

SHORT ARTICLES

POPULATION SURVEY OF THE AZUERO HOWLER MONKEY (*ALOUATTA PALLIATA TRABEATA*) IN HERRERA PROVINCE, REPUBLIC OF PANAMA

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Introduction

The taxonomic identity of the Azuero howler monkey has been controversial. Lawrence (1933) initially described this taxon as a subspecies of *A. palliata*. In 1987, Froehlich and Froehlich analyzed the fingerprint pattern of different species of howler monkeys as a proxy to infer genetic distance. They concluded that *A. p. coibensis* should be considered a distinct species, *A. coibensis*. In this analysis they also found *A. p. trabeata* to be closer to the *coibensis* form than to other *A. palliata* forms, and suggested that this taxon be a subspecies of *A. coibensis*. Cortés-Ortiz *et al.* (2003) carried out genetic studies (mitochondrial DNA) of howler monkeys along their entire geographic range and, inferring the phylogenetic relationships among the species, they concluded that both *trabeata* and *coibensis* share mitochondrial haplotypes with other forms of howler monkeys in Central America (*coibensis* with *mexicana* and *palliata*, and *trabeata* with *aequatorialis*), supporting the initial classification of Lawrence, and suggesting that they are at best subspecies of *A. palliata*.

The original distribution of the Azuero howler monkey covered most of the Azuero peninsula in Panama, including portions of the provinces of Veraguas, Herrera and Los Santos (Méndez, 1970; Froehlich and Froehlich, 1986, 1987; Arauz, 1998; Méndez, 1999). This subspecies is an endemic taxon under high risk of extinction if the present trends of forest destruction continue (Rodríguez-Luna *et al.*, 1996; Rylands *et al.*, 2000; Méndez, 2002).

In order to better understand the current status of the Azuero howler monkey, I conducted a survey in the northern part of its range in the province of Herrera (Fig. 1). Demographic and behavioral data were recorded, as well as the quality of the habitat in the area. I also used the information collected on these howler monkeys to initiate an education program with local people aiming at the conservation of this primate in Azuero.

Study site

The Azuero peninsula is in southwestern Panama. The annual average temperature is 28.1°C (22.5°C to 33.7°C) and annual rainfall averages 1,410 mm/year (Contraloría General de la República, 2001). The dry season is from December to April and the rainy season from May to December (Suárez, 1981). The area surveyed was quite flat with

small hills of 90 to 150 m (Méndez, 2001). Remnant forest can be found on the hilltops and along the rivers. The tallest trees are about 15 to 20 m high (Méndez, 2001). There is only one patch of forest that the farmers have left more or less untouched. The landscape in the region is mostly grassland and cattle pasture, with a few fragments of forest, some of them connected by narrow strips of trees and sparse riparian forest.

Methods

I first traveled through the region (15 towns) asking local people about the presence of monkeys in order to get some understanding of the location of the howler populations. Fieldwork was subsequently conducted for five consecutive days each month, from April to December 2001. I surveyed all the trails and roads between the towns of Ocu and Parita (Fig. 1), from 6:00 am to about 2:00 pm. On finding a group of monkeys, I recorded their location, the number of individuals and the composition (following Milton, 1982), and also noted aspects of their behavior and the quality of the habitat. I spent as much time as I could observing the behavior of the group and whenever possible following and recording the activities of particular individuals I was able to identify. Remaining with the group until the howlers vocalized made it possible to detect other groups in the vicinity. When hearing other groups, I recorded the compass bearing, inferred the distance, and went in search of them. Care was taken not to double-count groups or individuals.

Results

Three hundred and sixty hours were spent in fieldwork. Thirty percent of this time was devoted to searching for the howler monkeys and the remaining 70% was dedicated to accompanying the groups, identifying sex-age composition, and conducting direct observations on behavior. In total I visited 15 towns and their surrounding areas, along 24 linear kilometers (Fig. 1, Table 1). Howler monkeys were found around only three of the towns: Santa Mónica, Llano Grande, and Llano Hato. Eleven howler monkey groups were located. In Santa Mónica I also found captive monkeys of two other species, *Cebus capucinus* and *Saguinus geoffroyi*, that were taken from Eastern Panama (Cerro Azul and Darien respectively). In the town of Camaron (Fig. 1) I was told of an introduction of a male howler monkey that was brought from La Chorrera, in the Panama Canal area, and therefore *A. p. aequatorialis*. However, I was unable to find any howler monkeys in that area. Local people also reported a case when a howler monkey was hunted and eaten in the town of Pedregosito (Fig. 1).

I counted 119 howler monkeys in five groups by direct observations. The average size of the groups was 23.8 (range 15–39) individuals. Six more groups were heard but never found in a forest of approximately 400 ha between the towns of Llano Grande and Llano Hato. The forest around Santa Mónica totaled approximately 245 ha in two patches

of forest and a riparian forest corridor. All these forest fragments are surrounded by grassland. In total I estimated 262 howler monkeys in the area between Ocu and Parita towns, in the central part of Herrera Province. Population density in the area was calculated to be 40.6 individuals/km² and 1.7 troops/km². The average sex-age composition of the groups was 6.0 adult males, 7.8 adult females, 6.6 juveniles and 3.4 infants. Female/male and immature/female ratios were 1:1.3 and 1:1.39 respectively (Table 2).

Habitat use

At least in this part of the Azuero peninsula, the howler monkeys showed no strong preference for any particular types of forest. Our observation did, however, demonstrate their attachment to certain trees. On some occasions we watched them spend up to 60% of the day in the same group of trees (*Enterolobium cyclocarpum*, *Bursera simaruba*, *Ficus yoponensis* and *Spondias mombin*) in the middle of the thin lines of trees that separate cattle ranching properties. According to local people, the monkeys sometimes use

wire fences to travel from one tree to another, and even run through the grassland to reach other trees. They evidently have a taste for mango fruits (*Mangifera indica*), a very common introduced tree in Panama. Table 3 gives a list of trees that were used by howler monkeys (as food or to rest in) during the survey. The majority of the tree species reported in this survey have also been reported by other authors as sources of food for howler monkeys in different localities (e.g., Milton, 1982; Terborgh, 1983).

Discussion

I estimated 262 individual howler monkeys in 11 troops living in highly fragmented forest and along the sparse corridors of trees which customarily delineate properties in central Herrera Province. In general, the land use in the area is a fine-grained mosaic, with small forested areas interspersed with crops and enormous areas of grassland and cattle pasture. People take wood from the forest patches and hunt deer, rabbit, and armadillo in them. Although local people did not admit to hunting howlers, I did witness one

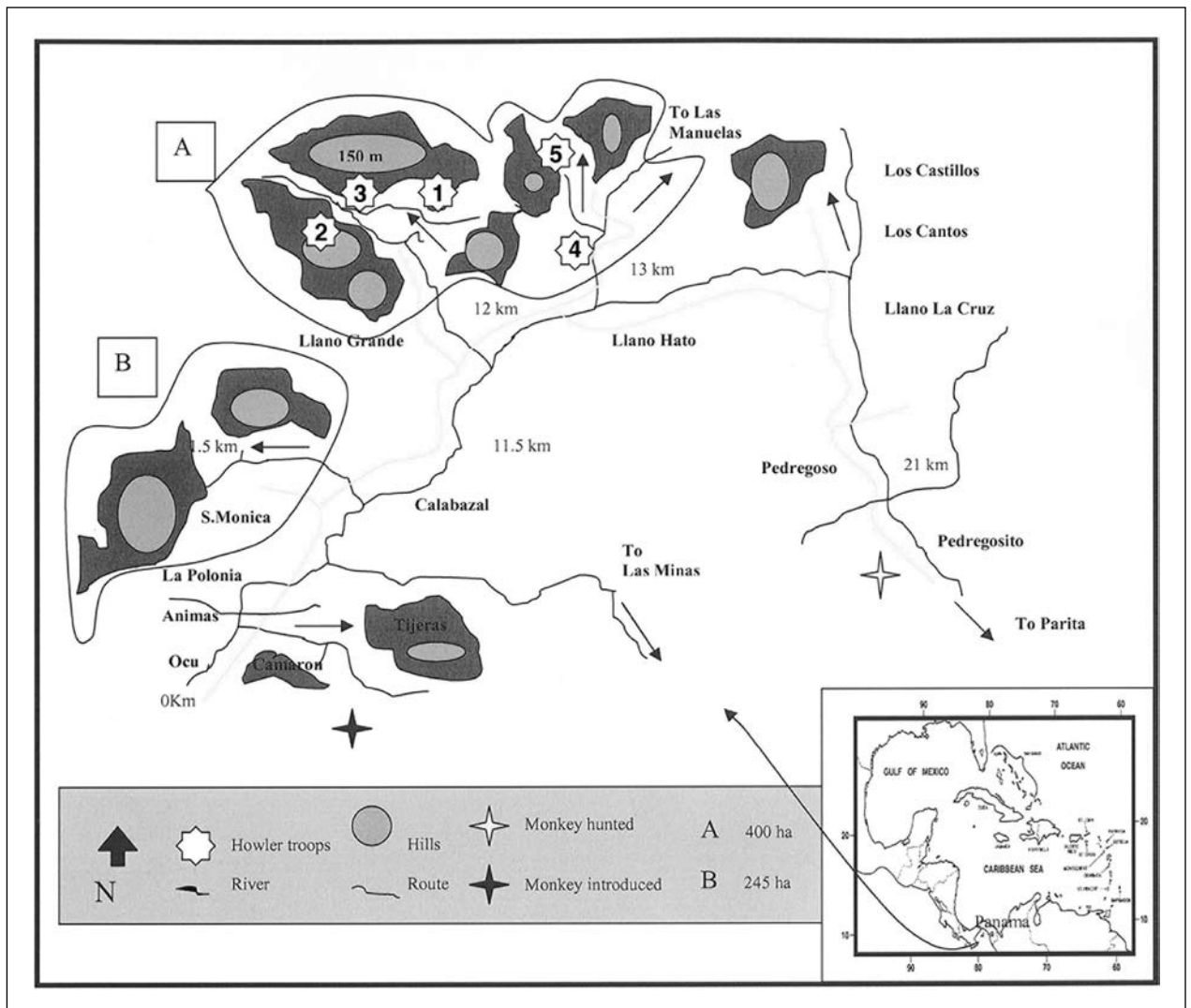


Figure 1. Location of the towns between Ocu and Parita, Azuero, Herrera Province, Republic of Panama.

case where an individual was hunted and eaten. This part of the range of the Azuero howler monkey is not protected in any way by the National Environmental Authority (*Autoridad Nacional del Ambiente* – ANAM) and yet is one of the few lowland areas in the region that still has forest patches large enough (645 ha in total) to hold small numbers of groups of howler monkeys.

Despite the fragmentation of their habitat, the howler monkeys in the region have a robust and healthy appearance, suggesting that they are not lacking in food. There is a good variety of trees in the patches of forest that the howlers can exploit as food sources (Table 3), and some of the trees left standing to delineate properties are mature and

evidently appear to be providing sufficient food and shelter. Furthermore, the howlers are able to eat fruits from species such as mango trees that have been introduced, likely an important supplement to their diet, or even a mainstay at certain times of the year.

The presence of juveniles and infants suggests that the population is growing. Average group size for *A. p. trabeata* in this region of Herrera was similar to that of other populations of howler monkeys studied in Azuero (Brandaris, 1983) and in Barro Colorado Island, Panama (Carpenter, 1934; Milton, 1982). The large number of individuals per group may be a consequence of the impossibility of dispersal among fragments. When howler monkeys cross

Table 1. Localities, distance and the presence of Azuero howler monkeys during the survey in Herrera Province. *We found *Saguinus Geoffroyi* and *Cebus capucinus* in captivity. (h) = hearing; (o) = observed.

Town	Linear distance from Ocú (km)	Habitat	No. of monkeys estimated by local people	Number of troops identified
Ocú	0	Human settlements	0	0
Las Animas	1.5	Human settlements	0	0
La Polonia	10	Human settlements, riparian forest	0	0
El Calabazal	11	Human settlements, riparian forest	?	0
Santa Mónica	11.5	Human settlements, riparian forest, forest fragment	30–35	2(h)
Llano Grande	12	Human settlements, riparian forest, forest fragment, grassland	20	5(h) 3(o)
La Chavarria-Pesé	12.5	Human settlements, riparian forest, forest fragment, grassland	1	0
Llano Hato	12.5	Human settlements, riparian forest, forest fragment, grassland	40	4(h) 2(o)
Llano de la Cruz	14	Human settlements, riparian forest.	3	0
Los Cantos-Parita	22.4	Human settlements, riparian forest, forest fragment on a hill	2	0
Los Castillos-Parita	24.9	Human settlements, riparian forest, grassland	12	0
Pedregoso-Pesé	21	Human settlements, riparian forest, forest fragment	0	0
Pedregoso-Pesé	23	Human settlements, riparian forest, grassland	1	0
Camaron	5	Human settlements, Forest Reserve	-	
Tijeras	8	Hill	-	11(h) 5(o)

Table 2. Social structure of Azuero howler monkey troops observed in Santa Mónica, Llano Grande and Llano Hato, Herrera Province. Classification according to Milton (1982).

Troops	Male	Female	J3	J2	J1	I3	I2	I1	Total
T-1	5	6	1	1	0	0	1	1	15
T-2	4	5	3	3	2	0	0	1	18
T-3	10	10	8	5	1	1	1	3	39
T-4	7	11	3	1	1	1	1	1	26
T-5	4	7	3	1	0	0	1	5	21
Totals	30	39	18	11	4	2	4	11	119
Average	6.0	7.8	3.6	2.2	0.8	0.4	0.8	2.2	23.80
%	25.2	32.8	15.1	9.2	3.4	1.7	3.4	9.2	100

Table 3. List of tree species used by Azuero howler monkeys and collected in Herrera Province. * = monkeys eating from these trees during the survey.

Common name	Scientific name	Family
Espavé*	<i>Anacardium excelsum</i>	Anacardiaceae
Mango	<i>Mangifera indica</i>	Anacardiaceae
Malagueto hembra	<i>Xylopia aromatica</i>	Annonaceae
Malagueto macho	<i>Xylopia frutescens</i>	Annonaceae
Caracucha	<i>Plumeria</i> sp.	Apocynaceae
Lagartillo	<i>Sciadodendron excelsum</i>	Araliaceae
Palma negra	<i>Astrocaryum standleyanum</i>	Arecaceae
Uvito	<i>Bactris major</i>	Arecaceae
Barrigón*	<i>Pseudobombax septenatum</i>	Bombacaceae
Indio desnudo*	<i>Bursera simaruba</i>	Burseraceae
Guarumo	<i>Cecropia peltata</i>	Cecropiaceae
Camaroncillo	<i>Hirtella racemosa</i>	Chrysobalanaceae
Sastra	<i>Rheedia</i> sp.	Clusiaceae
Guachapali	<i>Albizia guachapele</i>	Fabaceae
Harino	<i>Andira inermis</i>	Fabaceae
Corotú*	<i>Enterolobium cyclocarpum</i>	Fabaceae
Bobo	<i>Erythrina fusca</i>	Fabaceae
Liana	<i>Erythrina</i> sp.	Fabaceae
Sigua	<i>Ocotea dendrodaphne</i>	Lauraceae
Nance	<i>Byrsonima crassifolia</i>	Malpighiaceae
Pasmo hediondo	<i>Siparuna guianensis</i>	Monimiaceae
Higuerón*	<i>Ficus insipida</i>	Moraceae
Higuerón*	<i>Ficus yoponensis</i>	Moraceae
Guayabo de montaña	<i>Eugenia</i> sp.	Myrtaceae
Arbol carne	<i>Roupala montana</i>	Proteaceae
Jagua	<i>Genipa americana</i>	Rubiaceae
Naranjo	<i>Citrus sinensis</i>	Rutaceae
Mamón*	<i>Melicoccus bijugatus</i>	Sapindaceae
Guázimo*	<i>Guazuma ulmifolia</i>	Sterculiaceae
Peine de mono	<i>Apeiba membranacea</i>	Tiliaceae

grassland to reach other fragments there is a high risk of predation by dogs — a situation reported by local people, confirmed by direct observations, and reported elsewhere in Azuero (Brandaris, 1983). Another potential predator that has been reported in Azuero is the coyote (*Canis latrans*), which reached the peninsula at least five years ago (2000), and is currently considered a serious problem for howler monkeys and other populations of wild animals in Azuero. The natural predators of howler monkeys, such as harpy eagles (Eason, 1989; Sherman, 1991) and jaguars (Kinzey, 1997), are no longer believed to occur in the region.

Age-sex composition of *A. p. trabeata* troops is similar to other *A. palliata* populations studied in different locations (Carpenter, 1934; Chivers, 1969; Milton, 1982). The social system observed in the Azuero howler monkey troops is multi-male/multi-female, similar to what has been reported for *A. p. mexicana* (Cortés-Ortiz, 1998; Dias and Rodríguez-Luna, 2003) and for other species of the genus

(Crockett and Eisenberg, 1987). It is interesting to note that the unimale social system reported by Milton and Mittermeier (1977) for *A. p. coibensis* (always considered as the same species as *A. p. trabeata* but then believed to be a different species of *Alouatta*) differs from the one observed in the population of Azuero howler monkeys.

I recorded only one case of aggression among the howlers, but I did note that many males had scars on their bodies. The dominant male in group T3, for example, had lost an eye. Another male in group T4 had a recent cut on his left leg and was unable to use it when I first saw him, although he was fully recovered when I returned a year later. Other males had easily visible scars from old wounds and fractured tails. The one aggressive event occurred between two males evidently fighting over a female. The male that was guarding the female chased and fought off an approaching male. The presence of scars, injuries and fractures in the males of these groups suggest that there are sporadic but serious fights.

Although howler monkeys suffer botfly (*Alouattamyia baeri*) parasitism in most of their range (Milton, 1982, 1996 for Barro Colorado Island; Cowlshaw and Dunbar, 2000 for Brazil; Cortés-Ortiz, pers. comm. for Mexico) I was unable to find signs of botflies in the population I observed in Azuero. Special conditions of soil humidity are necessary for botflies to complete their pupal phase (K. Milton, pers. comm.). The more arid conditions of the Azuero peninsula may be responsible for the absence of this parasite. Nonetheless, the cattle surrounding the howler monkeys undoubtedly increase the probabilities of infection by screw worm larvae (*Cochliomyia hominivorax*), another parasite reported for *A. palliata* in Panama (Milton, 1982). The risk of infection by this type of larvae increases with open wounds, such as those observed in the males of this population.

The Azuero howler monkeys in the central part of Herrera Province, Panama, are highly endangered for the reasons already mentioned above, including forest clearance and fragmentation, as well as hunting for food or pets. The isolation of this population of howler monkeys is jeopardizing its long-term genetic viability. As a consequence of this survey, and in order to help with the conservation of the Azuero howler monkeys, the Mammal Society of Panama (SOMASPA) has initiated a conservation campaign and environmental education project in the region. Furthermore, we will continue monitoring this population to understand the population dynamics and social behavior of this highly threatened primate.

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ESTUDOS PRELIMINARES DA PRESENÇA DE SAGÜIS NO MUNICÍPIO DE BAURU, SÃO PAULO, BRASIL

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Introdução

O município de Bauru localiza-se na região centro-oeste do Estado de São Paulo (Fig. 1, painel superior) e apresenta 67.937 hectares de área, sendo 5,54% da superfície coberta por vegetação nativa. A maioria dessa vegetação está concentrada numa unidade de conservação chamada Área de Proteção Ambiental (APA) Vargem Limpa – Campo Novo, localizada na região leste do município (22°20'S, 49°01'W), e rodeada pelo Jardim Botânico e Zoológico Municipal de Bauru e por áreas de ocupação rural e urbana (Fig. 1, painel inferior). A vegetação da APA foi extensivamente estudada por Cavassan e colaboradores (1984), que descreveram-na como sendo típica de cerradão, com manchas de cerrado senso restrito e de floresta subtropical semi-decídua (Cavassan, 1990). O clima é predominantemente tropical, com uma estação seca entre março e outubro (na qual a



Figura 1. Ilustrações relativas à área de estudo. Painel superior: localização do município de Bauru no Estado de São Paulo, Brasil. Painel inferior: área de proteção ambiental (APA) municipal Vargem Limpa – Campo Novo.

umidade relativa do ar pode chegar a 15%) e um período quente e úmido estendendo-se pelos meses de novembro a fevereiro.

Ao longo dos últimos anos, surgiram numerosos relatos sobre a presença de sagüis nas proximidades da área em questão. Vale destacar que pouquíssimos levantamentos sobre a fauna do local foram realizados, sendo inexistente qualquer menção na literatura sobre a presença de sagüis na área. Por esse motivo, o objetivo do presente trabalho foi realizar um levantamento preliminar da presença de calitriquídeos na APA e suas adjacências, com vistas a contribuir para o mapeamento das espécies de primatas no território sul-americano pelo projeto BDGEOPRIM (Hirsch *et al.*,