Searching for *Alouatta palliata* in Northern Colombia: Considerations for the Species Detection, Monitoring and Conservation in the Dry Forests of Bolívar, Colombia

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Articles

SEARCHING FOR *ALOUATTA PALLIATA* IN NORTHERN COLOMBIA: CONSIDERATIONS FOR THE SPECIES DETECTION, MONITORING AND CONSERVATION IN THE DRY FORESTS OF BOLÍVAR, COLOMBIA

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Abstract

The conservation status of *A. palliata*, commonly referred to as black mantled howler monkey, is vulnerable in Colombia because of its decline in population. The distributional limit in the northeast of the country is not well defined and the dry forests of the north of the country are being destroyed at alarming rates. In the municipality of El Guamo (Bolívar) less than 20% of the landscape is composed of forests. The two largest remnants of forests in the municipality have extensions of 3,544.7 and 879.6 ha each. From interviews with the community, I concluded that habitat loss is the main threat to primate populations. 37.6 % of the community of inhabitants said they had seen the monkey in the municipality of Guamo, however, I found no *A. palliata* during a short transect sampling. Individuals of the species *Alouatta seniculus* and *Saguinus oedipus* were detected during these walks. Conservation actions such as reforestation, establishment of agroforestry systems and corridors designed to improve the habitat of *A. palliata* should encourage the participation of the human communities.

Key Words: Black mantled howler monkey, primate conservation, dry forests, Colombia, El Guamo.

Resumen

El estatus de conservación de *A. palliata*, mico aullador negro, en Colombia es vulnerable debido al decremento en las poblaciones. El límite de distribución hacia el noreste del país no es bien definido y los bosques secos del norte del país están desapareciendo rápidamente. En El Guamo (Bolívar) menos del 20% del paisaje esta compuesto por bosque. Los dos remanentes de bosque mas grandes tienen extensiones de 3,544.7 y 879.6 ha respectivamente. De entrevistas con la comunidad se concluyó que la perdida de hábitat es la mayor amenaza para las poblaciones de primates. 37.6% de la comunidad de habitantes de El Guamo afirmó haber visto la especie en el área del municipio, sin embargo ningún individuo de *A. palliata* fue encontrado durante el recorrido de un transecto piloto. Individuos de las especies *Alouatta seniculus* y *Saguinus oedipus* fueron encontrados durante las caminatas. Las acciones de conservación en conjunto con las comunidades rurales deben ser una prioridad en la propuesta de actividades como la reforestación, el establecimiento de corredores y de sistemas agroforestales con el objetivo de mejorar las condiciones de hábitat para poblaciones de *A. palliata*.

Palabras Clave: Mico aullador negro, conservación de primates, bosques secos, Colombia, El Guamo.

Introduction

Although *A. palliata* is one of the best studied neotropical species (Neville *et al*., 1988; Defler, 2004), little is known about the state of its populations, its ecology and its geographic distribution in Colombia. *A. palliata* is listed in CITES in Appendix I and by the IUCN as Low Concern (LC), because its populations are considered abundant and stable. However in Colombia, the loss of habitat and the pressure of hunting have affected populations negatively, and presently the species is classified as vulnerable (VU) in the red lists of the IUCN for Colombia (Cuarón *et al*., 2003).

A. palliata is distributed throughout southern Mexico as well as much of Central America to the west coast of Colombia and Ecuador. In Colombia, the range of *A. palliata* includes the entire pacific coastal lowlands, except in flooded areas (Hernández-Camacho and Cooper, 1975; Defler, 2004)*;* the distribution of *A. palliata* in the North of the country is poorly defined (Defler, 2004). A specimen of the species collected by Carriker in the Cartagena region during the early 1900's (and information provided by Dugand during the 1950's about the presence of the species in a locality close to the study site of this research), suggests that the distribution of the species to the northeast

could be greater than indicated in some distribution maps (Defler, 2004). However, the few studies carried out in the Montes de Maria (Mountains of Mary), in the departments of Sucre and northern Bolivar, including Cartagena region, have not reported *A. palliata.*

The research I conducted was carried out in 2005 under the regional conservation strategy for threatened species of the Corporacion Autonoma Regional del Canal del Dique (CARDIQUE), a governmental organization with jurisdiction in the northern and central parts of the department of El Bolivar. The interest of this organization in the populations of *A. palliata* are due to a variety of reasons: the conservation status of the species in Colombia, the unknown distribution of the species in the north of the country, the lack of knowledge about the ecology of the species in dry forests of the country and lastly the repeated sightings of the species in the area.

Methods

Study Area

El Guamo is located in the department of Bolivar in northern Colombia, west side of the Magdalena River between the municipalities of Calamar and San Juan de Nepomuceno. It is located between 10° 08' and 9°57' N, and 75°05'74° 47' W. Its altitude lies between 25 and 100 m above sea level. Mean annual rainfall in this region is about 1185 mm. The area presents a dry period between December and April, and a rainy season between May and November, with a decrease in rainfall during June and July. The annual average for temperature is 28°C, with insignificant fluctuations through the year, and the annual average for relative humidity is 77% (IDEAM, 2005). The total municipality area is about 39,000 ha.

This research was divided into 4 phases: 1) identification and description of the forested landscape patterns using remote sensing 2) meetings and interviews with the community 3) pilot study and 4) description of the habitat.

Description of the forested landscape patterns using remote sensing

The description of forested areas in El Guamo was done through analysis of an ASTER satellite image taken in May of 2004 during the rainy season for a better estimation of vegetation. The analysis was done using ARC GIS. Vegetation was identified by using the Normalized Difference Vegetation Index ratio (NDVI) (NASA, 2010). The description of the landscape pattern, applied only to the patches of forests, followed the methodology for numerical and spatial data processing in landscape ecology, (Forman and Gordon, 1986; Farina, 1998), including: a) dimensions of individual elements, b) landscape composition, and c) spatial arrangements of elements. Overall analysis was focused on the identification of potential areas for monitoring and conservation of *A. palliata* with consideration of the habitat requirements of the species.

Focus groups and interviews

I conducted focus groups and interviews with the community members of El Guamo in each of the main villages in order to determine the presence of *A. palliata* in the municipality. During the focus groups I presented visual material such as pictures, only after the community described the species they allegedly saw, in order to confirm the accuracy of the information. The questions asked during the focus groups and interviews were: have you seen the black howler monkey in the forests of this area? if yes, where have you seen it?, how long ago did you see it?, are monkeys frequently hunted for bushmeat?. I asked these questions in order to confirm the presence of the species in the region and also, to determine possible locations, as well as main threats. Participation was voluntary, all responses were anonymous and no incentives were offered to survey responders. I asked the questions to each participant and the information was collated using a questionnaire during the focus groups and interviews.

Pilot census of Alouatta palliata

In 2005 I conducted a pilot census in order to determine the presence of the species in the area. The site was selected taking into account information provided by inhabitants of the region, accessibility and security. However, the presence of illegal armed groups in the area (paramilitares and guerrillas) did not allow the application of probabilities sampling. Therefore the selection of a survey site was biased by external factors. I conducted the census of *A. palliata* using the line transect method. A transect of 2000 m was cut in a fragment of forest called "La Reserva" (28.7 ha) (Figure 1). The pilot census were conducted in the morning starting at 6:00 am (during the maximum time spent by *A. palliata* in howling and traveling (Muñoz *et al.*, 2001)), and finishing

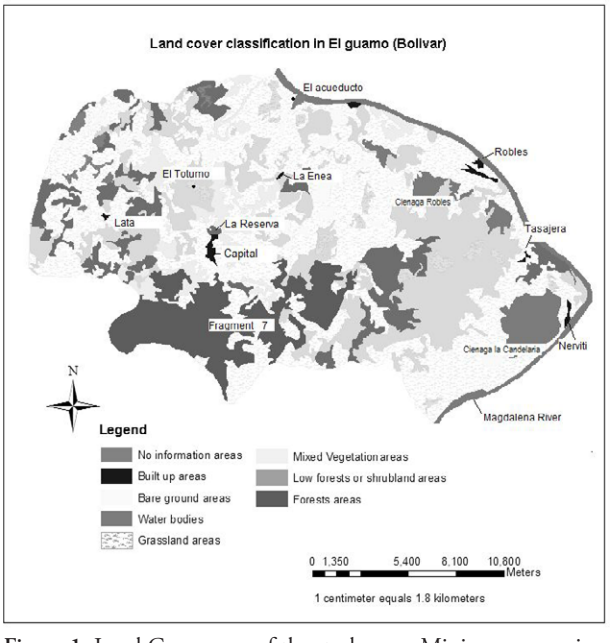

Figure 1. Land Cover map of the study area. Minimum mapping unit: 10 ha. Elaborated by Andrea Dechner.

at 12:00m, due to rainy afternoons. The speed of the walks was 1 km/h, with stops of 5 minutes each 100 m for visual or auditory indications of the presence of animals.

Description of the habitat

In order to characterize the floristic composition and structure of the vegetation of the area, a single quadrant of 1,000 m^2 was established in the area selected for the census of *A. palliata*. All trees in the quadrant with a diameter at breast height (DBH) greater than or equal to 10 cm were identified. I measured variables such as tree height, DBH, and cover, as well as altitude, presence of erosion processes and terrain inclination. Taxonomic identification of collected samples relied on Gentry (1993) and Mahecha (1997), as well as by comparison with specimens from the MOBOT- Missouri Botanical Garden.

Results

Description of the Forested Landscape Patterns Using Remote Sensing

The municipality of El Guamo consists of 38,270 ha mainly covered by grasslands or croplands (17,166 ha), followed by low forests or shrublands (8,281 ha) and well developed forests (6,834 ha) (Table 1). Forested areas represent 17.9% of the total study area and are mainly located to the south towards the border with the municipality of San Juan de Nepomuceno. There are 31 fragments of forest, presenting an average size of 220 ha. The fragment sizes vary between 10 ha (the MMU or minimum mapping unit) and 3544 ha (Table 2).

The largest fragment of forest is the fragment N° 7. It is located to the south of the capital and has an extension of 3,544 ha (Figure 1). It represents 53% of the total area of forests. However, this fragment presents small perforations which were not mapped due to their small size (i.e. under the assigned MMU). In addition it has a very irregular shape (CPA Corrected Perimeter Area Ratio = 4.6). Fragments N° 10 and 3 present the second and third largest extensions with 880 and 266 ha respectively.

The nearest neighbor observed mean distance between forests was 1,956 meters and the nearest neighbor ratio based on feature centroids had a value of 0.94. This indicates that the spatial pattern of the fragments of forests is random, neither clustered or dispersed. According to the directional distribution of the fragments of forests, the largest fragments of forests are located to the south and are connected with other forests located outside El Guamo.

Focus groups and interviews

I conducted 141 interviews in 7 different localities of the municipality of El Guamo during July-August 2005. These localities include El Guamo (capital of the municipality, 58 interviews), Nerviti (27 interviews), Tasajera (21 interviews), El Totumo (12 interviews), La Enea (5 interviews), Robles (10 interviews), and El Acueducto (8 interviews). About 62% of the participants interviewed said they have never seen *A. palliata*, while 38% said they have seen the species. Participants from localities such as La Enea and Robles affirmed they have never seen a black howler monkey, while more than the 40% of the interviewers in localities such as El Guamo, Nerviti and Tasajera said they have seen the species in nearby areas.

Approximately 30% of the interviewees said they have seen the monkey in Lata, followed by El Totumo (29%), Casablanca (12%), San Luis (9%) and La Reserva (9%). Locations where the sightings had been less included Desconsolado, Cerro de Maco, El Yucal and La Venta. The people who have seen the species more recently (i.e. between July 2004 and July 2005) said they have seen it between April and July 2005 in El Totumo, between January and April 2005 in La Reserva and Lata, and between July 2004 and January 2005 in localities such as San Luis and La Venta. Localities where it had not been seen recently include Casablanca.

Table 1. Area and relative abundance of cover types in the study area. The mixed vegetation category was given to those areas with 2 or more types of cover, where each cover had less than 10 ha (MMU).

Cover type	Total area (ha)	Relative abundance (%)
Forest	6,834.0	17.9
Low forest or shrubland	8,281.0	21.6
Mixed vegetation	2,212.0	5.8
Grassland or cropland	17,165.5	44.9
Water Bodies	2,310.8	6.0
Bare Ground	1,112.9	2.9
Built up areas	189.2	0.5
No Information	165.2	0.4
Total	38,270.7	100.0

Table 2. Characteristics of patches of forest in the study area. Table shows the details of the 3 largest fragments.

Fragment #	Area (ha)	Perimeter (m)	Patch shape	Relative abundance (%)
7	3,544.7	99,806	4.7	51.9
10	879.6	33,259	3.2	12.9
3	266.1	16,367	2.8	3.9
Following 28 fragments	2,143.8	167,779	55.8	31.3
Minimum	10.1	1373	1.2	0.1
Maximum	3544.7	99806	4.7	51.9
Average	220.5	10233.3	2.1	3.2
Total	6834	317231	66.5	100

Only 2.8% of the total participants said monkeys are frequently hunted for bushmeat. Hunted species included *Alouatta seniculus* (red howler monkey) and *Cebus capucinus* (white throated capuchin monkey). In addition, visits to places in El Guamo, La Enea and Robles, where the presence of monkeys in captivity was confirmed, uncovered no individuals of *A. palliata* in captivity. However some inhabitants said they had a black howler monkey in captivity in the past. Individuals of the species *Cebus capucinus* (white throated capuchin monkey) and *Saguinus oedipus* (cotton top tamarin), were found in captivity.

Census of Alouatta palliata

The area selected for the census of the species was La Reserva which has an extension of 28.7 ha (Fragment N° 15) (Figure 1). Although a small percentage of the interviewees said they have seen the species there, the selection of the area was made based on a convenience (non-probability) sampling due to the presence of illegal armed groups (paramilitares and guerrillas). In total I walked a distance of 22 km and no individuals of *A. palliata* were found. Troops of other primates such as *Alouatta seniculus* and *Saguinus oedipus* were observed during the census (Table 3).

Table 3. Information on the individuals of the species *Alouatta seniculus* and *Saguinus oedipus* found during the census in La Reserva.

Species	# of individuals observed	Location (Coordinates)
Alouatta seniculus	2	10°02'24.00"N, 74°58'34.49"W
Saguinus oedipus	5	10°02'24.73"N, 74°58'29.80"W

In addition, during informal walks, a troop of 9 individuals of the species *Saguinus oedipus* was observed on a single tree in a semi-open area in a place called El Acueducto (10°06'53.18" N, 74°56'41.25" W).

Description of habitat

The total tree species richness with DBH≥ 10cm was 14 species (32 individuals) in a total area of 1,000m^2 (0.1 ha). The Shannon-Weaver species diversity index was 2.2, and the Simpson diversity index was 0.8. The families with higher number of species were Leguminosae with 4 species, followed by Bignoniaceae with 2 species. Only one species was found for the rest of the families (Table 4). The most abundant species were *Astronium graveolens* (Anacardiaceae) with 34.4% of the individuals found, followed by *Bursera simaruba* (Burseraceae) and *Caesalpinia* sp. (Leguminosae), each with 12.5% of the species found.

The mean tree height was 9.4 m; the tallest trees measured were a *Girocarpus americanus* and *Caesalpinia* sp., with a total height of 16 m each; whereas the minimum height registered was for a *Cordia* sp. with 4 meters of height. The average tree diameter at breast height was 20.8 cm with a maximum diameter of 59.5 cm. The total basal area of all the tree species was 10.1m^2/ha. *Caesalpinia* sp. makes the greatest contribution to this value with 26% of the total

Table 4. Floristic composition of 0.1 ha vegetation plot in the study area.

Family	# sp.	%	Species	# ind	%
Anacardiaceae	1	7.1	*Astronium graveolens*	11	34.4
Apocynaceae	1	7.1	*Aspidosperma polyneuron*	1	3.1
Bignoniaceae	2	14.3	*Tabebuia bilbergii*	1	3.1
			Tabebuia rosea	1	3.1
Boraginaceae	1	7.1	*Cordia* sp.	2	6.3
Burseraceae	1	7.1	*Bursera simaruba*	4	12.5
Capparidaceae	1	7.1	*Capparis odoratisima*	1	3.1
Euphorbiaceae	1	7.1	*Hura crepitans*	1	3.1
Hernandiaceae	1	7.1	*Girocarpus americanus*	2	6.3
Leguminosae	4	28.6	sp 1	1	3.1
			Caesalpinia sp.	4	12.5
			Acacia sp.	1	3.1
			sp 2	1	3.1
Rubiaceae	1	7.1	*Alseis* sp.	1	3.1
Total	14	100	-	32	100

basal area, followed by *Astronium graveolens* with 21% of the total basal area. *Caesalpinia* sp. is dominating in the upper canopy with 53% of the crown cover, followed by *Astronium graveolens* (14%) and *Bursera simaruba* (6%).

Discussion

Dry forests, such as those in El Guamo, Bolivar, are considered the most endangered major tropical ecosystem because their original area has been reduced by more than 90%, and less than 2% of what remains is protected (Janzen, 1986). By 1997 only 1.5% of the original cover of the dry forests remained in Colombia (IAVH, 1997). In comparison to other ecosystems, dry forests are more exposed to human disturbances due to a variety of reasons: 1) the climate, 2) the forest structure, which make easier to cut them down for agriculture, 3) the soils, which are more fertile than the soils of rainforests, and 4) in many areas like in El Guamo, the geomorphology, which is highly suitable for livestock. Consequently, tropical dry forests are under increasing pressure and the status of conservation of this ecosystem is critical for large areas of South America (Janzen, 1986).

In El Guamo, grassland or cropland compose the matrix of the landscape being the most extensive and contiguous element in the landscape. Forests in the study area were highly fragmented, under increasing threat of being replaced for agricultural or cattle grazing lands, reducing the areas with potential value for the monitoring and conservation of biodiversity. The fragments of forests presented an irregular shape which increases significantly the amount of habitat affected by the edge effect, consequently altering plant composition, structure and the functionality of the forests (Laurance *et al*, 1997).

Considering that the habitat availability depends on the extension of the area, and that largest fragments would contain sufficient habitat to meet the needs of the species (Saunders *et al*., 1991; leigh *et al*., 1993), the largest remaining fragments should be first in consideration for monitoring and conservation actions for *A. palliata*. The average size of the fragments of forests is 220 ha, which is a favorable number considering that *A. palliata* presents a home range that varies between 10 and 60 ha (Chivers, 1969) and that the average daily path ranges between 123 and 443 m (Milton, 1980; Estrada, 1982, 1984). The nearest neighbor ratio indicates that the forest fragments are not clustered, which may have negative implications on the movement of the species that inhabit these areas. Actions toward increasing connectivity of the fragments should be considered in order to reduce the impact of the fragmentation.

Although only 37.6% of the stakeholders interviewed said they have seen the monkey, the fact that the physical descriptions of the species provided by them were so accurate (i.e. black face, body not completely black, with brown fur in the back) reinforce the idea that although in very low densities, *A. palliata* may be in the area. Also, as expressed by some farmers, the species is living sympatrically with *Alouatta seniculus* as reported by Hernandez-Camacho and Cooper (1975) in the west of the Atrato River of Colombia.

Localities such as Lata and El Totumo, should be priorities in selecting sampling areas for monitoring because results from the interviews with the community suggest the presence of the monkey in these areas (Figure 1). From the interviews it can be concluded that hunting is not currently the main threat for populations of the species. Instead, the continuing loss of forested areas to cattle grazing and crop cultivation is the main threat to species in the region. The absence of sightings of the species during the pilot study may have been due to the low density or absence of the species in the sampled area (La Reserva) and the short length of the transect (22 km). In addition, the likely absence of the species in the sampled area may have been due to habitat degradation and isolation.

The forests of the sampled area are secondary forests, and the tree species richness (14 spp.) is lower than the average richness registered in other dry forests (24.7 spp.) (Gentry, 1995). This low tree species richness value may be explained as the result of the different levels of human disturbance and selective logging. Also, the difference between species richness values may be due to the sampling size and to the fact that I sampled 0.1 ha using a single quadrant (20 × 50 m) and not 10 2 × 50 m transects like in the studies reported by Gentry (1995). Results of the most important families in number of species showed that as reported for other dry forests (Gentry, 1995; Mendoza, 1999), Leguminosae was the most speciose family (4 spp.). The second most speciose family was Bignoniaceae (2 spp.), which is described by Gentry (1995) as the "undisputed number two family of woody plants of neotropical dry forests".

Results of this study showed that by comparison with the diet of *A. palliata* in other dry forests, the potential species to be used as a source of food by *A. palliata* in the area of El Guamo include *Astronium graveolens* (Glander, 1981) with 30% of relative abundance in the study area, *Bursera simaruba* (Serio-Silva *et al*., 2002) with 13% of relative abundance, and several species of the genera *Cordia* (Estrada, 1984) also with 13% of relative abundance in the study area. Being folivore and because of their wide diet that includes mature leaves, young leaves, flowers and fruits (Glander, 1981), *A. palliata* has more food available to them in comparison with non-folivore primates. However, the food supply of the species can be affected by the phenology of the species they feed on. The relationship between the seasonality, availability of resources and the behavior in primates has been widely studied (Hladik, 1977; Overdorff, 1993; Gursky, 2000). In tropical dry forests, which are characterized by 4–6 months of drought, seasonal climate and tree phenology are not highly correlated. Phenology varies widely among plant species with shoot

growth and flowering occurring either after the leaves are dropped during the dry season or during the beginning of the rainy season (Borchert 1994, 1996).

According to the climatic information, the area of El Guamo presents a dry period between December and April, and a rainy season between May and November, with a decrease in rainfall during June and July. Plant species such as *Astronium graveolens* and *Bursera simaruba* being abundant in the study area may provide an important amount of food to the populations of *A. palliata* almost all year round. *Astronium graveolens* has been classified as drought-deciduous species with young leaves that appear together with the flowers immediately after leaf shedding during the dry season. This species can also be used for reforestation activities due to its ability to grow under full light (Marin and Flores, 2002). Similarly, *Bursera simaruba* has been described as a deciduous species, with flowering of leafless trees during the dry season and fruits almost year round. *Bursera simaruba* grows well in either poor or rich soils and adapts to severe drought periods. It has a fast germination with 80–100% of germination reaching maturity after 15 years (Navarrete-Tindall and Orellana Nunez, 2002).

In regard to the structural development of the sampled forests, results showed that the canopy height and basal area registered are lower than those registered in other dry forests. In such forests, the average canopy height varies between 10 and 40 m and the basal area varies between 17 and 40 m2/ha (Murphy and Lugo, 1986). These differences in structural terms may be the result of disturbance activities in the area. Selected areas for censusing and conservation activities should include structurally well developed forests. Fedigan *et al*. (1998) suggested that as structural requirements, *A. palliata* only feed and rest in trees that are sufficiently large to support their weight (with a minimum DBH of 20 cm and a preferred DBH of 63 cm). Then, although the habitat of the sampled area can meet the structural requirements of the species, its relatively low structural development may be the cause of the low densities or absence of the *A. palliata* in some areas and of the restricted presence of the species in other areas with greater structural development. Therefore, it is necessary to consider conservation actions in order to enhance the suitability of all the fragments of forests in the area.

Considerations for the conservation of *Alouatta palliata* in the dry forests of northern Colombia

Dry forests of El Guamo are under increasing pressure to be turned into areas for agricultural use and cattle grazing. This implies that most of primates that live in these forested areas and require relatively well developed forests are threatened, and the conservation of their habitats should be a priority in proposing strategies of conservation in the region. Conservation strategies should include actions directed to the restoration of some fragments and of the connectivity between them in order to increase the suitability of the habitat. Towards these actions, working with farmers and land owners to reduce habitat destruction is very important. Encouraging forest corridors through the cut areas will improve their habitat by allowing howlers monkeys to move between fragments of forests (Horwich, 1998). Agroecosystems with cacao, coffee and mixed plantations have proved to have a positive effect on enhancing forest habitat for primates (Estrada, 2006)

In agricultural areas, it is essential to encourage actions such as: (1) promoting the planting of food species for howlers and (2) establishing corridors to enhance the connection between isolated forests (Horwich, 1998). Choosing species that are used by *A. palliata* as resource of food could radically improve their habitat. Although species of the genus *Ficus* are an important food source for *A. palliata* (Horwich, 1998; Ramírez-Orjuela and Sánchez-Dueñas, 2005), species of this genus were not considered in this study because of their preference for humid areas.

Restoration actions should be done by planting fast to medium growing native species of trees encountered in the dry forests of the area preferred as a resource of food by *A. palliata.* Trees to be planted include *Brosimum alicastrum* and *Anacardium excelsum*. *Brosimum alicastrum* remains green during the dry season, thus being a reservoir of food for many species (Rocas, 2002). *Anacardium excelsum* drops its leaves for a short period of time (Fournier, 2002). Additionally, other species of the genera *Brosimum* and *Anacardium excelsum* were reported as food resource for *A. palliata* in the Chocó region in Colombia (Ramírez-Orjuela and Sánchez-Dueñas, 2005). Other potential species to be used in restoration activies are: *Spondias mombin*, *Muntingia calabura, Guazuma ulmifolia* and *Gliricidia sepium*. *Spondias mombin* produces fruits that are consumed by livestock and by humans, also its fruits and both young and mature leaves are consumed by *A. palliata* (Serio-Silva *et al*., 2002). *Muntingia calabura* is a very fast-growing evergreen tree characterized for being drought-resistant (Morton, J. 1987). *Guazuma ulmifolia* and *Gliricidia sepium* are fast growing medium trees that may also be used as living fence (Suttie, 2000). Additionally, *Guazuma ulmifolia* may be a source of food for livestock (Little and Wadsworth, 1964). All these tree species may play an important role in the establishment of activities to improve the suitability of habitat of populations of *A. palliata* by providing food resources to the species, services to the rural community, and by allowing and encouraging the forest regeneration.

One of the main limitations to any monitoring and conservation action in the area is the presence of illegal groups, although such topic is out of the scope of this paper, it is important for governmental and non-governmental organizations to set realistic objectives and conservation actions, as well as to make constant presence in these areas to be recognized by the different actors of the conflict as neutral in order to reach desired conservation objectives.

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