

Rufford Small Grant Annual Report

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Vocal behaviour of *Alouatta guariba* and *Alouatta caraya* living in sympatry in El Piñalito Provincial Park in Misiones, Argentina.

Abstract:

The Atlantic Forest is one of the most endangered regions on earth. Most of the primate species endemic of this region are threatened by extinction. This project would gather critical information about the population status and the behavioural ecology of two howler species *Alouatta guariba* (endemic to the Atlantic Forest) and *A. caraya*, living in sympatry in a small protected area in Misiones, Argentina. Sympatry is a not common situation in howler monkeys but provides a very useful scenario to test some hypothesis about the function of their roaring behaviour. The major goal of the project is not only to gather scientific information about this two howler species, but to also know the real population status and necessary basic information that would permit in the future to take serious conservation actions for *A. guariba* and it's habitat in Argentina.

Goals:

The major goals of the project are: 1) To understand the function and possible biological implications of the long distance calls of the howler monkeys (*Alouatta* spp.), analyzing the vocal behaviour of *A. guariba* and *A. caraya*. 2) To analyze the dynamics of space use in both species inhabiting the same area in relation to their use of long distance calls.

Objectives:

The specific objectives of the project are: 1) To describe the vocal repertoire of both species living in sympatry. 2) To evaluate a possible seasonal variation in the abundance of long distance calls and in that case to analyze the possible ecological factors (availability and distribution of key resources) that may influence the variation. 3) To know if there are specific places for long distance calls ("Hot Spots") within the home range of the groups and

in that case to evaluate the possible factors (trees bearing new leaves and/or sleeping sites) that may influence the occurrence of hot spots.

Study Site:

The study is carried out in El Piñalito Provincial Park (26°30'S, 53°50'W), a 3,796 ha strictly protected area in the province of Misiones, Argentina.

Introduction:

The Atlantic Forest is among the most endangered tropical rainforests on earth, with just 7.4 % of its original forest remaining as isolated forest fragments (Brown & Brown, 1992; Myers et al., 2000, Di Bitetti et al. 2003). Most Atlantic Forest primate species are endemic to this region. The habitat destruction and fragmentation of the Atlantic Forest have brought several of its endemic species to the verge of extinction and now make conservation action particularly urgent.

Brown howlers (*Alouatta guariba* = *A. fusca*) are endemic to the Atlantic Forest of South America (Cordeiro da Silva, 1981; Kinzey, 1982). So far, very little is known about the size and conservation status of the remnant populations or the behavioral ecology of this less known howler species (Chiarello, 1993a,b, 1994; Mendes, 1989). The brown howler is one of the poorest studied of the howler monkeys and is being threatened by extinction. The northern subspecies, *A. g. guariba* has been listed as Critically Endangered by IUCN (Rylands et al., 2003). The southern subspecies *A. g. clamitans*, listed as Near Threatened (Rylands et al., 2003), is currently affected by widespread habitat destruction and fragmentation, and its present distribution is reduced to a few small scattered populations (Chiarello & Galetti, 1994; Mittermeier et al., 1982). In Argentina, the brown howler has been included in the national list of threatened mammals species presented by the Argentine Society for the Study of Mammals (SAREM) (Diaz & Ojeda, 2000). The province of Misiones has declared this species by law a Provincial Natural Monument. For the small Argentinean portion of the brown howler's range there are no population assessments or density estimates, and only a few records of its presence have been reported (Crespo, 1974, 1982; Di Bitetti et al., 1994; Di Bitetti, 2003). Only two small protected areas are known to contain groups of this species in Argentina, and one is the Provincial Park "El Pinhalito" in Misiones (Di Bitetti, 2003).

Black howlers (*Alouatta caraya*) share some morphological, dietary, and behavioral similarities with brown howlers. However, black howlers seem to be specialized to live in secondary forests, and are able to cope with forest disturbance and fragmentation

(Kowalewski and Zunino, 1999). Black howlers are also well known to be able to colonize new habitats in fragmented landscapes. In Argentina, this monkey species is also found in a small portion of the Atlantic Forest. As of now, information on the ecology and behavior of the black howler's population that inhabits the Atlantic Forest is still lacking.

One of the most amazing characteristics of the behaviour of the howler monkeys are their powerful and very loud long distance calls. The highly specialised anatomy of their vocal apparatus (Schön, 1971; Schön Ybarra, 1988), coupled with the time and presumably energy invested in loud calling (contrasting with their otherwise phlegmatic lifestyle) suggests an important role for these calls in the lives of howler monkeys (Teixeira Da Cunha y Byrne, 2006). There is no consensus regarding the function of these loud vocalisation in howler monkeys; however, most authors support the hypothesis proposed by Carpenter (1934), that loud calls are used in regulation of use of space in a non-territorial primate: neighbouring groups with overlapping home ranges mutually avoid each other through their loud calls. The "dawn choruses" very early in the morning before the groups begin their activities may function as a signal of the group's position, reducing the probability of encounters. However, researchers vary in the mechanisms they propose for how this regulation is achieved (Teixeira Da Cunha y Byrne, 2006). Studies carried out with different howler species in different locations shows variation in the interpretation of the results. For the loud calls of *A. palliata*, the most studied species, most researchers suggest space regulation operates through mutual avoidance or reciprocation of movements between neighbours. The scarce evidence in *A. pigra* shows a different way of regulation of space: a patrolling behaviour with loud calls in the morning and in the afternoon along the boundaries of their home range, which suggests a defence or demarcation of the territory (Horwich and Gebhard, 1983). Studies in the same species show that the loud calls are honest indicators of the minimum number of male group members and indicate the fighting ability of the group (Kitchen, 2004). Oliveira (1997) proposes that the function of the long distance calls in *A. guariba* is to warn the resource defence potential for a group of monkeys to their neighbours (indicating the number, age, sex and physical condition of the group members). The vocalisations would be the less risky way to show the strength to other opponents, avoiding the physical encounter during which the individual may be seriously injured or killed (Chivers, 1969; Rudran, 1979; Crocket and Sekulic, 1984; Crocket and Pope, 1988). A recent study in *A. caraya* suggests that this species uses the long distance calls as a way for regular advertisement of occupancy of an area (Teixeira Da Cunha and Byrne, 2006).

Until now there is no evidence that suggest howler monkeys are territorial primates. Overlapping home ranges and low defendability indices support this hypothesis (Mitani and Rodman, 1979). The defendability index (D) proposed by Mitani and Rodman (1979) indicates the ability of an individual to encounter the perimeter of its range with sufficient frequency to monitor potential intruders.

A different hypothesis about the function of long distance calls in howler monkeys was proposed by Sekulic (1982 b; 1983 and Sekulic and Chivers 1986) in *A. seniculus* and suggests the utilization of this vocalisation in regulation of access to mating partners (*mate defence*). Males roar as a warning to other opponents in the context of competition for females, and the females roar to discourage other females from entering the group. One alternative explanation is that females howl to reduce the risk of infanticide. Infanticide by males constitutes a very common reproductive strategy in howler monkeys (Clarcke *et al.* 1994; Crocket and Sekulic, 1984). When the alpha male is replaced by another male, this second male may kill all infants in the group (Brockett *et al.* 1999). The females have little chance to avoid infanticide once the new male takes control of the group. One possible mechanism to reduce the risk of alpha male replacement is to reduce the number of female members in the group (Crocket and Janson, 2001). The possibility exists that the long distance calls emitted by the males in the group and commonly initiated by the alpha male not only serve to indicate the alpha male's defence potential for his females but also to repel males that can potentially take over the group with the consequent infanticide. The mate defence hypothesis (Sekulic, 1982) could contain both a females defence component and an infant defence component, and it is in the last one where the females can play a very active role in the defence of their offspring by participating in the choruses, repeling infanticidal males and other females.

Another aspect of long distance calls in howler monkeys is the seasonal variation in the abundance of the roaring behaviour. Chiarello (1995) observed for *A. guariba* in northeastern Brazil that long distance calls were more abundant during the dry season. The reason is that groups of howlers encounter each other more frequently as a consequence of the low availability (or patchy distribution) of their main food source (trees bearing new leaves). Similarly, the red howlers (*A. seniculus*) of the Venezuelan Llanos roared more frequently during the dry season, as intergroup disputes over fig trees (a key food source) increased (Sekulic, 1982). The same was observed for *A. seniculus* in Guyana (Drubbel and Gautier, 1993) and for *A. pigra* in Belize (Horwich and Gebhard, 1983).

Some differences have been observed in relation to the place where long distance calls were emitted within the home range of each group. Chiarello (1995) suggests for *A. guariba* the presence of “Hot-spots” within the home range of a group, which represent the main concentration of long distance calls vocalizations. These “hot-spots” may be related to key resources, like food trees for the monkeys or sleeping sites. The sleeping sites are not only places where the monkeys rest sometimes, but are near the last food resource that the monkeys ate that day or the first that will be consumed in the morning. Also the hot spots can be related to trees with certain conditions to propagate the sounds (high, emergent and exposed trees). *A. pigra* concentrate most of the howling bouts in the boundaries of their home range (Horwich and Gebhard, 1983) and for *A. caraya* it has been observed that the howling sessions are distributed within the home range and there are not particular places where vocalizations are concentrated (Da Cunha and Byrne, 2006). These findings would suggest that the relative value between costs and benefits from the long distance calls can vary between species and may be adapted to local conditions. That help to explain why it has being observed such a variation between study sites and species, in the frequency that monkeys vocalized.

There is no vocalization study that involved two howler species in sympatry. There is no description about how the mechanism of regulation in use of space operates between neighbouring groups of two different howler species inhabiting the same area. The sympatry situation is extremely benefit to test the principal hypothesis of this behaviour.

Methodology:

Since January 2005, I have been working in El Piñalito Provincial Park with my colleague, Ilaria Agostini, an Italian researcher working on her PhD thesis (“A population assessment and comparative study of two howler monkeys living in sympatry (*Alouatta guariba* and *Alouatta caraya*) in the Atlantic Forest of NE Argentina”), under the supervision of Dr. Mario Di Bitetti. The first nine months were used to cut line transects for the census in order to estimate the density of the two howler species within the area. We cut seven line transects between 2-3 km each, with a total of 19 km of transects. After that period we selected four groups of howler monkeys, two of *A. guariba* and two of *A. caraya* and started to cut the trails to follow the four groups. Prior to data collection, we spent three months habituating the monkeys because they were not used to human presence. Then I started taking data on the diet, the activity patterns and the use of space of the monkeys. My original PhD project was “Comparative study of the behavioural ecology of *Alouatta guariba clamitans* in

two protected areas with different history of land use in the Atlantic Forest of Misiones, Argentina”. In December 2006, I realised that my original project was not possible given the time schedule of a PhD research. It took me very long to complete all the work in the first park (El Piñalito), and I would need three more years to work in the second park (Cruce Caballero) needed for the comparative study. So I decided to change my original project to the present one, “Vocal behaviour of *Alouatta guariba* and *Alouatta caraya* living in sympatry in El Piñalito Provincial Park in Misiones, Argentina”. Since January 2007, I have been taking data on the vocal behaviour of the two howler species. I follow the four groups three days per month from dawn to dusk during a one-year period. Using the “all occurrence method” during all the long distance calls sessions produce by my focal group (the groups that I am following that day), I record: hour of start, hour of end, direction in which the individuals of the group look, location within the home range using a GPS, which individuals are roaring, and the context of the vocalization (resting, feeding, predation event). I also record with the same method any long distance call produced by a different group from my focal. During these sessions I record: hour of start, hour of end, direction with a compass where the vocalization come from, the estimated distance, and which howler species is howling. I also record the location and the reaction of my focal group. The long distance calls of both species are clearly different.

After a whole year of taking data of the four groups I will start in January 2008 with the experimental part of the project. I am going to do playback experiments during 6 months, until June 2008. For the experiments in each of my treatments, I will change: The species which produces the vocalisation and the position of the experiment within the home range of the group. For this experiments I will use a SONY CD player and a Technomad Vernal speaker.

To describe the vocal repertoire of both species and to obtain the material for the playback experiments, I am already recording every type of vocalization in every individual of each group, using a Sennheiser ME67 microphone and a Hi-MD recorder SONY MZ-RH1. Using the scan sampling method, every 10 minutes I record the activity of all individuals in the group and any vocalization related to the observed behaviour.

Preliminary results:

I conducted 62 transect surveys between March and October 2005, obtaining an encounter rate of 0,3 groups/10km for *A. guariba* and 0,4 groups/10km for *A. caraya*. Censuses will be carried once per month during 2008. Chiarello and de Melo (2000) estimate

the density for *A. guariba* in 14 different places from Brazil and in most places (except for 3) they estimate much higher density values, than in El Piñalito. The same low-density situation occurs for *A. caraya* in relation to its density in other places from Argentina (Arditi and Placci, 1990)

Between September 2005 and September 2007, I observed 37 group encounters from both howler species. 60% of these encounters were between groups of the two different howler species and 40% were between groups of the same howler species. I also noticed that the encounters between groups of different howler species, were mostly pacific and without long distance calls (except for two encounters), but 86% of the intra-specific encounters, involved the use of long distance calls and aggressive interactions between the members of the groups.

Discussion:

The very low density of both howler species in El Piñalito (when compared with densities in other places) could represent a very serious threat for *A. guariba*, the Atlantic forest endemic howler species threatened by extinction. Since this is the first long term study with howler monkeys in the Atlantic forest of Argentina, it is extremely important to continue working in order to understand the situation of its population in Argentina.

The low density of groups of howler monkeys in El Piñalito resulted in low group encounter rate in this site, when compared to other sites in Brazil and Argentina. Preliminary results about the home ranges of the four study groups in El Piñalito, show a greater home range overlap between groups from different howler species than between groups of the same howler species. Hence, it is not strange that most groups encounters occurred between groups of different species. The analysis of our data on the diet of both howler species would be very important in order to understand why some group encounters are more aggressive and include long distance calls, while other are pacific and silent. The observed pattern of inter-specific encounters occurring without long distance calls and intraspecific ones with long bouts of long distance calls highlights differences in species-specific behaviours of howlers in El Piñalito. This makes this study site a unique place to understand the function of the roaring behavior in *Alouatta* spp.

Education and Outreach:

In November 2005 Mario, Ilaria and I participated in a provincial Festival in San Pedro, organized by students of the Park Ranger School and local authorities of Misiones, and

presented a talk about the situation and the behavioral ecology of the howler monkeys in El Piñalito.

In December 2005 we organized a talk in the local primary school of El Piñalito. Most children don't know the monkeys and they have never been to the park, so with the aid of pictures and sounds, we showed them how the monkeys live and what things are bad for the monkeys. One of the local problems with the brown howler in Misiones is that sometimes, local people take the monkeys out of the park and keep them as pets at home. So in June 2007, I was collaborating with Kristina Cockle (another RSG grantee working in "The Parana Pine Forest Project: Argentina") and with a local teacher from San Pedro, to design posters for a campaign to protect the brown howler monkey, directed to the local people from San Pedro.

In November 2006, we organized a talk in the Park Ranger School in San Pedro with Agustin Paviolo (a RSG grantee, working with the jaguar in the Atlantic Forest) to talk about the different research projects carried out in the province of Misiones. In December 2006, three students of the Park Ranger School (Olga Villalba, Luis Cardoso and Leonardo Netter) came to El Piñalito to collaborate with the howler monkey project.

During 2007, we collected faeces samples from both howler monkey species in El Piñalito, for two research projects. One project ("Genetic variability and Phylogeography from *A. caraya* and *A. guariba*") carried out by Dr. Luciana Oklander, an Argentinean researcher working in the Universidad Pontificia de Porto Alegre, Brazil. The other project ("Management and conservation of Neotropical Primates, free and in captivity: Genetics, Behaviour and Education") carried out by Dr. Marta Mudry in the Universidad Nacional de Buenos Aires.

In winter 2008, two biologists from the Universidad Nacional de La Plata, Melina Brivodoro and Romina Pfoh, are going to start their PhD projects with the howler monkeys in El Piñalito. Both began their primate work experiences in 2005 and 2007 collaborating as field assistants with Ilaria Agostini and me. To gain more experience and to familiarize themselves with the site and the monkeys, they will be collaborating with my PhD project, helping me with my playback experiments in the first part of 2008.

Ilaria's PhD project and mine are gathering complementary basic information about the population status and the behavioural ecology of these two monkeys living in the Atlantic Forest of Argentina. The results of both projects will be used to conduct a population viability analysis (PVA) of the brown howlers in Argentina. With the results of this PVA and the

participation of other researchers, NGOs, and national and local authorities, we will promote the development of a management plan for this endangered population.

Expenses (in £):

1 £ = 6,44 Argentinian Pesos

	Budgeted from RSG	Spent (RSG)	Spent (other sources*)	To Spend (RSG, January to June 2008)
Field equipment	360	810	960	90
Field running costs	2,000	1550	2,915	450
Local Transportation	900	620	825	280
Office running costs	200	---	165	---
Field Personnel	1,000	800	880	200
Communications, Participation in Conferences	340	---	---	---
Unexpected	200	200	440	---
TOTAL	5000	3980	6185	1020

* The field work started in January 2005 supported by other grants received by the Project Director, Mario Di Bitetti from the Scott Neotropical Fund, Primate Conservation Inc., and the Primate Action Fund. Ilaria Agostini received a Conservation Grant from the International Primatological Society in 2006 (column 4, Spent, other sources). During 2007 and 2008 the project is being supported by the Rufford Small Grant and a fellowship by CONICET (Consejo Nacional de Investigaciones Científicas y Tecnológicas) to Ingrid Holzmann. Since I had to spend an extra amount of expenses, to acquire the new field equipment needed to work with the vocalizations, the expenses for Communications and participation in conferences and the office running cost were covered with my fellowship from CONICET.

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Some pictures of the monkeys:



Photo 1: Two females of black howler monkeys (*A. caraya*). “Salome” and her daughter “Azucena” resting in an Araucaria Pine. Photo by Ilaria Agostini.

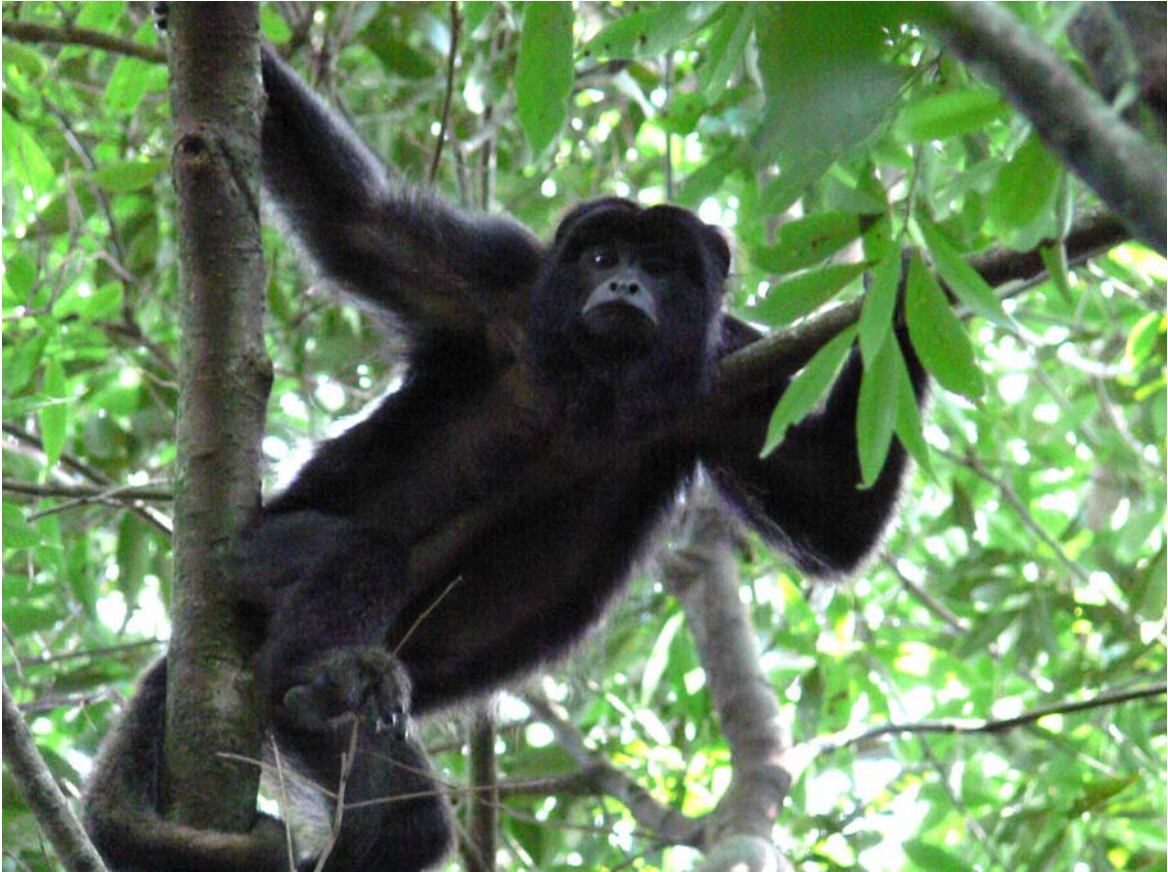


Photo 2. A young adult male (*A. caraya*), "Picciotto" resting in the forest. Photo by I.A.



Photo 3. Part of the group "Cosacos" (*A. guariba*) resting in the forest.



Photo 4. "Rasputin" the alpha male from the group "Cosacos" scanning in an araucaria pine. Photo by I.A.