



Nest sites of Brumback night monkey (*Aotus brumbacki*, Primates, Aotidae) in fragmented landscapes of Colombian Llanos

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Resumen

Aotus brumbacki es un primate nocturno endémico de los Llanos Colombianos, que usa huecos en árboles vivos y muertos para dormir. El objetivo de este estudio es describir los tipos de nidos usados por *A. brumbacki* en paisajes fragmentados y relictuales en los Llanos Colombianos. Las observaciones se hicieron durante censos en paisajes de San Martín y durante búsquedas de dormitorios usando entrevistas en paisajes de Villavicencio, Acacias y Cumaral. Los paisajes en los que se encontraron los nidos fueron clasificados de acuerdo con el porcentaje de bosque presente en: fragmentados 10.2-29% y relictuales 1.9-7.3%. Se caracterizaron 24 nidos. En los paisajes de Villavicencio, Acacias y Cumaral, los nidos estuvieron dentro de fragmentos de bosque, en sus bordes o en cercas vivas (2-8m altura). Mientras que, en los paisajes de San Martín, se encontraron en fragmentos de bosque y morichales y en sus bordes (8-18m). Las plantas usadas incluyeron especies de las familias Moraceae, Fabaceae, Combretaceae, Meliaceae, Poaceae, Apocynaceae y Arecaceae. Este estudio resalta la diversidad de sitios usados como dormitorios influenciada por la disponibilidad de especies de planta que deben ser consideradas en proyectos de reforestación y conectividad.

Palabras clave: *Aotus brumbacki*, Mico de noche llanero, dormitorios, paisajes fragmentados, paisajes relictuales

Abstract

Aotus brumbacki is an endemic nocturnal monkey from Colombian Llanos, which use tree holes in dead and live trees to sleep. This study aim is to describe the type of nesting sites used by *A. brumbacki* in fragmented and relictual landscapes at Colombian Llanos. Observations were made during census in San Martín landscapes, and nest searches using

interviews in Villavicencio, Acacias and Cumaral landscapes. Landscapes in which nest were found were classified according to percentage of forest cover present in the landscape as fragmented: 10.2-29% and relictual: 1.9-7.3%. A total of 24 nests were characterized in this study. In Villavicencio, Acacias and Cumaral landscapes, nest sites were located inside forest fragments, at its edges or in living fences (2-8m height). While in San Martin landscapes nest were found inside forest and *Mauritia flexuosa* swamp fragments and at its edges (8-18m). Plant species used includes species from Moraceae, Fabaceae, Combretaceae, Meliaceae, Poaceae, Apocynaceae and Arecaceae families. This study highlights nest sites diversity influenced by plant species availability, that need to be considered in reforestation and connectivity projects.

Key words: *Aotus brumbacki*, Brumback night monkey, nests sites, fragmented landscapes, relictual landscapes

Resource availability is a constrain for species survival, including food scarcity, mates and nesting sites (Janson & Chapman 1999; Fernandez-Duque & van der Heide 2013). Species of genus *Aotus* spp. sleep in tree holes in dead and living trees, and in tall trees with a combination of climbers, vines and epiphytes (Aquino & Encarnación 1986; Fernandez-Duque et al. 2008; Shanee *et al.*, 2013). However, tree holes and tall trees are scarce in fragmented landscapes, a limited resource. Despite this, *Aotus* species are found in small forest fragments (<50ha) in fragmented landscapes of Peru and Colombia (Shanee *et al.*, 2013, Montilla *et al.*, 2021).

Aotus brumbacki is an endemic nocturnal primate of Colombian Llanos. It is distributed in piedmont of Colombian Llanos, in gallery forest, *Mauritia flexuosa* swamps and lowland forest fragments (Defler 2010; Carretero-Pinzón & Defler 2019; Carretero *et al.*, 2020; Shanee *et al.*, 2023). It has been poorly studied despite its endemism and vulnerable status (Solano 1995; Vargas 2011; Carretero-Pinzón 2013; Carretero *et al.*, 2020; Vargas-Gomez *et al.*, 2023). No nest sites information was given in previous studies, which is relevant for its conservation due to its limited availability. This study aim is to describe nest types used by *Aotus brumbacki* in fragmented and relictual landscapes of Colombian Llanos, Meta department.

Observations of *A. brumbacki* nest were made during census (2012, 2016-2024, n=34, N3 35.226 W73 27.405) in San Martin landscapes and nest search using interviews (2023- 2024, n=84, 4.290032, -73.515975) in Villavicencio, Acacias and Cumaral landscapes (Figure 1). Landscape fragmentation degree is based on forest cover percentage using ArcGIS Pro from a no-forest/forest map (IDEAM 2016) updated using Landsat8 images from 2023. Landscapes were of variable size (1640-9307ha, n= 11) with 5 fragmented (% forest cover 10.2-29%) and 6 relictual (% forest cover 1.9-7.3%) (McIntyre & Hobbs 1999). Nest characterization was based on vegetation (Aquino & Encarnación 1986).

A total of 24 nests of *A. brumbacki* were characterized. Nest sites were in forest fragments, in *Mauritia flexuosa* swamp fragments, its edges or in living fences, with variable fragment size (0.5-205ha), and in fragmented and relictual landscapes (Table 1). In Villavicencio, Acacias and Cumaral landscapes, nest height varies from 2-8m and were from species of Moraceae (*Ficus* spp.), Fabaceae, Combretaceae, Meliaceae and Poaceae families. One group was sleeping in a house roof (Table 1). While in San Martin landscapes nest height

varies from 8–18m. Plant species used includes species of Apocynaceae, Moraceae (*Ficus* spp.) and Arecaceae (*M. flexuosa*, *Oenocarpus bataua*) families (Table 1).

Ad libitum observations showed that nest sites were used for continuous days and then leave it for several weeks/months to then use it again during the same year. For example, a tree hole nest used during December (2022) and January several times was then used again in March, July and October (2023). Other nests were used more permanently for some months and not used since then.

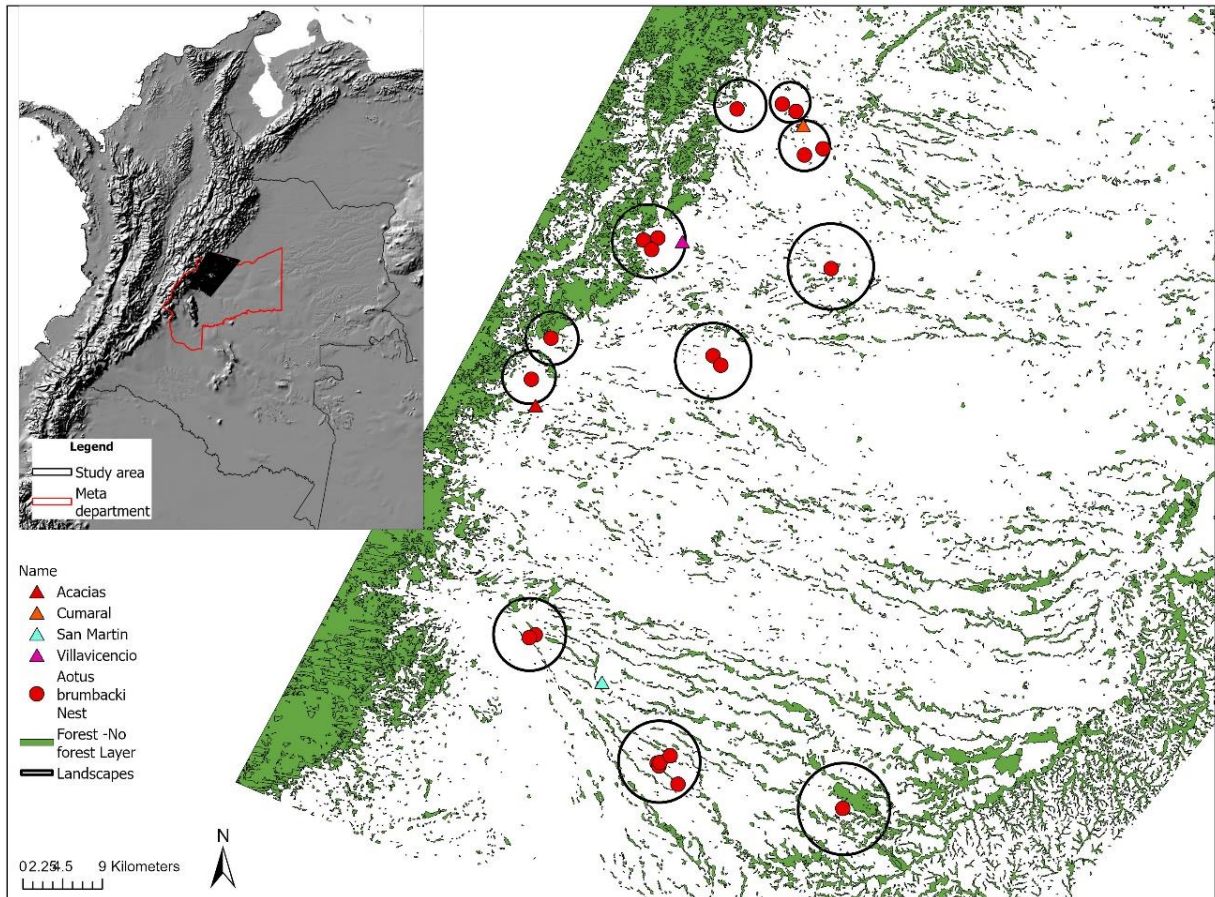


Figure 1. Nest site locations in each landscape studied in Colombian Llanos.

Table 1. Description of nests used by *Aotus brumbacki* in landscapes studied in Colombian Llanos.

Nest type	Description	No. Nest observed/ type	Nest height	Nest plant species (Family)	Fragment Size	Landscape fragmentation degree (McIntyre & Hobbs 1999): Fragmented: 10-60% forest cover, relictual: >10%
Holes in living trees	Hole in living trees	10	6-12m	<i>Ficus americana</i> , <i>Ficus cf. obtusifolia</i> , <i>Ficus</i> spp (Moraceae), <i>Terminalia catappa</i> (Combretaceae)	0.5-35ha	Relictual and fragmented
Holes in dead trees and palms	Like "holes in trunks and branches of dry or senescent trees" Aquino & Encarnación (1986)	5	4-12m	<i>Oenocarpus bataua</i> and, <i>Mauritia flexuosa</i> (Arecaceae), <i>Himantanthus articulatus</i> (Apocynaceae), <i>Inga</i> spp. (Fabaceae)	1-8ha	Relictual and fragmented
Live palms	Live palms	1	15m	<i>Oenocarpus bataua</i> and, <i>Mauritia flexuosa</i> (Arecaceae)	205ha	Fragmented
Vine tangles	Like "simple sites among thickets and dense foliage" Aquino & Encarnación (1986)	2	8-12m	Indeterminate	4-28ha	Fragmented
Guadua/bamboo stands	Isolated stands of Guadua/bamboo (F. Poaceae)	5	>2.5m	<i>cf. Guadua angustifolia</i> (Poaceae)	1-5ha	Relictual and fragmented
Human constructions	House roof	1	2m	NA	NA	Fragmented

This study highlights nest sites diversity used by *A. brumbacki* in fragmented and relictual landscapes, which are typically found in >50% of its distribution range (Carretero *et al.*, 2010). Their flexibility to use different nest types increase its adaptability to fragmented landscapes. Live palm use as nest only was observed in large fragments due to its closed canopy that provides less exposure to wind and solar light, compared with smaller and more degraded fragments. Use of vine tangles and tree holes as nests are reported for *Aotus azarae* (Fernandez-Duque *et al.*, 2008) and *Aotus miconax* (Shanee *et al.*, 2013). Two types of nests described by Aquino and Encarnación (1986) characterized by epiphyte plants presence weren't observed in this study.

Nest on Guadua/bamboo stands are not reported for this genus and were lower in height than all nest types reported for *Aotus* spp (>15m height) (Aquino & Encarnación 1986; Shanee *et al.*, 2013). However, other primates use Guadua stands as nest, e.g. *Alouatta seniculus* in fragmented landscapes in Colombia (Gomez-Posada *et al.*, 2009; Carretero-Pinzón pers. obs.). The use of introduced species as nests such as *Terminalia catappa* (Combretaceae), also highlight its flexibility in nest choices.

Slight differences in nest heights observed between San Martín landscapes and all other nest in this study, can be related to human activities. All landscapes in San Martín are large cattle ranching farms (>150ha), while all landscapes in Villavicencio, Acacias and Cumaral are surrounded by urbanizations, small farms and roads, with higher degradation and probably less availability of tall trees. On the other hand, nest use pattern observed is like that observed in detailed studies of *A. azarae* (Fernandez-Duque *et al.*, 2008) and *A. miconax* (Shanee *et al.*, 2013). Nest site choice seems influenced by plant species availability; therefore, reforestation and connectivity projects should consider plant species used as nests to increase this species persistence.

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References

- Aquino R, Encarnación F. 1986. Characteristics and use of sleeping sites in *Aotus* (Cebidae: Primates) in the Amazon lowlands of Peru. *American Journal of Primatology* 11(4): 319 - 331. <https://doi.org/10.1002/ajp.1350110403>
- Carretero-Pinzón X. 2013. An eight-year life history of a primate community in the Colombian Llanos. In: Marsh LK, Chapman CA, editors. *Primates in fragments: complexity and resilience, developments in primatology: progress and prospects*. New York: Springer. pp 159–182.
- Carretero-Pinzón X, Defler TR. 2019. Primates and flooded forest in the Colombian Llanos. In: Barnett AA, Matsuda I, Nowak K, editors. *Primates in flooded habitats: ecology and conservation*. Cambridge, UK: Cambridge University Press. pp 153–162. <https://doi.org/10.1017/9781316466780>
- Carretero X, Guzmán-Caro D, Stevenson PR. 2020. Brumback's night monkey: *Aotus brumbacki*. IUCN. <https://www.iucnredlist.org/species/39915/17923405#geographic-range> Accessed January 13, 2024.
- Defler TR. 2010. *Historia Natural de los Primates de Colombia*. Bogotá, Colombia: Universidad Nacional de Colombia
- Fernandez-Duque E, Di Fiore A, Carrillo-Bilbao G. 2008. Behavior, ecology and demography of *Aotus vociferans* in Yasuní National Park, Ecuador.

- Fernandez-Duque E, van der Heide G. 2013. Dry season resources and their relationship with owl monkey (*Aotus azarae*) feeding behavior, demography and life history. *International Journal of Primatology* 34: 752 – 769
- Gómez-Posada C, Alvarez Z, Giraldo-Chavarriaga P. 2009. Densidad y estatus poblacional de monos aulladores rojos en un gradual, fragmento aislado, La Tebaida, Quindío, Colombia. *Universitas Scientiarum*, 2009, Vol. 14: 8 – 15.
- IDEAM. 2016. Bosque y No-bosque 2016. <http://www.siac.gov.co>
- Janson CH, Chapman CA. 1999. Resources and primate community structure. In: Fleagle JG, Janson CH, Reed KE, editors. *Primate communities*. Cambridge: Cambridge University Press. pp. 237–267.
- McIntyre S, Hobbs R. 1999. A framework for conceptualizing human effects on landscapes and its relevance to management and research models. *Conservation Biology* 13(6): 1282-1292.
- Montilla SO, Mopán-Chilito AM, Sierra Murcia LN, Mahecha Triana JD, Caro Ruiz OM, Montoya-Cepeda J, Gutierrez-Barreto DA, Holguín-Vivas JA, Agámez CJ, Perez-Grisales LJ, Cruz-Moncada M, Corredor-Durango NJ, Chavez Diaz EA, Cardona-Cardona AH, Franco-Perez E, Rivera-Ospina AM, Link A. 2021. Activity Patterns, diet and home range of night monkeys (*Aotus griseimembra* y *Aotus lemurinus*) in tropical lowland and mountain forest of central Colombia. *International Journal of Primatology* <https://doi.org/10.1007/s10764-020-00192-1>
- Shanee S, Allgas N, Shanee N. 2013. Preliminary observations on the behavior and ecology of the Peruvian night monkeys (*Aotus miconax*: Primates) in a remnant cloud forest patch, northeastern Perú. *Tropical Conservation Science* 6(1): 138 – 148
- Shanee S, Tirira DG, Aquino R, Carretero-Pinzón X, Link A, Maldonado AM, Mendez-Carvajal P, Urbani B, Wallace RB, Juarez CP, Fernandez-Duque E. 2023. Geographic distributions of owl monkeys. In: Fernandez-Duque E. *Owl Monkeys: Developments in Primatology: Progress and Prospects*. Springer. <https://link.springer.com/book/10.1007/978-3-031-13555-2>
- Solano C. 1995. Patrón de actividad y área de acción del mico nocturno *Aotus brumbacki* hershkovitz 1983 (Primates: Cebidae) Parque Nacional Natural Tinigua, Meta, Colombia. (Undergraduate Thesis). Bogotá, Colombia: Pontificia Universidad Javeriana.
- Vargas-Gómez M. 2011. Vocalizaciones de *Aotus brumbackii* (Hershkovitz, 1983) y su relación con las actividades en vida Silvestre, San Martín (Meta, Colombia). (Undergraduate thesis). Bogotá, Colombia: Pontificia Universidad Javeriana.

Vargas-Gomez M, Gomez-Castañeda FS, Niño-Moreno M, Carretero-Pinzón X. 2023. Fruit consumption by the endemic Brucmback night monkey (*Aotus brumbacki*, Primates, Aotidae) in forest fragments of Colombian Llanos. *Mammalogy Notes* 9(2): 394 – 398. <https://doi.org/10.47603/mano.v9n2.394>

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