back and tail, grayish to white ear tufts, black/gray on the throat, back of the head, and around the face, with a white "star" on the forehead. The marmosets feed on buriti exudates, and several trees were scarred with small cuts. Marmosets inhabit several of the towns in the region, and I saw two marmosets in a garden in Correntes and heard a group calling from some trees in another garden.

Cebus apella (macaco-prego)
I did not see capuchin monkeys, but several of the local workers and researchers reported sporadically seeing a group of approximately 16 monkeys. The capuchins appear to range widely, using the wooded savannas in addition to the gallery forests, and raid mango trees during the fruiting season. I found a "mortar and pestle" site in the woodlands where capuchins use stone hammers to open hard palm nuts.

Conservation status

Although it would appear that the extensive network of gallery forests would provide ample habitat for the three primate species, they are all rare. FURPA (1997) reported low densities for all species, with *C. jacchus* being the most abundant, followed by *C. apella*, and with *A. caraya* (listed incorrectly as *A. belzebul*) on the verge of extinction in the region due to over-hunting. Informants (five hunters interviewed) told me that while some people eat howler monkeys, capuchin monkeys and marmosets are rarely, if ever, eaten. Eisenberg and Redford (1999) cite yellow fever epidemics as another possible explanation for low howler densities throughout the cerrado biome. Natural predators include boa constrictors, jaguars, pumas, several smaller cats, and raptors.

Biogeography

The howler monkeys I saw were undoubtedly *Alouatta caraya*, with the characteristic sexual dimorphism and female coloration of the sub-adults. This expands the distribution of this species to 10° S, an increase of 2 to 3° over former estimates, adding a minimum of 180,000 km² to the species range. While Eisenberg and Redford (1999) place the southern range limit of *A. belzebul* at 15° S, their southernmost data collection site is in the Amazon rain forest biome at 5° S. Coimbra-Filho *et al.* (1995), however, discussed a record of *A. belzebul* in the far south of Piauí (Angico, Parnagauá; Neiva and Penna, 1916). This is a little south of the Chapada das Mangabeiras, and in area believed to be humid forest at the time (Coimbra-Filho and Câmara, 1996). *A. caraya* is the howler of the cerrado/caatinga in Brazil, and it has probably expanded its range north, replacing *A. belzebul* in North-east Brazil, as the caatinga (desert scrub) has expanded with the widespread destruction of the forests, as argued by Coimbra-Filho and Câmara (1996). Today, the ranges of the two howlers interdigitate as the cerrado grades into rain forest in southern Maranhão.

The presence of *Callithrix jacchus* on the east bank of the Rio Parnaiba conforms with the distribution maps of Auricchio (1995), Emmons and Feer (1997), and Eisenberg and Redford (1999). Whether or not the western bank is occupied by *C. penicillata* (or *C. j. penicillata*), remains to be determined, although if the FURPA (1997) report is correct, *C. jacchus* also occurs on the west bank in the river's upper watershed. This implies that the upper Rio Parnaiba is not a biogeographic barrier separating these two marmoset species. It is difficult to imagine that the streams and small rivers of the upper Parnaiba watershed are wide enough to create movement barriers for any of these primates.

While I did not see capuchin monkeys, local informants and other scientists identified *Cebus apella* as the species present when asked to select a capuchin monkey from the plates in Emmons and Feer (1997), and as this information conforms to the distribution maps of the three field guides and the FURPA report, there is no reason to suspect that the species was misidentified.

Kevin Flesher, Department of Human Ecology, Rutgers University, New Brunswick, NJ 08091, USA, e-mail: <kevinflesher@yahoo.com>.

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News

New Field Site: Preliminary Census of Primates at El Zota Biological Field Station, Costa Rica

El Zota is a new biological field station located in northeastern Costa Rica (10°57.6'N, 83°75.9'W) near the Barro del Colorado Reserve (Fig. 1). The Station includes approximately 1000 hectares (over 2470 acres) of lowland rainforest that is host to a diverse native fauna and flora. It is among the largest of its kind in Costa Rica and is home to more wildlife than in any other biological station of its kind in the country. Portions of El Zota were formerly used as a cattle ranch, but have now been converted to a functional tree farm, producing both native and exotic trees for harvest as a means of sustainable land use. The majority of the station is natural forest (~700 ha), including lowland rain forest, lowland swamp forest, pasture (~30ha), and the reforested areas of monospecific stands of trees used for timber and paper. A small river meanders through the swamps.

The mammals at El Zota include white-fronted capuchins (*Cebus capucinus*), mantled howlers (*Alouatta palliata*), black-handed spider monkeys (*Ateles geoffroyi*), tapirs (*Tapirus bairdii*), jaguars (*Panthera onca*), peccaries (*Tayassu tajacu*), Honduran tent bats, and white-tailed deer (*Odocoileus virginianus*). The avifauna includes the great green macaw (*Ara ambigua*), several other species of parrots, including *Amazona farinosa*, three species of toucans (*Ramphastos* spp. and *Pteroglossus torquatus*), king vultures (*Sarcoramphus papa*), swallow-tailed kites (*Elanoides forficatus*), purple-throated fruit crows (*Querula purpurata*), semiplumbeous hawks (*Leucopternis semiplumbea*), laughing falcons (*Herpetotheres cachinnans*), and a host of others. The brown caiman (*Caiman crocodilus*), green iguana (*Iguana iguana*), green basilisk (*Basiliscus plumifrons*), yellow-headed gecko (*Gonatodes albogularis*), fer-de-lance or terciopelo (*Bothrops asper*), hog-nosed viper (*Porthidium nasutum*), and boa constrictor (*Boa constrictor*) are among the documented species of reptiles, and the strawberry (*Dendrobates pumilio*) and green-and-black (*D. auratus*) poison dart frogs are among the amphibians. Several of these species are considered endangered or threatened (e.g., spider monkey, jaguar, and tapir). Faunal surveys are still in progress.

The El Zota field station is designed to allow students to learn techniques that can be applied to field research on ecology, behavior, and conservation in the tropics as well to the protection and management of the research station itself. The station is owned by the Hiner Ramirez family of Costa Rica and affiliated with the Fundación Neotropical in Costa Rica. The field school curriculum is designed by a group of seasoned faculty from various universities. Together, all parties involved are committed to the conservation and the land and its inhabitants in this part of Costa Rica.

We surveyed El Zota Biological Field Station from 21 to 29 July, 2000, specifically to census the primates. Over the course of five days we walked line transects, at a speed of less than 1 km per hour, following old trails and recording the species, number, age and sex, activity, heights, and reactions of all primates observed. Transect length totaled 18.9 km, and the area surveyed was approximately 7% of the total forest (5.7 km²). Detection distances for the primates were set at 20 m. Transects were thus considered to be 40 m in width (2 x 20 m). A total of 16 spider monkeys, 20 howlers, and 17 capuchins were recorded in 13 different groups. We observed one mixed species group containing capuchins and one spider monkey. Spider monkey parties (n = 6) ranged from one to eight individuals and averaged 3.3 individuals per party. Capuchins averaged 5.4 individuals per group (n = 3, range 4-8 individuals), and howling monkeys averaged 4.2 individuals per group (n = 5, range 1-6 individuals).

The densities of the different primate species were calculated by dividing the number of individuals sighted by the area surveyed (length x width of transects). The density of spider monkeys at El Zota is estimated to be approximately 28 ind/km². Howling monkeys were recorded at a density of 35 ind/km², while capuchins were present at a density of 30 ind/km². Densities reported for spider monkeys at other sites in Central America are similar (Cant 1978, Gonzalez-Kirchner, 1999). Using these values, we estimate there to be two to three spider monkey communities within the boundaries of El Zota Biological Field Station. Densities of howling monkeys at El Zota agree with findings from other sites as well (Estrada, 1982). One howling monkey group was observed more than once and was identifiable based on the pelage color of some individuals. This group consisted of at least six individuals: two adult males, one subadult male, two females, and one immature.

Inaugural class sessions, including courses in Primate Behavioral Ecology and Tropical Herpetology, will be held at El Zota

Figure 1. Location of El Zota Biological Field Station.