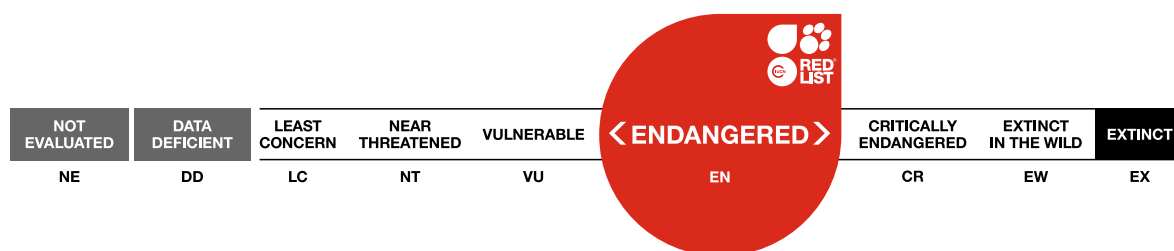# *Saimiri vanzolinii,* Black Squirrel Monkey

Assessment by: Lynch, J.W., Paim, F.P., Rabelo, R.M., Silva Júnior, J.S. & de Queiroz, H.L.

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	‹ ENDANGERED ›	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX

View on www.iucnredlist.org

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Primates	Cebidae

Scientific Name: *Saimiri vanzolinii* Ayres, 1985

Common Name(s):

- English: Black Squirrel Monkey, Black-headed Squirrel Monkey
- Portuguese: Macaco-de-cheiro

Taxonomic Notes:

Saimiri vanzolinii Ayres 1985 was described based on 13 specimens collected at the confluence of the Solimões and Japurá rivers and deposited in the Museum of Zoology at the University of São Paulo. The type locality is the northern shore of Lake Mamirauá, Amazonas, Brazil. Ayres (1985) allocated *S. vanzolinii* in the species group "*Saimiri boliviensis*" (Roman group), based on the taxonomic arrangement of Hershkovitz (1984). *Saimiri vanzolinii* was referred by Hershkovitz (1987) as a subspecies of *S. boliviensis*. Although no specimen was examined, Costello *et al*. (1993), based on the data described by Ayres (1985), considered *S. vanzolinii* as a junior synonym of *S. sciureus*. All subsequent authors followed Ayres (1985), considering *S. vanzolinii* as a valid species. Lynch Alfaro *et al*. (2015) analysed biogeographical and mitochondrial molecular data for the genus and concluded that *S. vanzolinii* is a valid species. More recently, Mercês (2018) performed an extensive morphological review of museum specimens of *Saimiri* species from throughout the Amazon basin; she also employed RAD-seq to sequence nuclear genomic markers to construct a *Saimiri* phylogeny. The nuclear genetic and morphological analyses by Mercês (2018) both provide strong evidence to place *Saimiri vanzolinii* as a distinct taxon and the sister species to *Saimiri boliviensis*.

Assessment Information

Red List Category & Criteria: Endangered A3c; B1ab(iii) ver 3.1

Year Published: 2021

Date Assessed: December 1, 2020

Justification:

This species is listed as Endangered, given that its entire range is confined to one location within an area of occupancy of 870 km², which is split into three geographically isolated subpopulations with no demographic or genetic exchange: Mamirauá Sustainable Development Reserve, Capucho and Tarará islands. Although this protected area is well managed and free of hunting, nonetheless it is susceptible to selective logging, especially along the main stream of the Solimões River. The most imminent threat to this habitat and the squirrel monkeys is climate change, which is predicted to radically disrupt the annual precipitation cycle for the entire specialized flooded forest environment that is the unique habitat for this species.

The popoulation size is a predicted to undergo a reduction of at least 50% within the next 30 years

(approximately three generations), based on an estimated continuing decline of nearly 100% in the quality of its habitat. In addition, the species' extent of occurrence is estimated at 3,116 km², significantly less than 5,000 km² (the threshold for Endangered criterion B1). *Saimiri vanzolinii* is known to exist in only one location, as defined by IUCN as 'a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present'—this is far smaller than the Endangered threshold B1a, which requires no more than five locations. There is a projected continuing decline in the quality of its entire habitat in the sole location for the species.

Previously Published Red List Assessments

2008 – Vulnerable (VU)
https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T19839A9023022.en

2003 – Vulnerable (VU)

2000 – Vulnerable (VU)

1996 – Vulnerable (VU)

1994 – Vulnerable (V)

Geographic Range

Range Description:

This species is highly endemic, occurring exclusively in flooded forests, mostly limited to the Mamirauá Sustainable Development Reserve. It probably has the smallest geographic distribution of any known Neotropical primate, with an area of occupancy of only 870 km² (Paim *et al*. 2013).

Country Occurrence:

Native, Extant (resident): Brazil (Amazonas)

Distribution Map
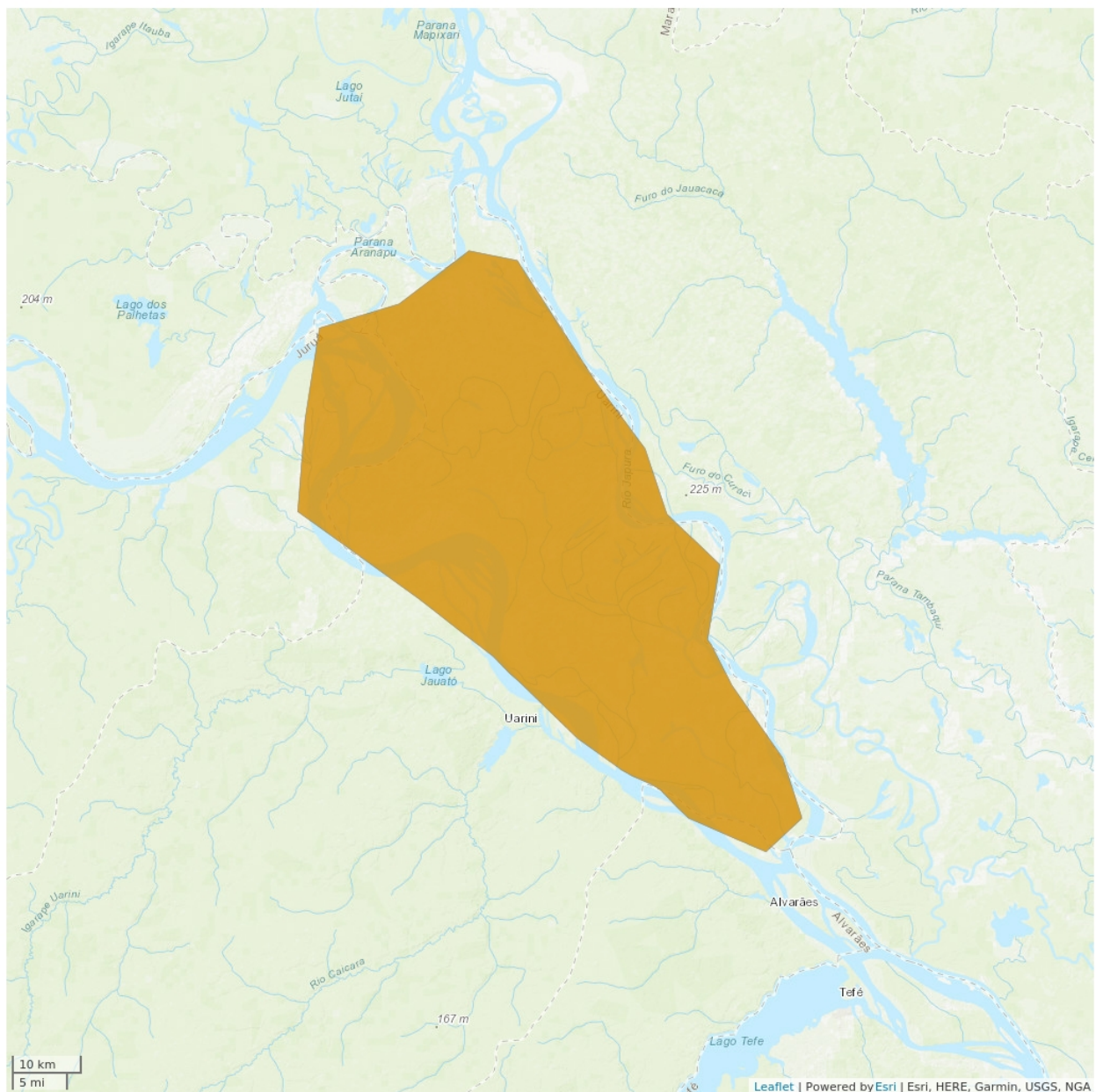
Legend

■ EXTANT (RESIDENT)

Compiled by:

IUCN (International Union for Conservation of Nature) 2008

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	‹ ENDANGERED ›	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX
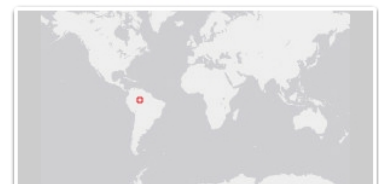
The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

Although it has a very small range, this species is common in a large part of that range. It has been recorded at a population density of 2.8 groups/km² (Ayres 1986). The species occurs in high densities, ranging from 293 to 439 individuals/km² (Paim *et al*. 2019).

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Typically, this species prefers seasonally inundated forests, river edge forests, floodplain forests and secondary forests. The monkeys use all levels of the forest, but forage and travel mainly in the lower canopy and understory. Locomotion involves predominantly quadrupedal walking and running.

Squirrel monkeys are small frugivorous-insectivores. They spend most of their time (60%) travelling and foraging for insects and fruit (Paim *et al*. 2017). Seasonality shows to be an important factor influencing their feeding behaviour. Despite fruit availability differs between extreme seasonal peaks (low- and high-water period), they consume fruits equally along the year, since figs are available year round (Paim *et al*. 2017).

Saimiri groups are multi-male-multi-female and can be large, up to 100 animals (larger groups are believed to be temporary and may be mergers of two smaller groups) but most frequently are of 20–75 individuals (Baldwin and Baldwin 1981, Terborgh 1983, Mitchell *et al*. 1991). In Mamirauá Reserve, densities did not vary along five consecutive years (2009–2013), showing a high general density, varying from 293 up to 439 individuals/km² (Paim at al., 2019). However, it is recommended to conduct a new survey to verify population trends after 2013.

As emphasized by Boinski (1999, 2005) and Boinski *et al*. (2005), although all squirrel monkeys are morphologically very similar, their social systems are quite distinct (Sussman 2000). However, there have been no studies on social system of this species to date. It is likely that its social organization is similar to that of *S. boliviensis*.

Mating and births in *Saimiri* are highly seasonal, seldom exceeding two months in duration. Single offspring. Mating usually occurs during the dry season. In *S.* oerstedii, sexual receptivity in females is synchronized, and lasts only or two days each season. In *S. sciureus*, birth synchrony is less pronounced and births occur only once every two years.

Amazonian *Saimiri* frequently form interspecific associations, travelling with *Cebus albifrons* or *Sapajus apella* (Terborgh 1983, Wallace *et al*. 2000), benefiting from the disturbance caused by the capuchin monkeys above them which flushes out insects. Associations between *S. vanzolinii* and *Sapajus macrocephalus* are very common (F. Paim pers. obs.).

Size: Adult male 950g, adult female 650g (Jack 2007).

Systems: Terrestrial

Threats (see Appendix for additional information)

Saimiri vanzolinii is primarily at risk from threats posed by future climate change, given that the species has a very small distribution, restricted to a single location, and its habitat quality is in continuing decline. Habitat suitability is expected to be extremely reduced by climate change (with the majority of the current preferred habitat likely to be completely degraded due to increased water levels in more extreme flooding events, because of changing temperature and precipitation patterns in what is now a seasonal floodplain), so we predict a significant population reduction of at least 50% over the next 30 years (approximately three generations).

Saimiri vanzolinii has the smallest extent of occurrence among all Neotropical primates (870 km²), which is split into three geographically isolated subpopulations with no demographic or genetic exchange: Mamirauá Sustainable Development Reserve, Capucho and Tarará islands (Paim *et al*. 2013). The entire species distribution is embedded in a floodplain forested ecosystem, called 'várzea', which is seasonally flooded by nutrient-rich white-water rivers (Prance, 1979). The current local annual flood pulse in the region has a vertical amplitude of up to 12 m (Ramalho et al., 2009), reaching its maximum around June and its minimum level between October and November (IDSM 2010). The species has a particular preference for using a vegetation type known as 'chavascal' (Paim 2008), which is a dense and species-poor shrub/tree community developed in old depressions, abandoned channels, and shallow lakes, that have the most varied inundation pattern and that are usually flooded during 105–125 days per year (Ferreira-Ferreira *et al*. 2015). The maximum inundation extent in the current species' range is projected to increase, at least, 10% by the end of this century (Sorribas *et al*. 2016), as well as the intensity and frequency of extreme flooding events that are expected to increase, at least, 20% in the same time period (Langerwisch *et al*. 2013). As all three subpopulations occur in the same floodplain (one location), a single extreme seasonal flooding event can rapidly (i.e., within a single generation: ~8 years) affect the entire range of the species. In addition to the longer and more frequent flooding events, the suitable habitat for the species is projected to be extremely reduced due to future changes in temperature and precipitation patterns.

Projected changes in precipitation and temperature will dramatically reduce the species' habitat suitability by nearly 100% within the next 30 years (approximately three generations), in both optimistic and pessimist future emission scenarios (Salles *et al* 2019, Rabelo and Paim, in prep). These predictions of climate change impacts on the species were made by robust species distribution modelling frameworks, following the *Guidelines for Using the IUCN Red List Categories and Criteria* (section 12.1.12; IUCN Standards and Petitions Committee 2019). It is not known yet if this continuing decline in the habitat suitability for the species will lead to a population reduction in the same proportion or if individuals will adapt to environmental conditions outside their range of current physical tolerance. However, it is unlikely that the species will be able to track shifts in suitable habitat due to its dispersal capabilities and, even with management actions, such as translocations, it would need to co-occur with strong potential con-generic competitors with overlapping dietary niches (*Samiri macrodon* and *S. cassiquiarensis*). Further studies are needed to better understand how the species will cope with this dramatic reduction in habitat suitability, but a population reduction within the next three generations of at least 50% is predicted.

Conservation Actions (see Appendix for additional information)

As noted, the species occurs almost entirely inside the Mamirauá Sustainable Development Reserve (1,124,000 ha) (Ayres 1984, Queiroz 1995, Paim *et al.* 2013).
It is listed on CITES Appendix II.

Credits

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Reviewer(s):	Cotton, A., Molur, S. & Schwitzer, C.
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Facilitator(s) and Compiler(s):	Angelico, M.
Authority/Authorities:	IUCN SSC Primate Specialist Group

Bibliography

Ayres, J. M. 1984. *Estação Ecológica do Lago Mamirauá: Proposta para sua implantação. Relatório, Secretaria Especial do Meio Ambiente (SEMA), Brasília, DF.*

Ayres, J. M. 1985. On a new species of squirrel monkey, genus *Saimiri*, from Brazilian Amazonia (Primates, Cebidae). *Papéis Avulsos Zoologia, São Paulo* 36: 147–164.

Baldwin, J. D. and Baldwin, J. I. 1981. The squirrel monkeys, genus *Saimiri*. In: A. F. Coimbra-Filho and R. A. Mittermeier (eds), *The Ecology and Behavior of Neotropical Primates*, pp. 277-330. Academia Brasileira de Ciências, Rio de Janiero, Brazil.

Boinski, S. 1988. Sex differences in the foraging behavior of squirrel monkeys in a seasonal habitat. *Behavioural Ecology and Sociobiology* 23: 177-186.

Boinski, S. 1999. Geographic variation in behavior of a primate taxon: stress responses as a proximate mechanism in the evolution of social behavior. In: S. A. Foster and J. A. Endler (eds), *Geographic Variation in Behavior: Perspectives om Evolutionary Mechanisms*, pp. 95-120. Oxford University Press, Oxford, UK.

Boinski, S. 1999. The social organization of the squirrel monkeys: implications for ecological models of social evolution. *Evolutionary Anthropology* 8: 101-112.

Boinski, S. and Cropp, S. J. 1999. Disparate data sets resolve squirrel monkey (*Saimiri*) taxonomy: Implications for behavioral ecology and biomedical usage. *International Journal of Primatology* 20(2): 237–256.

Boinski, S., Ehmke, E., Kauffman, L., Schet, S. and Vreedzaam, A. 2005. Dispersal patterns among three species of squirrel monkeys (*Saimiri oerstedii, S. boliviensis* and *S. sciureus*): II. Within-species and local variation. *Behaviour* 142(5): 633-677.

Boinski, S., Kauffman, L., Ehmke, E., Schet, S. and Vreedzaam, A. 2005a. Dispersal patterns among three species of squirrel monkeys (*Saimiri oerstedii, S. boliviensis* and *S. sciureus*): I. Divergent costs and benefits. *Behaviour* 142(5): 525-632.

Costello, R. K., Dickinson, C., Rosenberger, A. L., Boinski, S. and Szalay, F. S. 1993. *Squirrel monkey (genus* Saimiri*) taxonomy: a multidisciplinary study of the biology of the species*. Plenum Press, New York, USA.

de Queiroz, H.L. 1995. *Preguiças e Guaribas: Os Mamíferos Folívoros Arborícolos do Mamirauá. Ministério de Ciência e Tecnologia (MCT) – CNPq*. Sociedade Civil Mamirauá, Brasília e Tefé, Brazil.

Groves C.P. 2001. *Primate Taxonomy*. Smithsonian Institution Press, Washington, DC, USA.

Groves, C.P. 2005. Order Primates. In: D.E. Wilson and D.M. Reeder (eds), *Mammal Species of the World*, pp. 111-184. The Johns Hopkins University Press, Baltimore, Maryland, USA.

Hernández-Camacho, J. and Defler, T. R. 1989. Algunos aspectos de la conservación de primates no-humanos en Colombia. In: C. J. Saavedra, R. A. Mittermeier and I. B. Santos (eds), *La Primatología en Latinoamerica*, pp. 67-100. WWF-U.S., Washington, DC, USA.

Hershkovitz, P. 1984. Taxonomy of squirrel monkeys, genus *Saimiri*, (Cebidae, Platyrrhini): a preliminary report with description of a hitherto unnamed form. *American Journal of Primatology* 4: 209–243.

Hershkovitz, P. 1987. Uacaries, New World monkeys of the genus *Cacajao* (Cebidae, Platyrrhini): a preliminary taxonomic review with the description of a new subspecies. *American Journal of primatology* 12: 1–53.

IDSM (Instituto de Desenvolvimento Sustentável Mamirauá). 2010. Plano de Gestão Reserva de Desenvolvimento Sustentável Mamirauá RDSM. Tefé, Brazil: MCTI/IDSM-OS.

IUCN. 2021. The IUCN Red List of Threatened Species. Version 2021-1. Available at: www.iucnredlist.org. (Accessed: 25 March 2021).

IUCN Standards and Petitions Committee. 2019. Guidelines for Using the IUCN Red List Categories and Criteria. Version 14. Prepared by the Standards and Petitions Subcommittee. Available at: http://www.iucnredlist.org/documents/RedListGuidelines.pdf.

Jack, K. 2007. The cebines: toward an explanation of variable social structure. In: C. J. Campbell, A. Fuentes, K. C. Mackinnon, M. Panger and S. K. Bearder (eds), *Primates in Perspective*, pp. 107-123. Oxford University Press, Oxford, UK.

Langerwisch, F., Rost, S., Gerten, D., Poulter, B., Rammig, A. and Cramer, W. 2013. Potential effects of climate change on inundation patterns in the Amazon Basin. *Hydrology and Earth System Sciences* 17: 2247-2262.

Lynch-Alfaro, J., Boubli, J.P., Paim, F.P., Ribas, C.C., Silva, M.N., Messias, M.R., Röhe, F., Mercês, M.P., Silva Jr., J.S., Silva, C.R., Pinho, G.M., Koshkarian, G., Nguyen, M.T.T., Harada, M.L., Rabelo, R.M., Queiroz, H.L., Alfaro, M.E. and Farias, I.P. 2015. Biogeography of squirrel monkeys (genus *Saimiri*): south-central Amazon origin and rapid pan-Amazonian diversification of a lowland primate. *Molecular Phylogenetics Evolution* 82(B): 436-454.

Mercês, M.P. 2018. Revisão taxonômica e filogenômica de *Saimiri* Voigt, 1831 (Primates, Cebidae). Doctoral thesis. Universidade Federal do Pará and Museu Paraense Emílio Goeldi.

Mittermeier, R. A. and Van Roosmalen, M. G. M. 1981. Preliminary observations on habitat utilization and diet in eight Surinam monkeys. *Folia Primatologica* 36: 1–39.

Paim, F.P and Rabelo, R.M. 2015. Methods for capturing wild squirrel monkeys in a floodplain forest: A comparison of two techniques and two species. *Neotropical Primates* 22: 7-11.

Paim, F.P., Aquino, S.P. and Valsecchi, J. 2012. Does ecotourism activity affect primates in Mamirauá Reserve? *Uakari* 8(2): 43-50.

Paim, F.P., Chapman, C.A., Queiroz, H.L. and Paglia, A.P. 2017. Does resource availability affect the diet and behavior of the Vulnerable squirrel monkey *Saimiri vanzolinii*? *International Journal of Primatology* 38: 572-587.

Paim, F.P., El Bizri, H.R., Paglia, A.P. and Queiroz, H.L. 2019. Long-term population monitoring of the threatened and endemic black-headed squirrel monkey (Saimiri vanzolinii) shows the importance of protected areas for primate conservation in Amazonia. *American Journal of Primatology* 81(6): DOI: https://doi.org/10.1002/ajp.22988.

Paim, F. P., Silva Júnior, J. S, Valsecchi, J., Harada, M. L., Queiroz, H. L. 2013. Diversity, geographic distribution and conservation of squirrel monkeys, Saimiri (Primates, Cebidae) in the floodplain forests of central Amazonia. *International Journal of Primatology* 34: 1055-1076.

Paim, F.P., Valenta, K., Chapman, C.A., Paglia, A.P. and Queiroz, H.L. 2018. Tree community structure reflects niche segregation of three parapatric squirrel monkey species (*Saimiri* spp.). *Primates*.

Prance, GT. 1979. Notes on the vegetation of Amazonia III. The terminology of Amazonian forest types subject to inundation. *Brittonia* 31: 26–38.

Rabelo, R.M. and Paim, F.P. In prep. Predicting climate change impact on the distribution of threatened Amazonian primate (*Saimiri vanzolinii*).

Ramalho, E.E., Macedo, J., Vieira, T.M., Valsecchi, J., Calvimontes, J., Marmontel, M. and Queiroz, H.L. 2009. Ciclo hidrológico nos ambientes de várzea da Reserva de Desenvolvimento Sustentável Mamirauá – médio Rio Solimões, período de 1990 a 2008. *Uakari* 5: 61–87.

Rylands, A. B. 1994. Macaco-de-cheiro, *Saimiri vanzolinii* Ayres, 1985. In: G. A. B. da Fonseca, A. B. Rylands, C. M. R. Costa, R. B. Machado and Y. L. R. Leite (eds), *Livro Vermelho dos Mamíferos Brasileiros Ameaçados de Extinção*, pp. 227-230. Fundação Biodiversitas, Belo Horizonte, Brazil.

Sales, L.P., Ribeiro, B.R., Pires, M.M., Chapman, C.A. and Loyola, R. 2019. Recalculating route: dispersal constraints will drive the redistribution of Amazon primates in the Anthropocene. *Ecography*: doi: 10.1111/ecog.04499.

Sorribas, M.V., Paiva, R.C.D., Melack, J.M., Bravo, J.M., Jones, C., Carvalho, L., Beighley, E., Forsberg, B. and Costa, M.H. 2016. Projections of climate change effects on discharge and inundation in the Amazon basin. *Climatic Change* 136: 555–570.

Sussman, R. W. 2000. *Primate Ecology and Social Structure, Vol. 2: New World Monkeys*. Pearson Custom Publishing, Needham Heights, MA, USA.

Terborgh, J. 1983. *Five New World Primates: A Study in Comparative Ecology*. Princeton University Press, Princeton, NJ, USA.

Thorington Jr., R. W. 1985. The taxonomy and distribution of squirrel monkeys (*Saimiri*). In: L. A. Rosenblum and C. L. Coe (eds), *Handbook of Squirrel Monkey Research*, pp. 1–33. Plenum Press, New York, USA.

Wallace, R. B., Painter, R. L. E., Rumiz, D. I. and Taber, A. B. 2000. Primate diversity, distribution and relative abundances in the Rios Blanco y Negro Wildlife Reserve, Santa Cruz Department, Bolivia. *Neotropical Primates* 8(1): 24–28.

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	-	Suitable	Yes
1. Forest -> 1.8. Forest - Subtropical/Tropical Swamp	-	Suitable	Yes

Threats

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Minority (50%)	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
11. Climate change & severe weather -> 11.4. Storms & flooding	Future	Whole (>90%)	Rapid declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
		2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

Conservation Action in Place
In-place land/water protection
Occurs in at least one protected area: Yes
In-place education
Subject to recent education and awareness programmes: Yes
Included in international legislation: Yes
Subject to any international management / trade controls: Yes

Conservation Actions Needed

Conservation Action Needed
4. Education & awareness -> 4.3. Awareness & communications

Research Needed

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
3. Monitoring -> 3.1. Population trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 870
Estimated extent of occurrence (EOO) (km²): 3116
Number of Locations: 1
Population
Continuing decline of mature individuals: Unknown
Population severely fragmented: No
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 8

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