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Natural History

Unexpected Victims: Roadkill of Primates in the Fragmented Landscape of the Middle Magdalena, Colombia

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Resumen

Reportamos cinco (5) eventos de primates platirrinos hallados en la Autopista Ruta del sol, en paisaje del Valle del Magdalena Medio, Colombia. Específicamente, reportamos cuatro (4) atropellamientos y un evento de avistamiento vivo. Los atropellamientos ocurrieron entre octubre de 2024 y octubre de 2025, dos individuos de la especie *Cebus versicolor* categorizada como En Peligro (EN) según la IUCN. Consecuentemente, en junio de 2025 se registró un subadulto de *Alouatta seniculus* categorizada como preocupación menor (LC). Finalmente, en octubre de 2025 se registró un individuo de *Aotus griseimembra* (VU). Aunque estas especies son principalmente arbóreas, *C. versicolor* y *A. griseimembra* exhiben comportamientos terrestres, lo que aumenta su vulnerabilidad de colisionar con vehículos, tal como se observó con un adulto de *C. versicolor* avistado en diciembre del 2024 mientras se encontraba inmóvil en la autopista, rodeado de plantaciones de palma de aceite. Esto sugiere que los individuos podrían estar cruzando carreteras al nivel del suelo entre parches de bosque aislados. Estas observaciones, resaltan una amenaza compleja para los primates en paisajes tropicales fragmentados. Enfatizamos la necesidad de integrar infraestructura sensible a los primates, como puentes de dosel, así como la implementación de señalización de cruces de fauna silvestre y el monitoreo sistemático. Adicionalmente, esta evidencia debe ser incorporada en la planificación vial y las estrategias de mitigación de colisiones vehiculares en áreas fragmentadas con alta biodiversidad.

Palabras clave: Cruces de fauna silvestre, Ecología de carreteras, Platyrrhini; Primates amenazados, .

Abstract

We report five (5) events involving platyrrhine primates found in the Ruta del Sol highway, in the landscape of the Middle Magdalena Valley, Colombia. Specifically, we report four (4) roadkills and one living sighted event: The roadkills occurred between October 2024 and October 2025, two individuals of *Cebus versicolor*, a species categorized as Endangered (EN) by the IUCN. Subsequently, in June 2025, a subadult *Alouatta seniculus* (Least Concern, LC) was documented, and later October 2025, an individual of *Aotus griseimembra* (Vulnerable, VU) was found. Although these species are primarily arboreal, *C. versicolor* and *A. griseimembra* exhibit terrestrial behaviors that increase their vulnerability to vehicle collisions, as observed in December 2024 when an adult *C. versicolor* was seen motionless on the highway surrounded by oil palm plantations. This suggests that individuals may be crossing roads at ground level between isolated forest patches. These observations highlight a complex threat to primates inhabiting fragmented tropical landscapes. We emphasize the need to integrate primate-sensitive infrastructure, such as canopy bridges, as well as the implementation of wildlife crossing signs and systematic monitoring. Additionally, this evidence should be incorporated into road planning and vehicle collision mitigation strategies in fragmented areas of high biodiversity.

Key words: Endangered primates, Platyrrhini, Road ecology, Wildlife crossings.

Roads are essential transportation infrastructures that facilitate social and economic connectivity; however, they are also a major driver of biodiversity loss (Van Der Ree et al. 2011; Coffin et al. 2021; Kaiser & Barstow 2022). In the Americas, roads promote deforestation and fragmentation, resulting in barrier effect, edge effect, and direct wildlife mortality, thereby creating landscapes that disproportionately impact terrestrial vertebrates (Meza et al. 2019; Pinto et al. 2020; Galetti et al. 2021, Angarita-Corzo et al. 2025). While roadkill is a well-documented threat to terrestrial mammals, its impact on arboreal species such as primates is rarely addressed (Arango-Lozano & Patiño-Siro 2020; Linden et al. 2022; Praill et al. 2023). In fact, most reported cases of primate mortality in Colombia and other American countries associated with road infrastructures are linked to electrocution from power lines running alongside highways (Montilla et al. 2020; Pereira et al. 2020; Azofeifa-Rojas 2023), as well as isolation in small forest fragments, and human-primate conflict (da Silva et al. 2015; Galea & Humble 2022; Praill et al. 2023).

Here, we present five cases of primates found on the Ruta del Sol Highway, with four of them ending road-killed by vehicles and one as a living sighted event: the varied white-fronted capuchin (*Cebus versicolor*), the red howler monkey (*Alouatta seniculus*), and the Caribbean night monkey (*Aotus griseimembra*). The varied white-fronted capuchin is an Endangered (EN) primate species with a limited distribution restricted to the Middle Magdalena Valley in northern Colombia, possibly extending into border regions of Venezuela (Link et al. 2021a). The species inhabits lowland moist forests and natural palm swamps within a severely fragmented habitat, with a continuing decline in the number of mature individuals (Ruiz-García et al. 2010; Rondon et al. 2017; Link et al. 2021a), and an estimated area of occupancy of approximately 316 km² (Henao-Díaz et al. 2020). The red howler monkey is a widely distributed American primate currently listed as Least Concern (LC), due to its broad range across South America and relative ecological flexibility (Link et al. 2021b). Despite its conservation status, the red howler monkey is susceptible to habitat

fragmentation, hunting, and collisions with human infrastructure, particularly in regions undergoing rapid land-use change and deforestation (Palacios & Rodriguez 2001; Gómez-Posada & Londoño 2012). The Caribbean night monkey, a species restricted to lowland areas below 1000 m in the inter-Andean valleys of Colombia, is currently classified as Vulnerable (VU) by the IUCN and faces significant threats from habitat modification and climate change (Arango-Lozano et al. 2025).

The Ruta del Sol highway in Middle Magdalena is one of Colombia's main transport corridors linking the central and southern regions with the Caribbean and running parallel to the Magdalena River for over 1.000 km (Meza et al. 2019). Our study covered a 100 km stretch of National Route 4511 between the outskirts of Cimitarra and Barrancabermeja (Santander). About 70% of this section is dual carriageway and 30% single-lane, with speed limits ranging from 80–100 km/h depending on the road type. The route is heavily used by cargo trucks transporting goods nationwide (Meza et al. 2019), without any wildlife crossings. We recorded the roadkill and living sighted primate events as follows:

On October 27, 2024, we recorded an adult varied white-fronted capuchin (*C. versicolor*) roadkilled at 127+100 kilometers (6.9426° N, -73.7102° W; 109 masl). On December 22, 2024, we observed a living adult *C. versicolor* standing still on the road at kilometer 132+000 o national route 4511 (coordinates: 6.982670°N, -73.695218°W; 162 masl). On February 9, 2025, residents from rural areas of Cimitarra reported another roadkilled capuchin at kilometer 64+300 of National Route 4511 (Ruta del Sol), near the Carare River (6.526425° N, -74.078918° W; 192 masl). These individuals were identified as *C. versicolor*, characterized by reddish-brown limbs, yellowish ventral fur, and their occurrence within the known range of the species in the Middle Magdalena Valley (Pérez-Gómez et al. 2025; Figure 1 a,b,c; Figure 2 a,b,c). The first and second individuals were identified as adult males. The third, also presumed male from photographs, was no longer present upon our arrival, likely removed by scavengers.

On June 19, 2025, we recorded a roadkilled red howler monkey (*A. seniculus*) at kilometer 108+500 of the national route 4511 (coordinates: 6.803692°N; -73.800065° W; 149 masl). The individual was identified based on its reddish coat and the presence of a gular sac, both characteristic features of the genus *Alouatta,* as well as its occurrence within the recorded distribution in the region (Pérez-Gómez et al. 2025, Figure 1d, Figure 2d).

Finally on October 8th 2025 we recorded a roadkilled individual of Caribbean night monkey (*A. griseimembra*) in the kilometer 126+150 (6,938489° N, -73,713712° W; 161 masl), the individual was identified by its gray, dense and wooly fur, a relatively small head marked on the top with three black fur lines, big red eyes masked by white-cream shades, a belly color of yellow to orange, and a non-prehensile tail which is spotted black (Fernandez-Duque 2023, Arango-Lozano et al. 2025; Figure 1e, Figure 2e). Unfortunately, it was not possible to obtain any biological tissue sample from these individuals, as the encounters were opportunistic and we did not hold the necessary legal permits for tissue collections.

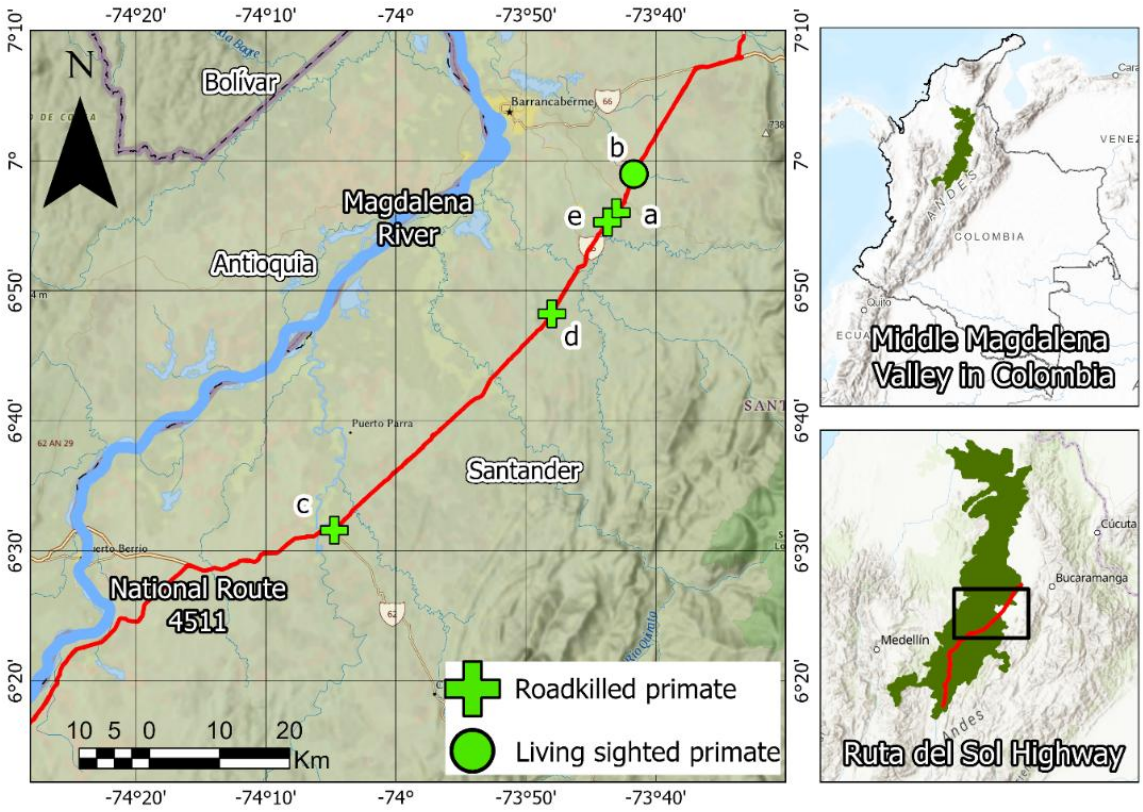

FIGURE 1. Records of primates in the Ruta del Sol Highway, Middle Magdalena Valley, Colombia. Green crosses represent confirmed roadkill events, while green circles indicate living sightings. a, b, c = *Cebus versicolor*, d = *Alouatta seniculus*, e = *Aotus griseimembra*.

The Middle Magdalena Valley is home to several primate species, many of which are threatened or endemic to Colombia. These include *Ateles hybridus* (CR), *Cebus versicolor* (EN) endemic for Colombia, *Oedipomidas leucopus* (VU) endemic for Colombia, *A. griseimembra* (VU), among others (de Luna & Link 2018; Henao-Díaz et al. 2020; Roncando-Duque 2021; Trujillo-Arias et al. 2023). All these species face severe pressures from deforestation and habitat degradation, which have been directly linked to populations in the Middle Magdalena Valley region. For example, *A. hybridus* has experienced dramatic population reduction due to forest loss (de Luna & Link 2018). Additionally, habitat fragmentation influences behavioral modifications, such as the observed ground-nesting behavior in *A. griseimembra* (Arango-Lozano et al. 2024), and may also disrupt genetic variation, as suggested by the report of an albino *A. griseimembra* individual (Montilla & Link 2022), potentially indicating inbreeding or genetic isolation. Beyond these well-documented threats, our findings highlight the specific risk of direct mortality caused by roadkill. In fragmented landscapes where canopy continuity is lost, and movement between forest patches is increasingly occurring at ground level, primates are becoming more exposed to vehicular collisions (Linden et al. 2022; Praill et al. 2023). This adds a critical dimension to primate conservation in Colombia, warranting urgent attention and integration into conservation strategies.

While mortality from roadkill in American primates is rare, our findings highlight this threat due to transportation infrastructure (da Silva et al. 2015; Praill et al. 2023). The

documentation of *A. seniculus,* a species currently classified as Least Concern (Link *et al.* 2021b), already raises concerns about the vulnerability of primates to road infrastructure in this fragmented region. Furthermore, records of roadkilled *C. versicolor* and *A. griseimembra*, Endangered and Vulnerable species respectively, with restricted distributions and ongoing habitat loss (Link et al. 2021a; De Aquino et al. 2022; Arango-Lozano et al. 2025), add to the known threats, highlighting that road infrastructure may pose a critical concern for primate conservation.

Given the isolated occurrence of *C. versicolor* populations in the Middle Magdalena Valley, even a single mortality event may have long-term demographic consequences. Our observations of the *C. versicolor* individuals roadkilled and the one living sighted (Figure 1b) suggest that they use terrestrial pathways, including road edges, to move between forest remnants, possibly due to canopy discontinuity. This behavioral shift dramatically increases their exposure to vehicular collisions and illustrates how road networks, when superimposed onto fragmented habitats, can become lethal barriers for already imperiled primate species (Linden et al. 2022; Praill et al. 2023).

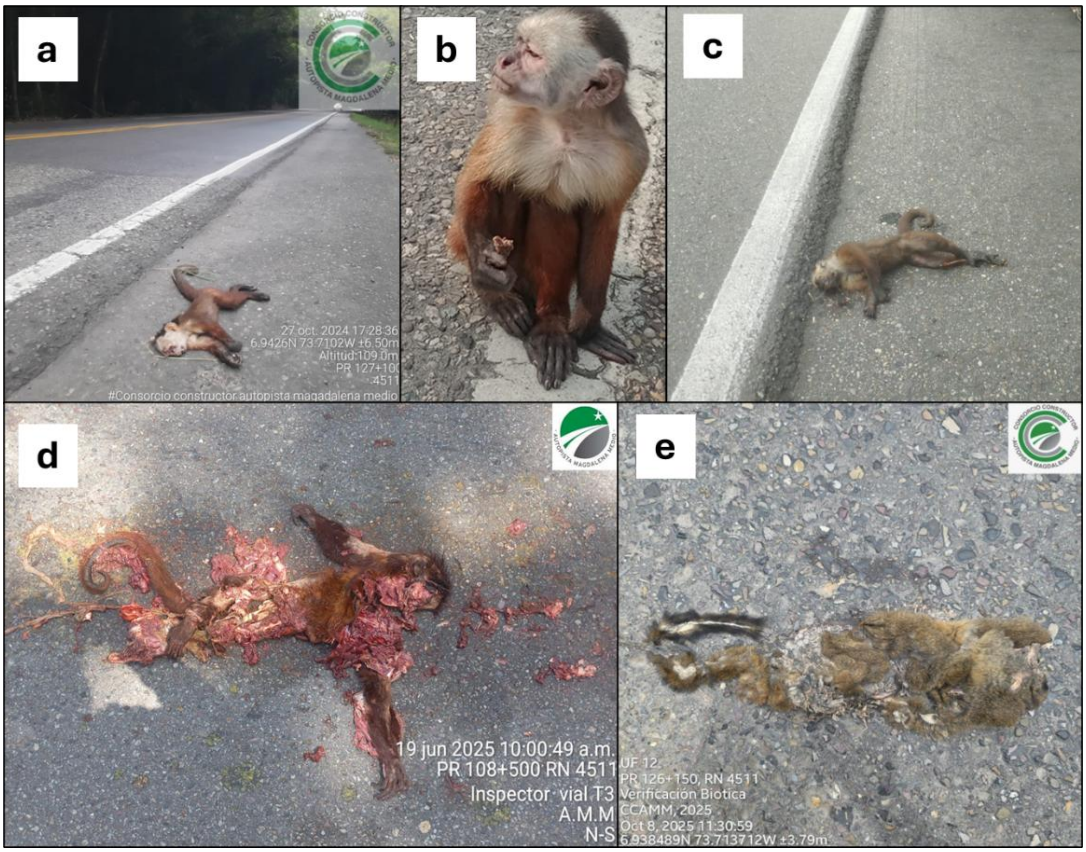

FIGURE 2. Detailed view of primates on the Ruta del Sol highway; individuals (a, c) roadkilled, (b) living sighted of *Cebus versicolor*; (d) roadkilled individual of *Alouatta seniculus*; (e) roadkilled individual of *Aotus griseimembra*.

The documentation of roadkill events involving primates from the Middle Magdalena Valley region remains rare in scientific literature. These species are generally assumed to move across fragmented landscapes via forest canopies, and when fatalities do occur, they are most often attributed to electrocution from power lines rather than direct collisions with vehicles (Montilla et al. 2020). In our four cases, however, none of the sites where primates were found contained overhead power lines that would suggest electrocution as the cause of death. Although our identification relies solely on photographic evidence and field observations, and we acknowledge the possibility of other contributing factors, such as illness, disorientation, or stress or actively foraging between coverages (da Silva et al. 2015; Montilla et al. 2020; Pereira et al. 2020; Moreno-Niño et al. 2024), no necropsies were performed. Therefore, our records only support vehicular collision as the most likely cause of death.

Although *C. versicolor*, *A. seniculus* and *A. griseimembra* are primarily arboreal, several studies have documented occasional terrestrial activity that may increase their exposure to road hazards. In Brazil, wild capuchins evidenced a strong link between tool use and terrestrial foraging behavior, frequently manipulating stones and other materials on the ground (Barrett et al. 2018; Falótico & Ottoni 2023). Similarly, occasional ground locomotion and foraging by *A. seniculus* have been reported in open savannas of the Colombian Orinoquía (García-Restrepo & Gómez-Sánchez 2021). While *A. griseimembra* exhibits specific nesting behaviors in Middle Magdalena that reflect its terrestrial habits in response to land-use changes (Arango-Lozano *et al*. 2024), such pressures may force these organisms to move across roads in search of new canopy areas.

In highly fragmented areas such as the Middle Magdalena Valley, where forest cover is often reduced to narrow, disconnected patches surrounded by agricultural matrices, primates may face a binary choice: remain isolated in small fragments or descend to cross open ground, both scenarios carrying significant ecological and demographic risks (Linden et al. 2022; Praill et al. 2023). Our findings call for the integration of road ecology into primate conservation strategies in Colombia. This includes the implementation of wildlife crossing structures, such as canopy bridges, systematic monitoring of roadkill incidents, and habitat restoration initiatives to improve landscape connectivity (Lindshield 2016; Baechli et al. 2021; Galea & Humle 2022; Meza-Joya 2023). By recognizing roads as active threats, conservation plans can more effectively address the cumulative pressures that fragmented habitats impose on already vulnerable primate populations.

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ETHICAL CONSIDERATION

No living primates were captured, handled, or manipulated during this study. All observations were made opportunistically during fieldwork focused on roadkill monitoring. When possible, carcasses of road-killed individuals were respectfully buried following local customs and guidelines for road ecology practices in Colombia, ensuring minimal disturbance to the environment and compliance with ethical standards.

REFERENCES

Angarita-Corzo K, Ceballos CP, Rojano-Bolaño C, Correa-Valencia NM. 2025. Impacto en la vida silvestre: una exploración del atropellamiento de fauna en carretera. Revista de Investigaciones Veterinarias del Perú 36(1). https://doi.org/10.15381/rivep.v36i1.27360

Arango-Lozano J, Patiño-Siro D. 2020. Does the geometric design of roads influence wildlife roakills? Evidence from a highway in Central Andes of Colombia. European Journal of Ecology 6(1):58–70. https://doi.org/10.17161/eurojecol.v6i1.13688

Arango-Lozano J, Angarita-Corzo K, Julio-Guzmán J, Yanes CA., Montilla SO. 2024. Ground Nesting Behavior of *Aotus griseimembra*: Rare Terrestrial Evidence in A Strictly Arboreal Species. Mammalogy Notes 10(2):433–433. https://doi.org/10.47603/mano.v10n2.433

Arango-Lozano J, Toro-Cardona FA, Montilla JSO, Ramirez-Chaves HE. 2025. Ecological Forecasting for Night Monkeys in the *Aotus lemurinus* Complex: Climate-driven Threats to Habitat Suitability. International Journal of Primatology, 46(2):556-572. https://doi.org/10.1007/s10764-024-00481-z

Azofeifa-Rojas I. 2023. Mortalidad por electrocución de monos congo (*Alouatta palliata*) debido a líneas eléctricas en Guanacaste, Costa Rica. Mesoamericana 25(1):15–21. Disponible en: https://revistas.up.ac.pa/index.php/mesoamericana/article/view/3820

Baechli J, Albanesi S, Bellis LM. 2021. Effectiveness of crossings as wildlife passages for mammals in the Yungas of Argentina. Journal for Nature Conservation 59:125944. https://doi.org/10.1016/j.jnc.2020.125944

Barrett BJ, Monteza-Moreno CM, Dogandžić T, Zwyns N, Ibáñez A, Crofoot MC. 2018. Habitual stone-tool-aided extractive foraging in white-faced capuchins, *Cebus capucinus*. Royal Society open science 5(8):181002. https://doi.org/10.1098/rsos.181002

Coffin Alisa W, Ouren Douglas S, Bettez Neil D, Borda-de-Água Luís, Daniels Amy E, Grilo Clara, Jaeger Jochen AG, Navarro Laetitia M, Preisler Haiganoush K, Rauschert Emily SJ. 2021. The ecology of rural roads: effects, management, and research. Issues in Ecology, Report No. 23. Ecological Society of America. 36 p.

da Silva LG, Ribeiro MC, Hasui E, da Costa CA, da Cunha RGT. 2015. Patch size, functional isolation, visibility and matrix permeability influences Neotropical primate occurrence within highly fragmented landscapes. PLoS One 10(2):e0114025. https://doi.org/10.1371/journal.pone.0114025

De Aquino I, González-Santoyo I, Link A, Muñoz-Delgado J. 2022. An exploratory study of cooperation: food-sharing behaviour in wild varied white-fronted capuchin monkeys (*Cebus versicolor*) in Central Colombia. Behaviour 159(13–14):1285–1300. https://doi.org/10.1163/1568539X-bja10180

de Luna AG, Link A. 2018. Distribution, population density and conservation of the critically endangered brown spider monkey (*Ateles hybridus*) and other primates of the inter-Andean

forests of Colombia. Biodiversity and conservation 27(13):3469–3511. https://doi.org/10.1007/s10531-018-1611-1

Fernandez-Duque E. 2023. Owl Monkeys: Biology, Adaptive Radiation, and Behavioral Ecology of the Only Nocturnal Primate in the Americas (pp. 325-352). Cham: Springer International Publishing.

Falótico T, Ottoni E. B. 2023. Greater tool use diversity is associated with increased terrestriality in wild capuchin monkeys. American Journal of Biological Anthropology 181(2): 312–317. https://doi.org/10.1002/ajpa.24740

Galea B, Humle T. 2022. Identifying and mitigating the impacts on primates of transportation and service corridors. Conservation Biology 36(1):e13836. https://doi.org/10.1111/cobi.13836

Galetti M, Gonçalves F, Villar N, Zipparro VB, Paz C, Mendes C, Bovendorp RS. 2021. Causes and Consequences of Large-Scale Defaunation in the Atlantic Forest. In: Marques, M.C.M., Grelle, C.E.V. (eds) The Atlantic Forest. Springer, Cham. https://doi.org/10.1007/978-3-030-55322-7_14

García-Restrepo S, Gómez-Sánchez DA. 2021. Registros ocasionales de *Alouatta seniculus* (Primates: Atelidae) en sabanas de la Orinoquia colombiana, San Martín de los Llanos, Meta, Colombia. Mammalogy Notes 7(1):212–212. https://doi.org/10.47603/mano.v7n1.212

Gómez-Posada C, Londoño JM. 2012. *Alouatta seniculus*: density, home range and group structure in a bamboo forest fragment in the Colombian Andes. Folia Primatologica 83(1):56–65. https://doi.org/10.1159/000339803

Henao-Díaz F, Stevenson P, Carretero-Pinzón X, Castillo-Ayala C, Pacheco J, Defer T. 2020. Atlas de la biodiversidad de Colombia. Primates. Mejores modelos con el apoyo de expertos. Atlas de la 441 Biodiversidad de Colombia. Instituto de Investigación de Recursos Biológicos Alexander von 442 Humboldt, Bogotá D. C., Colombia. 51 pp.

Kaiser N, Barstow CK. 2022. Rural transportation infrastructure in low-and middle-income countries: a review of impacts, implications, and interventions. Sustainability 14(4):2149 https://doi.org/10.1146/annurev.ecolsys.29.1.207

Linden B, Cuozzo FP, Sauther ML, Jonker WC. 2022. Impact of linear infrastructure on South Africa's primate fauna: The need for mitigation. Folia Primatologica 93(3-6):235–253. https://doi.org/10.1163/14219980-20211112

Lindshield SM. 2016. Protecting Nonhuman Primates in Peri-Urban Environments: A Case Study of Neotropical Monkeys, Corridor Ecology, and Coastal Economy in the Caribe Sur of Costa Rica. In: Waller, M. (eds) Ethnoprimatology. Developments in Primatology: Progress and Prospects. Springer, Cham. https://doi.org/10.1007/978-3-319-30469-4_19

Link A, Boubli JP, Lynch Alfaro JW. 2021a. *Cebus versicolor*. *The IUCN Red List of Threatened Species* 2021:e.T39952A81282279. https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T39952A81282279.en. Accessed on 07 July 2025.

Link A, Palacios E, Cortés-Ortiz L, Stevenson PR, Cornejo FM, Mittermeier RA, Shanee S, de la Torre S, Boubli JP, Guzmán-Caro DC, Moscoso P, Urbani B, Seyjagat J. 2021b. *Alouatta seniculus*. *The IUCN Red List of Threatened Species* 2021: e.T198676562A198687134. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T198676562A198687134.en. Accessed on 07 July 2025.

Meza FL, Ramos E, Cardona D. 2019. Spatio-temporal patterns of mammal road mortality in Middle Magdalena Valley, Colombia. Oecologia Australis 23(3). https://doi.org/10.4257/oeco.2019.2303.15

Meza FL. 2023. Road Permeability Index as a tool for mitigation planning of road impacts on wildlife in Colombia: a case study using mammals. Caldasia 45(1):66–75. https://doi.org/10.15446/caldasia.v45n1.94046

Montilla SO, Rios-Soto JA, Mantilla-Castaño JC, Patiño-Siro D, Bustamante-Manrique S, Botero-Henao N, Ramírez-Chaves HE. 2020. Eventos de electrocución de *Aotus lemurinus* (Primates: Aotidae) en los Andes Centrales de Colombia. Mammalogy Notes 6(2):183–183. https://doi.org/10.47603/mano.v6n2.183

Montilla SO, Link A. 2022. Albinism in a wild Caribbean night monkey (*Aotus griseimembra*) in a fragmented landscape in Colombia. Therya Notes 3:14–17. https://doi.org/10.12933/therya_notes-22-62

Moreno-Niño N, Salazar-Guzman AM, Rojas-Morales JA, Niño-Reyes A, Cárdenas-González C, Ceballos-Rivera O, Lozano-Flórez J. 2024. «Una última Cena». Mammalogy Notes 10(1):391. https://doi.org/10.47603/mano.v10n1.391.

Trujillo-Arias N, Serrano-Cardozo VH, Ramírez-Pinilla MP. 2023. Role of a campesine reserve zone in the Magdalena Valley (Colombia) in the conservation of endangered tropical rainforests. Nature Conservation Research. Заповедная наука 8(1):49–63. https://ncr-journal.bear-land.org/article/397

Palacios E, Rodriguez A. 2001. Ranging pattern and use of space in a group of red howler monkeys (*Alouatta seniculus*) in a southeastern Colombian rainforest. American Journal of Primatology: Official Journal of the American Society of Primatologists 55(4):233–251. https://doi.org/10.1002/ajp.1057

Pereira AA, Dias B, Castro SI, Landi MF, Melo CB, Wilson TM, Castro MB. 2020. Electrocutions in free-living black-tufted marmosets (*Callithrix penicillata*) in anthropogenic environments in the Federal District and surrounding areas, Brazil. Primates 61:321–329. https://doi.org/10.1007/s10329-019-00760-x

Pérez-Gómez K, Fernández-Rodríguez CR, Moreno-Niño N. 2025. Guía ilustrada de los mamíferos de Colombia. Primera edición. Editorial McMullan Publishers S.A.S, Cali-Colombia, 324 pp.

Pinto FA, Clevenger AP, Grilo C. 2020. Effects of roads on terrestrial vertebrate species in Latin America. Environmental Impact Assessment Review 81:106337. https://doi.org/10.1016/j.eiar.2019.106337

Praill LC, Eppley TM, Shanee S, Cunneyworth PM, Abra FD, Allgas N, Svensson MS. 2023. Road Infrastructure and Primate Conservation: Introducing the Global Primate Roadkill Database. Animals 13(10):1692. https://doi.org/10.3390/ani13101692

Roncando-Duque N. 2021. Effect of landscape modification on primate assemblages of the Magdalena River Valley, Colombia. Caldasia 43(2):261–273. https://doi.org/10.15446/caldasia.v43n2.84845

Rondón S, Ortiz M, León C, Galvis N, Link A., González C. 2017. Seasonality, richness and prevalence of intestinal parasites of three neotropical primates (*Alouatta seniculus*, *Ateles hybridus* and *Cebus versicolor*) in a fragmented forest in Colombia. International Journal for Parasitology: Parasites and Wildlife 6(3):202–208. https://doi.org/10.1016/j.ijppaw.2017.07.006

Ruiz-García M, Castillo MI, Vásquez C, Rodriguez K, Pinedo-Castro M, Shostell J, Leguizamon N. 2010. Molecular phylogenetics and phylogeography of the white-fronted capuchin (*Cebus albifrons*; Cebidae, Primates) by means of mtCOII gene sequences. Molecular Phylogenetics and Evolution 57(3):1049–1061. https://doi.org/10.1016/j.ympev.2010.09.002

Van Der Ree R, Jaeger JA., van der Grift EA, Clevenger AP. 2011. Effects of roads and traffic on wildlife populations and landscape function: road ecology is moving toward larger scales. Ecology and society 16(1). https://www.jstor.org/stable/26268822

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