

Primate records in the Amazonian lowlands of the Morona River basin, Morona Santiago, Ecuador

Registro de primates en las bajuras amazónicas de la cuenca del río Morona, Morona Santiago, Ecuador

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Abstract

Some regions of Ecuador remain understudied, and knowledge about primate species is limited. One such area is the Morona River basin in Morona Santiago Province, located in the country's southeastern part. To address this knowledge gap, we conducted fieldwork in the region between 2019 and 2024, aiming to gather data on its primate species and assess their conservation status. Through observation excursions and interviews with local inhabitants, we recorded 10 species of primates (*Leontocebus lagonotus*, *Cebus yuracus*, *Sapajus apella*, *Saimiri macrodon*, *Aotus vociferans*, *Plecturocebus discolor*, *Pithecia cf. aequatorialis*, *Alouatta seniculus*, *Ateles belzebuth* and *Lagothrix lagothricha*); among these, *Saimiri macrodon*, *Leontocebus lagonotus*, and *Plecturocebus discolor* stood out due to the frequency of sightings. We focused our analysis on four poorly studied topics: (1) the distribution of *Leontocebus lagonotus* and the potential role of the Morona River as a geographic barrier limiting its southern range; (2) the presence and rarity of *Sapajus apella*; (3) the possible range extension of *Pithecia cf. aequatorialis*; and (4) the search for evidence of the presence of the genus *Cebuella* and the discussion of the validity of the Pastaza River as a barrier to its distribution. The conservation status of eight of these species is concerning, since they are classified as threatened according to the *Red List of Mammals of Ecuador*, including *Ateles belzebuth*, which is listed as Critically Endangered; the other two species (*Leontocebus lagonotus* and *Plecturocebus discolor*) are categorized as Near Threatened. The absence of government-designated protected areas in the region exacerbates these concerns. Nonetheless, the Morona River basin hosts a high primate diversity, similar to larger and more protected areas in the country, such as the Yasuní National Park and the Cuyabeno Wildlife Reserve.

Resumen

Algunas regiones en Ecuador permanecen poco estudiadas y en donde el conocimiento sobre las especies de primates es limitado. Una de estas zonas es la cuenca del río Morona, en la provincia de Morona Santiago, ubicada en el sureste del país. Para abordar este vacío de conocimiento realizamos un trabajo de campo en la región entre 2019 y 2024, con el objetivo de recopilar datos sobre sus especies de primates y evaluar su estado de conservación. Mediante caminatas de observación y entrevistas con habitantes locales, registramos 10 especies de primates (*Leontocebus lagonotus*, *Cebus yuracus*, *Sapajus apella*, *Saimiri macrodon*, *Aotus vociferans*, *Plecturocebus discolor*, *Pithecia cf. aequatorialis*, *Alouatta seniculus*, *Ateles belzebuth* y *Lagothrix lagothricha*); entre ellas, por la frecuencia de avistamientos destacaron: *Saimiri macrodon*, *Leontocebus lagonotus* y *Plecturocebus discolor*. Centramos nuestro análisis en cuatro temas poco estudiados: (1) la distribución de *Leontocebus lagonotus* y el papel potencial del río Morona como barrera geográfica que limita su distribución meridional; (2) la presencia y rareza de *Sapajus apella*; (3) la posible extensión de la distribución de *Pithecia cf. aequatorialis*; y (4) la búsqueda de evidencias de la presencia del género *Cebuella* y la discusión de la validez del río Pastaza como barrera para su distribución. El estado de conservación de ocho de las especies de primates encontradas es preocupante, ya que están clasificadas como amenazadas según la *Lista Roja de Mamíferos del Ecuador*, incluyendo *Ateles belzebuth*, que está clasificada como En Peligro Crítico; las otras dos especies (*Leontocebus lagonotus*

y *Plecturocebus discolor*) están clasificadas como Casi Amenazadas. La ausencia de áreas protegidas designadas por el gobierno en la región exacerba estas preocupaciones. A pesar de ello, la cuenca del río Morona alberga una alta diversidad de primates, similar a la de zonas más grandes y protegidas del país, como el Parque Nacional Yasuní y la Reserva de Producción Faunística Cuyabeno.

Keywords:

Natural barrier, *Cebuella*, Conservation, *Leontocebus lagonotus*, *Pithecia* cf. *aequatorialis*, *Sapajus apella*.

Palabras clave:

Barrera natural, *Cebuella*, conservación, *Leontocebus lagonotus*, *Pithecia* cf. *aequatorialis*, *Sapajus apella*.

Introduction

Ecuador is recognized as one of the most biologically diverse countries on the planet (Mittermeier et al. 1997). However, the current knowledge about diversity varies across its territory. In the case of primates, some regions, such as the northern Amazon, have been extensively studied. Notable examples include the Cuyabeno Wildlife Reserve in Sucumbíos and Yasuní National Park in the Orellana and Pastaza provinces (De la Torre 2010). These areas have been the focus of numerous studies on a wide range of topics (e.g., De la Torre et al. 1995a, 1995b, De la Torre & Yépez 2003, Di Fiore 2004, Pozo-Rivera 2009, Tirira et al. 2018a) and are supported by thousands of sightings and records in databases (GBIF 2024, iNaturalist 2024, Tirira 2024). In contrast, other regions of the country remain understudied and have received little attention from researchers (Orellana-Vásquez & Gavilanez-Endara 2023).

A preliminary analysis of the distribution of primate diversity in Ecuador identified three areas of particular interest, each of them with a potential richness of 11 species (Tirira 2021a): [1] north and center of the province of Pastaza, between the Tigüino and Cononaco rivers, in the north, and Bobonaza and Conambo rivers, in the south; [2] north of the province of Orellana, between the Napo and Indillama rivers; and [3] east of the province of Morona Santiago, between the Huasaga, Panki, Cangaime and Morona rivers, up to the border with Peru. Interestingly, this analysis also revealed that these three areas are among the least studied in the country, with important information gaps (Tirira 2021a, Orellana-Vásquez & Gavilanez-Endara 2023). This finding aligns with an evaluation conducted by Peruvian researchers, who identified the province of Datem del Marañón, which includes the Morona River basin, as one of two regions in the Loreto Department with substantial knowledge gaps regarding mammals (Díaz et al. 2021).

Ecuador hosts 22 primate species, 18 of which inhabit the forests of the Amazon basin (De la Torre & Tirira 2018a). Despite the ecological importance of these species and the relative frequency with which some of them are recorded (Mittermeier et al. 2013), such as those of the genera *Leontocebus* and *Saimiri* (De la Torre et al. 1995b, Tirira et al. 2018a). Little is known about the dis-

tribution of several species of primates within the country or the status of their populations (Tirira et al. 2018b). The most recent assessment of the *Red List of Mammals of Ecuador (Lista Roja de los Mamíferos del Ecuador)* (Tirira 2021b) revealed that 15 of the 18 primate species in the Ecuadorian Amazon are threatened with extinction, one is classified as Critically Endangered, four as Endangered, and 10 as Vulnerable. These findings underscore the urgent need for studies in understudied areas to assess population statuses and to develop conservation strategies in line with the *Action Plan for the Conservation of Primates of Ecuador (Plan de Acción para la conservación de los primates del Ecuador)* (Tirira et al. 2018c).

The lower Morona River basin, in Ecuador, exhibits a high level of deforestation and fragmentation (MAE 2018). This process began in the late 1990s after signing a peace and boundary treaty with Peru. This treaty led to the construction of the “Quinto Eje Binacional” [Fifth Binational Axis] (ITTO et al. 2005), known as E40, a paved road over 140 kilometers long that connects the region with the city of Méndez and the Troncal Amazónica (E45), the main highway of the Ecuadorian Amazon (IGM 2013).

Deforestation on the Ecuadorian side of the Morona River basin has been exacerbated by the lack of protected areas (Google Maps 2024, MAE 2018). The only conservation zones are a small, recently established private reserve (Selva Eterna) and a military reserve designated as a national protection zone due to its proximity to the Peruvian border. These areas cover less than 2000 hectares of primary forest (E. Arbeláez, pers. comm.). By contrast, there is little evidence of deforestation in the forests on the Peruvian side (Google Maps, 2024). Most of the area between the Morona and Santiago rivers falls within the Santiago-Comaina Reserved Zone, which spans nearly 400,000 hectares of primary forest (Pitman et al. 2012).

The Morona River basin has received relatively little attention regarding primate research. For Ecuador, the earliest reference to primates in this area comes from a report mentioning a saki monkey identified as *Pithecia monacha*: “The species has also been obtained on the Rio Marona [Morona] in Western Ecuador” (Elliot 1913: 288). However, no reference specimens were provided. Decades later, a new report documented the presence of night monkeys (*Aotus vociferans*) in Macuma (= Makuma,

at 300 m altitude) (HersHKovitz 1983), based on three specimens captured in 1942 and housed at The Field Museum of Chicago (GBIF 2024).

At the end of the last century, an anthropological study was published on the life and traditions of two Shuar communities, Makuma and Mutints, located at altitudes ranging from 300 to 630 meters (Morales & Schjellerup 1998). That study mentioned the mammal species hunted by the indigenous people as a food source, including 11 primate species that are referred to only by their names in the Shuar language. Based on the nomenclature presented in the book *Nombres de los Mamíferos del Ecuador* (Tirira 2004), nine correspond to known primate species (Table 1). One species was identified as a carnivore (*kuji* = *Potos flavus*), and one appears to refer to a kind of squirrel (*kinamtum*, correctly spelled *kunámp-tun*; possibly of the genus *Hadroskiurus*).

In the present century, three studies have been published on mammal inventories in the Morona River basin. The first study was conducted in four Indigenous communities (Entsakua, Kuamá, Pankints, and Tsunki), located at altitudes between 250 and 1000 meters, within the territory of the Shuar Mankusas Association (Zapata Ríos et al. 2006). These communities are situated near the Mangosiza River, which flows south to join the Morona River, close to the Peruvian border (IGM, 2014). That study documented eight primate species, six identified through direct observation (five of which were hunted for food during the field study; Zapata Ríos et al. 2009) and two reported in interviews with locals (Table 1).

The second study was carried out approximately 15 kilometers west of the previous one, in the Shuar community of Uuntsuants, at elevations between 525 and 1300 meters (Mena-Valenzuela & Cueva Loachamín 2015). That study also recorded eight primate species (Table 1), although the specific methodology for recording each species was not explicitly detailed. This report mentioned that direct observations and interviews with local residents were employed.

The third study took place in Achuar territory, within the Shuinmamus community (260–290 meters elevation) (Brito & Tirira 2022). This locality technically corresponds to the Pastaza River basin. Still, it is especially interesting because it is part of the interfluvial space between the Pastaza and Morona rivers, an area corresponding to our study zone. The study reported the presence of eight primate species (Table 1): four were identified through direct observation, one through hunting, and three through interviews with residents.

On the Peruvian side, one study evaluated four localities along the Cerros de Kampankis, at elevations between 400 and 1435 meters (Castro Vergara 2012). This range, an extension of the Shaime mountain range in Ecuador, forms the watershed between the Morona (southeast) and Santiago (southwest) river basins. This study reported the presence of 10 primate species, nine identified through direct methods and one through interviews (Table 1).

This study aimed to gather information on the richness of primates in the Morona River basin, in the province of Morona Santiago, one of the least studied areas of Ecuador; in order to provide information on the abundance of these species, the threats they face, and their conservation status; based on four specific objectives: (1) the distribution of *Leontocebus lagonotus* and the potential role of the Morona River as a geographic barrier limiting its southern range; (2) the presence and rarity of *Sapajus apella*; (3) the possible range extension of *Pithecia aequatorialis*; and (4) the search for evidence of the presence of the genus *Cebuella* and the discussion of the validity of the Pastaza River as a barrier to its distribution.

Material and methods

Study area. The study area encompasses the Morona River basin, located east of the Kutukú mountain range in Taisha Canton, Morona Santiago Province (Figure 1). Particular focus was given to a small polygon of 3400 hectares situated on the southeastern bank of the Morona River, within the area of influence of the San José de Morona Parish (02°52'53" S, 77°40'08" W, 200 m). This polygon is bordered to the north and west by the Morona River, to the south and southeast by the Peruvian border, and the east by several Shuar indigenous communities. The Morona River is also known in Ecuador as Cangaime. In some sources, it is referred to by this name upstream of its confluence with the Makuma River, while in others, this designation applies before its confluence with the Mangosiza River (IGM 2013, Google Maps 2024).

The study area belongs to the Napo biotic province (Morrone 2014), the Amazon Tropical Rainforest natural region (Ron 2020), and the Abanico del Pastaza biogeographic sector (MAE 2013). It ranges from 197 meters above sea level (where the Morona River crosses the Peruvian border) to 350 meters, corresponding to the low eastern foothills of the Kutukú mountain range. The San José de Morona area is predominantly flat, with elevations not exceeding 200 meters. The average annual temperature is 24.6 °C, with minimum and maximum temperatures of 19.1 and 30.7 °C, respectively, and annual precipitation averages 2836 mm (MAE 2013).

Four ecosystems are identified in the study area (MAE 2013). The most abundant is the *Bosque siempreverde de tierras bajas del Abanico del Pastaza* (Lowland evergreen forest of the Abanico del Pastaza). In smaller proportions, and influenced by river flooding, are the *Bosque inundable de la llanura aluvial de los ríos de origen andino y de cordilleras amazónicas* (Flooded Forest of the alluvial plain of rivers of Andean origin and Amazonian Mountain ranges), the *Bosque inundado de la llanura aluvial de la Amazonía* (Flooded Forest of the Amazonian alluvial plain), and the *Bosque inundado de palmas de la llanura aluvial amazónica* (Flooded palm forest of the Amazonian alluvial plain). The majority of the study area falls within Shuar indigenous territory (EcoCiencia 2021). The northeastern part of Taisha Canton, near the Pastaza River, is home to the Achuar, another Indigenous group (EcoCiencia 2021). The populations of Puerto Mo-

Table 1. Reports of primates in the Morona River basin in the Amazon of Ecuador and Peru. Names are given as they appear in the publications cited. The asterisk (*) indicates records based only on information from interviews with residents.

Current taxonomy [Shuar name]	Makuma and Mutints	Mankusas	Uuntsuants	Shuinmamus1	Cerros de Kampankis
<i>Cebuella niveiventris</i> [tsepái]	Vipai*	—	<i>Callithrix pygmaea</i>	<i>Cebuella pygmaea</i> *	—
<i>Leontocebus lagonotus</i> [pinchich']	—	—	—	—	<i>Saguinus fuscicollis</i>
<i>Cebus yuracus</i> [tsere, jaanch']	<i>Cebus</i> sp.*	<i>Cebus albifrons</i>	<i>Cebus albifrons</i>	<i>Cebus albifrons</i>	<i>Cebus albifrons</i>
<i>Sapajus apella</i> [mirút']	—	<i>Cebus apella</i> *	—	—	<i>Cebus apella</i>
<i>Saimiri macrodon</i> [tseém]	Tzem*	<i>Saimiri sciureus</i>	<i>Saimiri sciureus</i>	<i>Saimiri cassiquiarensis</i>	<i>Saimiri sciureus</i>
<i>Aotus vociferans</i> [ujukam],	Ujukam*	<i>Aotus vociferans</i>	<i>Aotus vociferans</i>	<i>Aotus vociferans</i>	<i>Aotus vociferans</i> *
<i>Plecturocebus discolor</i> [kungiké]	Kunchikiai*	—	—	<i>Plecturocebus discolor</i>	<i>Callicebus discolor</i>
<i>Pithecia cf. aequatorialis</i> [sepúr]	Cepur*	<i>Pithecia monachus</i>	<i>Pithecia monachus</i>	—	<i>Pithecia monachus</i>
<i>Alouatta seniculus</i> [yakúm]	Yacun*	<i>Alouatta seniculus</i>	<i>Alouatta seniculus</i>	<i>Alouatta seniculus</i>	<i>Alouatta jurua</i>
<i>Ateles belzebuth</i> [washí]	Washi*	<i>Ateles belzebuth</i> *	<i>Ateles belzebuth</i>	<i>Ateles belzebuth</i> *	<i>Ateles belzebuth</i>
<i>Lagothrix lagothricha</i> [chúu]	<i>Lagothrix</i> sp.* (sic)	<i>Lagothrix lagothricha</i>	<i>Lagothrix poeppigii</i>	<i>Lagothrix lagothricha</i> *	<i>Lagothrix lagothricha</i>
Number of species	9	8	8	8	10
Country	Ecuador	Ecuador	Ecuador	Ecuador	Peru
Morona River bank	Right (southwest)	Right (southwest)	Right (southwest)	Left (north)	Right (southwest)
Altitudinal range	300–630 m	250–1000 m	525–1300 m	260–290 m	400–1435 m
Source	Morales & Schjellerup (1998)	Zapata Ríos et al. (2006)	Mena-Valenzuela & Cueva Loachamín (2015)	Brito & Tirira (2022)	Castro Vergara (2012)

(1) This locality is places in the lowlands of Morona Santiago Province, in Ecuador, but technically it corresponds to the Pastaza River basin.

rona and San José de Morona primarily consist of mestizo settlers who maintain farms in the surrounding areas.

Data collection. The data presented in this study are based on direct and incidental observations of primates at various locations around San José de Morona (Figure 1). Initial visits to the area began in December 2019, with 11 additional visits conducted in August and November 2022; January, June, August, October, and December 2023; and May, June-July, August, and September 2024. During each visit, one to five entries to the forest were made, approximately four to eight hours per entry. These observations focused on four sectors within a polygon of 3400 hectares:

- **Selva Eterna Reserve** (02°55'53" S, 77°42'52" W): A private property of primary forest near Puerto Morona, adjacent to the Remolinos military camp. This area, situated along the Morona River, connects to the E40 road and lies within a border zone.
- **E40 road** (02°55'06" S, 77°42'49" W): A stretch of paved road surrounded by primary forest, beginning at the Morona River bridge and extending approximately 8 km toward San José de Morona.

– **Segunda Línea** [Second Line] (02°54'12" S, 77°39'11" W): A region south of San José de Morona characterized by heavily disturbed primary forest surrounded by pastures and farms.

– **Tercera Línea** [Third Line] (02°55'33" S, 77°38'48" W): An area south of Segunda Línea, near the Peruvian border. This zone contains primary forest with minimal to moderate human intervention and is home to the Shuar community of San Luis.

To complement field observations, 14 structured interviews were conducted with residents from various localities:

Right (southwest) bank of the Morona River:

- **Barrio La Paz** (02°57'23" S, 77°43'20" W), a farm in front of Remolinos camp (one mestizo interviewee).
- **Kusuim** (02°39'48" S, 77°42'32" W), farm on the banks of the Kusuim River (one indigenous Shuar interviewee).
- **Miazal** (02°37'16" S, 77°47'07" W) (one indigenous Shuar interviewee).

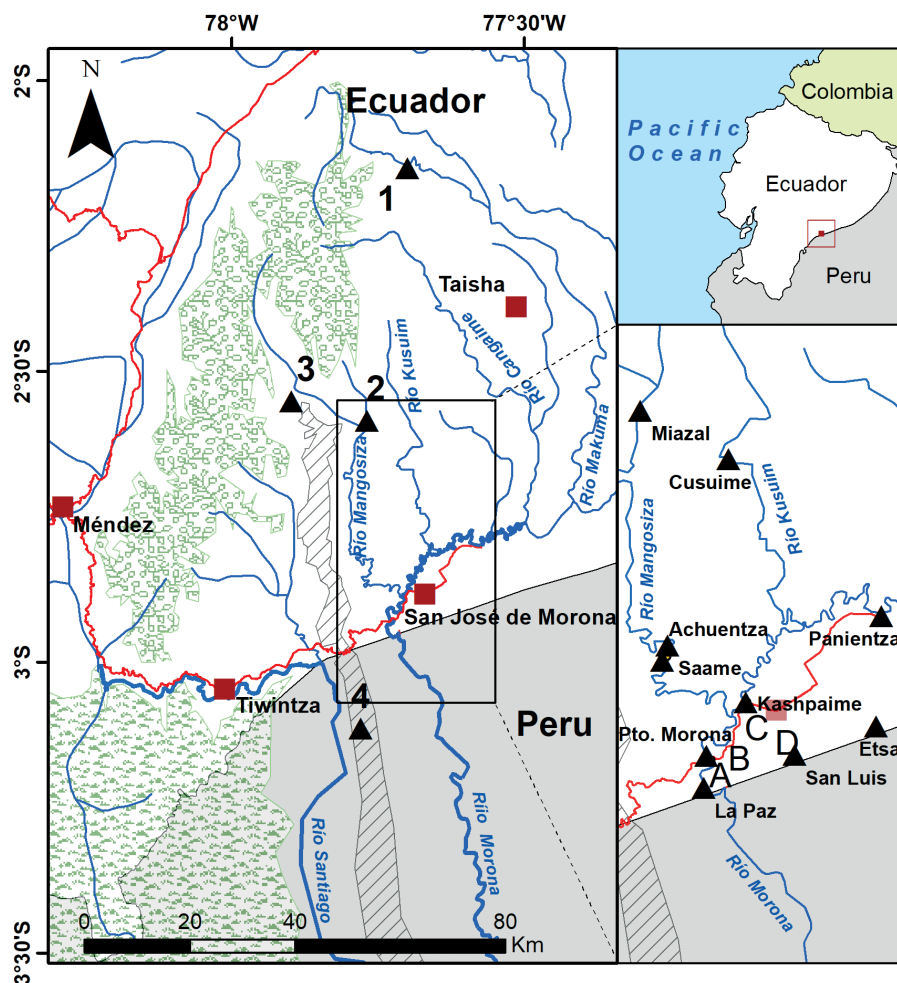


Figure 1. Primate study area in the Amazonian lowlands of Morona River basin, Morona Santiago Province, Ecuador. Left, Morona River Basin and reference primate studies: 1 = Makuma and Mutints, 2 = Mankusas, 3 = Uuntsuants, 4 = Pongo Chinim (Cerros de Kampankis). Right, field study locations: A = Selva Eterna Reserve, B = E40 road, C = Segunda Línea, D = Tercera Línea.

- **Puerto Morona** (02°55'32" S, 77°43'31" W) (two mestizo interviewees).
- **Saame** (02°49'51" S, 77°45'37" W), a locality on the Mangosiza River, downstream of Achuentza (one Indigenous Shuar interviewee).

Left (southeast) bank of the Morona River:

- **Etsa** (02°54'26" S, 77°34'47" W), near Nayantza River and Hito 24; indigenous community 10 km SE of San José de Morona (one indigenous Shuar interviewee).
- **Panientza** (02°47'59" S, 77°34'33" W), indigenous community 15 km NE of San José de Morona (one indigenous Shuar interviewee:).
- **Puerto Kashpaima** (02°52'29" S, 77°41'37" W), 5 km W of San José de Morona (two indigenous Shuar interviewees).
- **Selva Eterna Reserve** (one indigenous Shuar interviewee).
- **San José de Morona** (two indigenous Shuar interviewees).
- **San Luis** (Tercera Línea) (02°55'46" S, 77°39'05" W), Shuar community 6.5 km S of San José de Morona and 500 m from the border with Peru (one indigenous Shuar interviewee).

We used sheets featuring color photographs of the species we believed to be in the area for the interviews. Each picture included the species name in the Shuar language to facilitate identification by the interviewees. We were cautious with the information provided by the interviewees, especially regarding the origin of the records, the approximate year of the sightings, and the details used to identify the species, ensuring we could verify their presence in the area.

During our walks, we documented primates kept as pets and gathered information from the interviews about the usage of each species. Additionally, in the Shuar Achuentza community (02°50'03" S, 77°45'48" W) on the Mangosiza River, located on the right bank of the Morona River, we discovered three primate skulls in the possession of residents. This information has also been incorporated into the results of this research.

Data analysis. Each recorded species' category of relative abundance was assigned based on Tirira (2017): common, fairly common, uncommon, rare, and unknown. A rank abundance curve (Whittaker plot) was constructed for all recorded primates, expressed using the common logarithm (logarithm with base 10) (Moreno 2001). Conservation categories were noted following the *Lista Roja de los Mamíferos del Ecuador* (Red List of Mammals of Ecuador) (Tirira 2021b).

Primate conservation status was assessed through direct observation and interviews with local residents. Based on these methods, we identified direct threats and categorized them into five groups: habitat loss, hunting for food, pet possession, roadkill, and trafficking.

For the analysis of species richness, we used updated distribution maps for the 18 taxa present in the Ecuadorian Amazon (Tirira 2021a).

The taxonomy of neotropical primates has undergone numerous modifications in recent times (e.g., Groves 2001, 2005, van Roosmalen et al. 2002, Mittermeier et al. 2013, Rylands & Mittermeier 2024); several changes have been debated and not always accepted by some researchers or working groups (e.g., Ruiz-García et al. 2014, 2018, Gutiérrez & Marinho-Filho 2017). The taxonomy we follow in this article follows the *Mammals of Ecuador: official updated species checklist* (Tirira et al. 2024), which in turn is based on taxonomic suggestions from the Primate Specialist Group and the Species Survival Commission of the IUCN (2025). In this sense, *Leontocebus* is used and not *Saguinus* (as proposed by Rylands et al. 2016), and *Cebus yuracus* and not *albifrons* (as proposed by Rylands & Mittermeier 2013). For the other species we follow Mammal Diversity Database (2025).

Results

We documented the presence of 10 species from five families and 10 genera in the Morona River basin, based on 57 primate records (Table 2). Nine species were confirmed through direct methods: eight via direct observation of wild individuals (seven supported by photographic evidence) and four through auditory recordings. Additionally, skulls from three species hunted for food (*Cebus yuracus*, *Ateles belzebuth*, and *Lagothrix lagothricha*) were documented, along with a casual record of a complete skeleton (including a skull) of *Aotus vociferans* found in the forest (Table 2).

All 10 species were also corroborated through interviews with local residents. The marmoset (genus *Cebus*) was neither recorded through direct methods nor recognized by the local population.

The most frequently recorded species were *Saimiri macrodon*, *Leontocebus lagonotus*, and *Plecturocebus discolor* (Figure 2). In contrast, *Pithecia* cf. *aequatorialis*, *Aotus vociferans*, *Cebus yuracus*, *Lagothrix lagothricha*, and *Alouatta seniculus* were observed less frequently and in smaller groups. Additionally, we recorded only one skull of *Ateles belzebuth*, obtained from an individual hunted for food. While *Sapajus apella* was not directly observed, its inclusion in the study area is based on detailed information provided by interviewees. Both *Ateles* and *Sapajus* species were well-known to the respondents, who described their anatomy and behavior in detail, aligning with using specific names in the Shuar language that confirm their presence in the area.

We identified five direct threats to the primates recorded (Table 2): habitat loss affects all species, pet capture impacts eight species, hunting for food affects seven, trafficking for trade affects five, and roadkill was reported for one species. The species facing the greatest threats were *Leontocebus lagonotus*, *Cebus yuracus*, *Pithecia* cf. *aequatorialis*, and *Lagothrix lagothricha*, each with four threats.

Table 2. Species of primates confirmed for the Morona River lowlands, Morona Santiago, Ecuador. Record site in Morona River basin: **Right bank:** E40 = road E40, ET = Etsa, PA = Panientza, SE = Selva Eterna Reserve, SJ = San José de Morona, SL = Segunda Línea, TL = Tercera Línea (San Luis). **Left bank:** AC = Achuentza. Record type: DO = Direct observation, I = Interview with local people, SK = Skull recorded, VO = Vocalization (auditive record). Threats: HL = Habitat loss, HF = Hunting for food, P = Pet possession, RK = Roadkill, TR = Traffic. Red List category in Ecuador: CR = Critically Endangered, EN = Endangered, NT = Near Threatened, VU = Vulnerable.

Species	No. of records (relative abundance)	Record site [for interviews only]	Record type	Threats	Red List category in Ecuador
Family Callitrichidae					
<i>Leontocebus lagonotus</i>	10 (common)	E40, SE, SL, TL	DO, VO, I	HL, P, RK, TR	NT
Family Cebidae					
<i>Cebus yuracus</i>	4 (uncommon)	SE, TL, AC	DO, SK, I	HL, HF, P, TR	VU
<i>Sapajus apella</i>	0 (rare)	[ET, PA, SJ, TL]	I	HL, HF, P	VU
<i>Saimiri macrodon</i>	12 (common)	E40, SE, SL, TL	DO, VO, I	HL, P, TR	VU
Family Aotidae					
<i>Aotus vociferans</i>	6 (fairly common)	SE, SL, TL	DO, SK, I	HL, HF, P	VU
Family Pitheciidae					
<i>Plecturocebus discolor</i>	10 (common)	E40, SE, TL	DO, VO, I	HL	NT
<i>Pithecia cf. aequatorialis</i>	7 (fairly common)	SE, SL	DO, I	HL, HF, P, TR	VU
Family Atelidae					
<i>Alouatta seniculus</i>	3 (uncommon)	SE, TL	DO, VO, I	HL, HF	VU
<i>Ateles belzebuth</i>	1 (rare)	AC, [PA, TL]	SK, I	HL, HF, P	CR
<i>Lagothrix lagothricha</i>	4 (uncommon)	SE, AC	DO, SK, I	HL, HF, P, TR	EN

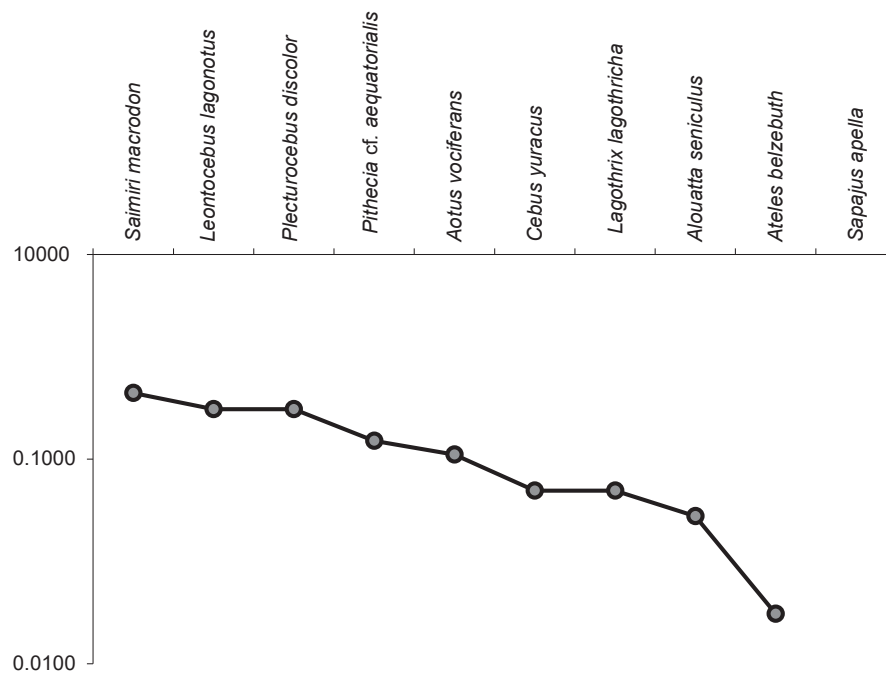


Figure 2. Rank abundance curve (Whittaker plot) on logarithmic scale of species of primates recorded during the study in the Morona River basin, Ecuador.

The species observed as pets, either in indigenous Shuar households or among settlers, included *Leontocebus lagonotus*, *Cebus yuracus*, *Saimiri macrodon*, *Aotus vociferans*, and *Pithecia cf. aequatorialis*. Additionally, interviewees reported keeping three other species—*Sapajus apella*, *Ateles belzebuth*, and *Lagothrix lagothricha*. Based on observations and information from interviewees, *Leontocebus lagonotus* is the species most commonly kept as a pet.

Some specific comments on the species recorded are as follows:

Leontocebus lagonotus (Jiménez de la Espada, 1870) (local name: mono de bolsillo; Shuar name: pinchich') (Figure 3A). We observed family groups with at least four individuals and documented two individuals kept as pets in San José de Morona, one of which has been cared for over five years. This species is well-known locally and

frequently kept as a pet. All direct observations were on the left (southeast) bank of the Morona River; however, most interviewees indicated it inhabits both sides.

Cebus yuracus Hershkovitz, 1949 (local name: machín, mono blanco; Shuar name: tsere, jaanch'). We observed a group of three individuals and other solitaires. A specimen kept as a pet in the community of San Luis (Tercera Línea) (Figure 3B). Also, a skull of a specimen hunted in Achuentza. This is a species well known by local people, with recent records.

Sapajus apella (Linnaeus, 1758) (local name: machín negro; Shuar name: mirút'). Although rare, this species was mentioned in all interviews. No recent direct observations were recorded.

Saimiri macrodon Elliot, 1907 (local name: barizo, mono payaso; Shuar name: tseém, tseenkúsh) (Figure 3C). Observed in groups of 8 to 15 individuals, including a sighting in the Selva Eterna Reserve where a Black Hawk-Eagle (*Spizaetus tyrannus*) (Aves: Accipitridae) was seen chasing a group. This species is well-known locally and frequently kept as a pet.

Aotus vociferans (Spix, 1823) (local name: tuta mono, mono nocturno; Shuar name: ujukam). Observed twice in a hollow tree at Segunda Línea, once in the afternoon (15:00) and once at night (21:00). A young individual was kept as a pet in San Luis (Tercera Línea). A complete skeleton with a skull was found near the E40 road in the Selva Eterna Reserve. All interviewees regularly encounter and recognize this species.

Plecturocebus discolor (I. Geoffroy & Deville, 1848) (local name: songo songo; Shuar name: kungiké, sunká-mat) (Figure 3D). Most observations were in forested areas along the E40 road, typically in groups of two to four. Their vocalizations were infrequent and brief.

Pithecia cf. *aequatorialis* Hershkovitz, 1987 (local name: parahuaco; Shuar name: sepúr) (Figure 3E). Groups observed ranged from one to four individuals. Known to all interviewees, including one who sent a photograph of a captive male in an attempt to sell it. At Remolinos Camp, an individual was reportedly hunted for food.

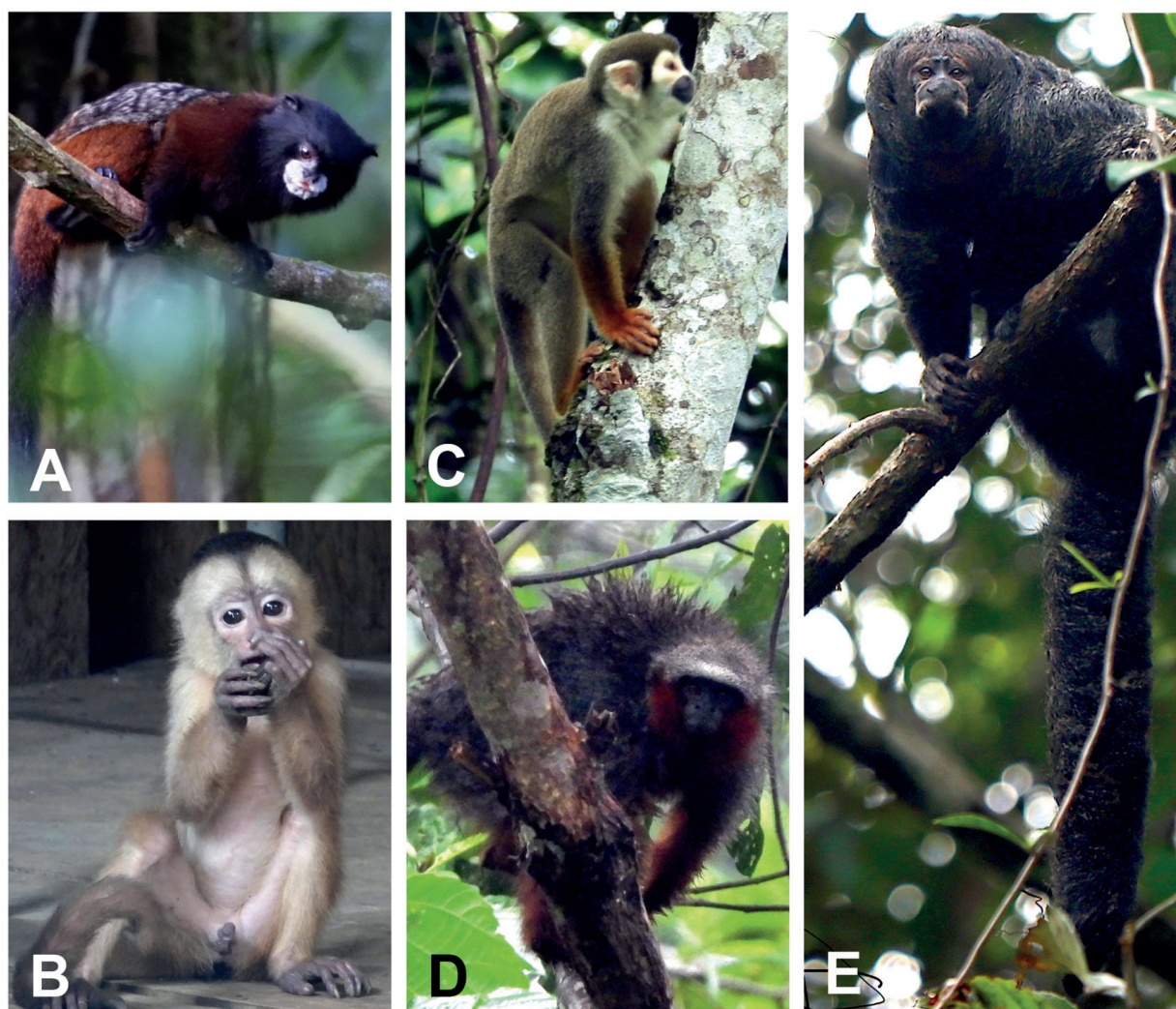


Figure 3. Primates recorded in the area of San José de Morona, Ecuador. A. *Leontocebus lagotus*, B. *Cebus yuracus*, C. *Saimiri macrodon*, D. *Plecturocebus discolor*, E. *Pithecia* cf. *aequatorialis*, female. Photographs: Juan Manuel Aguilar (A–D), Ernesto Arbeláez (E).

Alouatta seniculus (Linnaeus, 1766) (local name: mono rojo, coto, aullador; Shuar name: yakúm). Recorded through direct observation and audio recordings in the Tercera Línea. An individual and the feces of another were documented in the Selva Eterna Reserve. Interviewees reported that the species was more abundant in the past.

Ateles belzebuth É. Geoffroy, 1806 (local name: maquisapa, mono araña; Shuar name: washi). A skull of a hunted specimen was recorded in Achuentza, apparently hunted less than five years ago. While known to all interviewees, they reported not having seen it in the area for many years, with some suggesting last sightings over 10, 20, or even 30 years ago.

Lagothrix lagothricha poeppigii (Schinz, 1844) (local name: chorongó, mono choro; Shuar name: chúu). Observed in the Selva Eterna Reserve as a solitary individual, a pair, and an adult female with young (in May). A skull of a hunted specimen was also recorded in Achuentza. While known to all interviewees, some reported their last sightings 20 to 30 years ago.

Discussion

This is the first report on primates in the Amazonian lowlands of Morona Santiago Province, southeastern Ecuador. The primate community in the area of San José de Morona (left bank of the Morona River) comprises 10 species—a richness comparable to that of other localities in the northern and central Ecuadorian Amazon. However, the high levels of deforestation and the absence of national protected areas in this region raise concerns about the long-term survival of these populations.

The primate richness recorded in the San José de Morona area surpasses that of any other locality in Morona Santiago Province, where previous studies have reported between eight and nine species (Table 1) (Morales &

Schjellerup 1998, Zapata Ríos et al. 2006, Mena-Valenzuela & Cueva Loachamín 2015, Brito & Tirira 2022). These other localities are situated at higher altitudes (ranging from 250 to 1300 meters above sea level). They are characterized by hilly terrain, as they form part of the eastern foothills of the Kutukú mountain range. In contrast, our study area features flat terrain with minimal slope and floodplain forests influenced by the Morona River's seasonal flooding (Cerón et al. 2013, Guevara et al. 2013).

In the broader context of the Ecuadorian Amazon, the 10 primate species recorded in San José de Morona are comparable to the richness observed in larger protected areas of the northern and central Amazon. These include the Cuyabeno River lake system within the Cuyabeno Wildlife Reserve (De la Torre et al. 1995b), forests near the Yasuní Scientific Station (Di Fiore 2001, Pozo-Rivera & Yulatos 2005) within the Yasuní National Park and the Titupini Biodiversity Station, which borders the latter protected area (Marsh 2004, Blake et al. 2010). These findings underscore the ecological significance of the Amazonian lowlands along the Morona River and highlight the urgent need to preserve the remaining forest fragments in this region.

The importance of primate richness in San José de Morona was also assessed in the context of the interfluvial systems of the Ecuadorian Amazon (Table 3). The interfluvial systems with the highest primate richness in Ecuador are the Cononaco-Curaray and Curaray-Pastaza River systems, each hosting 11 primate species. These systems represent the areas with the highest sympatric species richness for primates in the country (Tirira et al. 2020, Tirira 2021a). The 10 primate species recorded in our study area, located within the Pastaza-Morona interfluvial system, match the richness of other, more extensive systems (Table 3), further confirming the biological significance of this region.

Table 3. Primate richness in the interfluvial systems of the Ecuadorian lowland Amazon (includes species recorded at altitudes below 600 m). Sources: A. Tirira (2017, 2021b), Tirira et al. (2018a). B. Tirira et al. (2020). C. This study. D. Pitman et al. (2012).

Interfluvial system [source]	Provinces	Number of species	Approximate length in kilometers*
Putumayo-Aguarico [A]	Sucumbíos	10 [§]	35
Aguarico-Napo [A]	Sucumbíos, Orellana	9	26
Napo-Curaray [A]	Napo, Orellana, Pastaza	10	24
Napo-Cononaco (Yasuní NP) [A]	Orellana, Pastaza	10	80
Cononaco-Curaray [A, B]	Orellana, Pastaza	11	29
Curaray-Pastaza [A]	Pastaza	11	96
Pastaza-Morona [C]	Morona Santiago	10	48
Morona-Santiago (Ecuador) [A, C]	Morona Santiago	7	12
Morona-Santiago (Peru) [D]	Loreto, Amazonas	10	14
Santiago-Zamora [A]	Morona Santiago, Zamora Chinchipe	6	36 [¶]

* Includes the shortest approximate distance between the two rivers; calculated using Google Maps (2024).

[§] Evidence suggests that only nine species are sympatric.

[¶] The Santiago and Zamora rivers are part of the same watershed, although separated by the Cordillera del Cóndor.

Below, we present observations and analysis for three primate species whose records and field data contribute significantly to understanding their distribution:

Leontocebus lagonotus is a small primate inhabiting south of the Napo River, in the Ecuadorian provinces of Napo, Orellana, Pastaza, and Morona Santiago (Tirira et al. 2021b). This species is frequently sighted in the areas where it is present and appears more common in lowland secondary forests (De la Torre 2000, Castro Vergara 2012). Previous studies suggested that the Cangaime-Morona River serves as a geographical barrier for this species (Zapata Ríos et al. 2006, Tirira et al. 2021b), a hypothesis that we further evaluate here. Our study did not record *L. lagonotus* on the right (southwest) bank of the Morona River, aligning with findings from previous research in the region (Table 1). However, during interviews, several local informants reported that this primate inhabits both sides of the river, a claim we were unable to verify.

A photograph on iNaturalist (#89666986) (2024) recorded an individual of *L. lagonotus* on the right bank of the Morona River, where its presence would be unexpected. The photographer (G. Zapata Ríos, pers. comm.) confirmed that the record represents a wild animal; however, we question the validity of this record since it could represent an individual intentionally relocated from the opposite bank, given the species' popularity as a pet.

A related study in the Cerros de Kampankis, Peruvian Amazon, which includes the interfluvial region of the Morona and Santiago rivers, documented the same number of primate species as our study (Pitman et al. 2012). Within this study, *L. lagonotus* was observed only in Pongo Chinim, the locality closest to the Ecuadorian border (14 km away) (Castro Vergara 2012). Local informants there also reported the species' presence on both riverbanks. However, this information contrasts with mammalian records from Loreto Department, Peru, which lack documentation of *L. lagonotus* between the Pastaza and Santiago rivers (Díaz et al. 2021), an area spanning over 120 kilometers (Google Maps 2024).

Based on the arguments above, including the information provided by local people and data from contiguous areas in Peru (Castro Vergara 2012), the validity of the Cangaime-Morona River as a geographical barrier limiting the southern distribution of *Leontocebus lagonotus* is questionable. However, if *L. lagonotus* does indeed occur on the right (southwest) bank of the Morona River, it is evident that its population is significantly less abundant there compared to the left bank, at least within Ecuadorian territory. This could reflect a marginal distribution pattern, where species are generally expected to be less abundant (Longton & Hedderson 2000).

This scenario raises the question of what geographical barrier limits the southward distribution of *L. lagonotus*. Fieldwork and interviews with local residents conducted on the left (north) bank of the Santiago River, less than 14 kilometers in a straight line from the Morona River, yielded no evidence of this primate's pre-

sence in the area. Additionally, the species was not recognized by local informants (approximately ten people interviewed). Several informants explicitly confirmed that they had only observed this species within the Morona basin.

The division between the Morona and Santiago river basins is marked by a modest mountain range that extends southeastward from the Kutukú mountain range, known as Shaime in Ecuador and Kampankis in Peru. This range has elevations that mostly do not exceed 1200 meters (Google Maps 2024). Such altitudes are unlikely to limit the distribution of *L. lagonotus*, as the species has been documented at higher elevations, with a maximum record of 1760 meters in the foothills of Sangay National Park (Brito & Ojala-Barbour 2016). Consequently, we propose that the Cangaime-Morona basin does act as a physical barrier for *L. lagonotus*. Reports of the species on the right (southwest) bank of the river may result from (1) specimens deliberately transported from the other side and (2) generalization of the knowledge and misunderstandings among local informants regarding the role of large rivers as geographic barriers for primate distribution.

Sapajus apella is a medium-sized primate species with one of the broadest distributions in South America, with records in most of the Amazon Basin in Colombia, Venezuela, the Guianas, Brazil, Peru, and Bolivia (Rylands & Mittermeier 2013a, Boubli et al. 2021). However, its presence in Ecuador is poorly understood, and the boundaries of its distribution remain undefined (Tirira & De la Torre 2018). Although we did not directly observe this species, it was well known to local residents near San José de Morona (left bank of the Morona River). Nevertheless, all interviewees described it as a rare species.

On the right bank of the Morona River, four records of *S. apella* were identified in the literature. These include a record from Mankusas, on the eastern slopes of the Kutukú mountain range in Ecuador (Zapata Ríos et al. 2006) and two from Cerros de Kampankis (Pongo Chinim and Quebrada Wee) in the Peruvian Amazon (Castro Vergara 2012). Additionally, there is a photographic record of a juvenile kept as a pet in Miazal (Patzelt 2000), approximately 25 kilometers northwest of the Morona River. These findings support the presence of the species in the region. However, the record from Mankusas, based on interviews with local people, inaccurately uses the Shuar term "jaanch" to refer to *S. apella*. This term actually denotes the white-fronted capuchin (*Cebus yuracus*) (Tirira 2004: 162), while the correct Shuar name for *Sapajus apella* is "mirút".

Saki monkeys (genus *Pithecia*) are medium-sized primates with several records south of the Pastaza River, encompassing areas within the province of Morona Santiago, Ecuador. Most of the documented localities of *Pithecia* within this province are located east of the Kutuku mountain range (Elliot 1913, Morales & Schjellerup 1998, Zapata Ríos et al. 2006, Mena-Valenzuela & Cueva Loachamín 2015, Rodríguez-Segovia & Montene-

gro-García 2024; Table 1). There are also two historical records from “Macas” or “Rio-Maccas,” collected around 1870 (Sclater 1872, Schlegel 1876, Jentink 1892). This locality, now the city of Macas, lies west of the Kutukú mountain range and the Upano River. The accuracy of these historical records is questionable, as Macas is located at an altitude of approximately 1000 meters, while saki monkeys are generally associated with tropical lowlands (Ferrari et al. 2013). In Ecuador, the highest confirmed record for *Pithecia* monkeys is 630 meters (Tirira 2021a). Consequently, records at higher elevations are likely erroneous or associated with trafficked individuals (Carrillo-Bilbao et al. 2018a).

In this context, for the province of Morona Santiago, the presence of two species of *Pithecia* has been documented: *P. monachus* (Zapata Ríos et al. 2006, Mena-Valenzuela & Cueva Loachamín 2015) and *P. napensis* (Marsh 2014, Marsh et al. 2018). For Peru, south of the Pastaza River, some reports of *Pithecia* are within the Datem del Maraón Province. In Cerros de Kampankis, between the Morona and Santiago rivers, three sightings of *P. monachus* were reported, and it is also commented that local people recognize that another species of the genus (*P. aequatorialis*) inhabits in sympatry (Pitman et al. 2012). In the Santiago River basin, *P. napensis* was reported in three localities (Marsh 2014), including one shared with the previous study (Quebrada Katerpiza). A third study reports *P. napensis* in Puerto Melendez, on the banks of the Maraón River (Díaz et al. 2021). This background shows how little is known about the species of the genus *Pithecia* south of the Pastaza River and in both countries, with three possible taxa present: *P. aequatorialis*, *P. monachus*, and *P. napensis*.

The seven sightings of *Pithecia* recorded during our investigation—most supported by photographic evidence—suggest they may belong to *P. aequatorialis*. Diagnostic features used to classify our records as this species include an entirely white arch around the face in males and a vivid orange ruff on the chest, combined with a grizzled pelage, primarily in males (according to Marsh 2014). Nevertheless, the white facial arch was less pronounced in some males we observed.

Pithecia aequatorialis was “known only from three areas in upper Amazonia between north (left) bank Río Napo, Napo, Ecuador, and north bank Río Maraón, Loreto, Peru.” (Hershkovitz 1987: 430); however, Marsh (2014) restricts its presence to Peru, south of the Napo and Curaray rivers as far north as the Tigre River, and comments that the Ecuadorian records are *P. napensis*, except for one whose identification was correct (*P. aequatorialis*), but whose locality of collection was incorrect, since it came from Peru. A recent study based on museum specimens and field observations confirmed the presence of *P. aequatorialis* in Ecuador, specifically in the province of Pastaza, with the Bobonaza and Conambo rivers marking its southern limit (Tirira 2023).

In this research, we concluded that the specimens of *Pithecia* present in the Morona River basin could be *P. aequatorialis*. Unfortunately, the material available for a taxonomic analysis from the province of Morona Santiago is currently insufficient, as only a couple of incomplete skulls are available (Rodríguez-Segovia & Montenegro-García 2024, Tirira 2024). Future studies with additional samples are required for morphological and genetic analysis and a more complete photographic record.

The genus *Cebuella* (pygmy marmosets) includes the smallest primates in the world, and their southern distribution in Ecuador was attributed to reach the Santiago River (Tirira 2007, Boubli et al. 2018). However, later evidence suggested that the Pastaza River, some 140 km further east, would be its southern distribution limit in this part of the Amazon (Rylands & Mittermeier 2013b, Tirira 2017, De la Torre & Tirira 2018b, Garbino et al. 2019). This monkey usually lives in flooded forests and prefers riverside trees, where it obtains its food (Soini 1982). The lower part of our study area aligns with these characteristics, primarily composed of flooded forests caused by the Morona River’s seasonal overflow (Guevara et al. 2013). This assumption is further supported by an ecological niche modeling analysis, which incorporated all recorded occurrences of *Cebuella pygmaea* sensu lato in Ecuador (Tirira 2021a). That study found that the habitat on the left (southeast) bank of the Morona River showed suitability levels above 75%, while the right (southwest) bank displayed suitability levels mostly exceeding 51%. However, no records of *Cebuella* were obtained during our study. Additionally, the evidence suggests that these primates are absent from the area, as they were unknown to all the local inhabitants interviewed.

We suggest that the southern distribution barrier for *Cebuella* is the Pastaza River, as previously proposed (Tirira 2017). Consequently, records reported for the province of Morona Santiago (Morales & Schjellerup 1998, Mena-Valenzuela & Cueva Loachamín 2015, Tirira 2021a, Brito & Tirira 2022) are likely invalid, stemming from identification errors.

In Ecuador, *Cebuella* are commonly referred to as “mono de bolsillo” [pocket monkeys] (Tirira 2004). However, during our visit to San José de Morona, we observed that this name generally applies to tamarin monkeys (*Leontocebus lagotus*). This local name was also noted in the study from the Cerros de Kampankis area (Pitman et al. 2012), located in the Peruvian Amazon near the Ecuadorian border. This misidentification likely explains the species’ inclusion in earlier studies.

The primate abundance recorded in our study aligns with other research conducted in Ecuador, where genera such as *Saimiri*, *Leontocebus*, and *Plecturocebus* tend to be most frequently observed in moderately disturbed environments. This trend is consistent across the Amazon region (Tirira 2021a), and specific sites, including Morona Santiago (Zapata Ríos et al. 2006), northeastern Sucumbíos (Zapata Ríos 2001), and Yasuní National Park (Tirira et al. 2018a). In contrast, species of the genus *Lagothrix* are more commonly found in well-preserved primary forests (Pozo-Rivera & Youlatos 2005).

During our fieldwork, we identified five direct threats to primates through either direct observation (habitat loss and pet possession) or local accounts (hunting for food, roadkill, and traffic). Although the direct threats to Ecuadorian primates have been summarized as 12 (Tirira et al. 2018d). We could not assess certain factors such as climate change, diseases, introduced species, or environmental noise due to our study's methodology and duration.

Habitat loss emerged as the most critical threat in the study area and likely poses the greatest challenge to the conservation of all identified primate species. However, its impact varies depending on each species' ecological requirements. Larger species, like *Ateles belzebuth* and *Lagothrix lagothricha*, are particularly affected, as they rely on primary forests far from human activity and hunters (De la Torre 2000, Aquino et al. 2013, Papworth et al. 2013). This likely explains their rarity in our study area. Conversely, smaller species, such as *Lentonecebus lagonotus*, *Saimiri macrodon*, and *Plecturocebus discolor*, are more resilient to habitat loss, as they can survive in secondary forests and even in disturbed areas (De la Torre 2000, Aquino et al. 2014, Carrillo-Bilbao et al. 2018b, Solórzano et al. 2018). Unsurprisingly, these smaller species were the most abundant in our study.

Hunting also poses a significant threat, as the Amazon forests serve as an important food source for Indigenous communities, including primates and other mammals (Hames & Vickers 1982, Zapata Ríos 2001, Zapata Ríos et al. 2006). According to the interviewed Shuar people, *Ateles belzebuth* and *Lagothrix lagothricha* are preferred for consumption due to their size and the perceived quality of their meat. This preference, widely reported among Ecuadorian Amazon communities (Zapata Ríos 2001, Sirén 2004, Tirira & Ríos 2018, Tirira et al. 2020), has led to overhunting and a progressive decline in their populations, hunting that is unsustainable (Zapata Ríos 2001, Sirén 2004, 2012, Zapata Ríos et al. 2009).

Addressing this issue is complicated by the Constitution of the Republic of Ecuador, which protects the right of Indigenous communities to maintain ancestral traditions and sustainably use natural resources found within their lands, including primates (Chapter IV: Rights of Communities, Peoples and Nationalities, Article 57, numbers 1, 6, 12) (Registro Oficial No. 449, 2008). Interviews revealed that hunting has decreased compared to a decade ago due to the rarity of the most sought-after species, the high cost of cartridges, and a shift toward alternative livelihoods such as agriculture and cattle ranching.

The capture of primates for pets often stems from hunting, with offspring of hunted individuals commonly ending up as pets (Tirira & Ríos 2018). This practice further facilitates illegal trafficking, as many pets are sold to settlers and visitors. For example, a male *Pithecia cf. aequatorialis* was offered for sale upon learning of our interest in primates.

Conservation in the Morona River basin is challenging, as most forests fall under indigenous community territories, complicating establishing governmental protected areas. However, local community-managed conservation initiatives could be explored, drawing from successful experiences in other regions (De la Torre et al. 2003, Yela Dávalos 2011). These efforts would emphasize sustainable resource use while conserving biodiversity, as outlined by the Convention on Biological Diversity (Ipenza Peralta 2018).

On the left (southeast) bank of the Morona River, near the border with Peru, lies a well-preserved remnant of primary forest covering approximately 2000 hectares. A portion of this area is part of the Selva Eterna Reserve, established in 2023, while another section is under military protection due to its designation as a strategic zone (E. Arbeláez, pers. comm.). This forest represents perhaps the region's most suitable location for primate conservation, as it connects seamlessly with the forests across the border in Peru. Such continuity creates the potential for a sink effect, which could support the recovery of local primate populations (Espinoza & Salvador 2017).

Literature cited

- Aquino R, Cornejo FM, Pezo E, Heymann EW. 2013. Distribution and abundance of white-fronted spider monkeys, *Ateles belzebuth* (Atelidae), and threats to their survival in Peruvian Amazonia. *Folia Primatologica* 84(1): 1-10. <https://doi.org/10.1159/000345549>
- Aquino R, López L, García G, Heymann EW. 2014. Diversity, abundance and habitats of the primates in the Río Curaray basin, Peruvian Amazonia. *Primate Conservation* 28(1): 1-8. <https://doi.org/10.1896/052.028.0103>
- Blake JG, Guerra J, Mosquera D, Torres R, Loiselle BA, Romo D. 2010. Use of mineral licks by white-bellied spider monkeys (*Ateles belzebuth*) and red howler monkeys (*Alouatta seniculus*) in Eastern Ecuador. *International Journal of Primatology* 31(3): 471-483. <https://doi.org/10.1007/s10764-010-9407-5>
- Boubli JP, da Silva MNF, Rylands AB, Nash SD, Bertuol F, Nunes M, Mittermeier RA, Byrne H, Silva FE, Röhe F, Sampaio I, Schneider H, Farias IP, Hrbek T. 2018. How many pygmy marmoset (*Cebuella Gray, 1870*) species are there? A taxonomic re-appraisal based on new molecular evidence. *Molecular Phylogenetics and Evolution* 120: 170-182. <https://doi.org/10.1016/j.ympev.2017.11.010>
- Brito J, Ojala-Barbour R. 2016. Mamíferos no voladores del Parque Nacional Sangay, Ecuador: Papéis Avulsos de Zoologia 56(5): 45-61. <https://doi.org/10.11606/0031-1049.2016.56.05>
- Brito J, Tirira DG. 2022. Mamíferos no voladores de Shuinmamus. In: Lozano P, Yáñez-Muñoz MH, editors. Biodiversidad de la comunidad achuar Shuinmamus, Morona Santiago, Ecuador: Una visión rápida de su paisaje. Quito, Puyo, Taisha: Serie de publicaciones del Instituto Nacional de Biodiversidad. Reportes Técnicos de Biodiversidad N° 1. INABIO, Universidad Estatal Amazónica, GAD Taisha; p. 77-80.

- Carrillo-Bilbao GA, Martin-Solano S, Zapata Ríos G, De la Torre S, Tirira DG. 2018a. Saki del Napo *Pithecia napensis* (Lönnberg, 1938). In: Tirira DG, De la Torre S, Zapata Ríos G, editors. Estado de conservación de los primates del Ecuador. Quito: Grupo de Estudio de Primates del Ecuador, Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; p. 136-143.
- Carrillo-Bilbao GA, Martin-Solano S, De la Torre S, Tirira DG. 2018b. Tití rojizo *Plecturocebus discolor* (I. Geoffroy y Deville, 1848). In: Tirira DG, De la Torre S, Zapata Ríos G, editors. Estado de conservación de los primates del Ecuador. Quito: Grupo de Estudio de Primates del Ecuador, Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; p. 116-123.
- Castro Vergara L. 2012. Mammals. In: Pitman NCA, Ruelas E, Alvir Reyes D, Vriesendorp C, Moskovits DK, Del Campo Á, Wachter T, Stotz DF, Noningo S. S, Tuesta C. E, et al., editors. Perú: Cerros de Kampankis. Chicago, IL: The Field Museum. Rapid Biological and Social Inventories 24; p. 280-285.
- Cerón C, Palacios W, Guevara JE, Mendoza ZA, Encarnación F, Josse C. 2013. Bosque inundado de palmas de la llanura aluvial de la Amazonía. In: MAE, editor. Sistema de clasificación de ecosistemas del Ecuador continental. Quito: Ministerio del Ambiente del Ecuador; p. 171-172.
- De la Torre S. 2000. Primates de la Amazonía Ecuatoriana. Quito: Proyecto PETRAMAZ, SIMBIOE; 60 pp.
- De la Torre S. 2010. Los primates ecuatorianos, estudios y perspectivas. *Avances en Ciencias e Ingenierías* 2: 27-35. <https://doi.org/10.18272/aci.v2i2.30>
- De la Torre S, Tirira DG. 2018a. Introducción. In: Tirira DG, De la Torre S, Zapata Ríos G, editors. Estado de conservación de los primates del Ecuador. Quito: Grupo de Estudio de Primates del Ecuador and Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; p. 15-20.
- De la Torre S, Tirira DG. 2018b. Tití pigmeo *Cebuella pygmaea* (Spix, 1823). In: Tirira DG, De la Torre S, Zapata Ríos G, editors. Estado de conservación de los primates del Ecuador. Quito: Grupo de Estudio de Primates del Ecuador and Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; p. 24-31.
- De la Torre S, Yépez P. 2003. Environmental Education: A teaching tool for the conservation of pygmy marmosets (*Cebuella pygmaea*) in the Ecuadorian Amazon. *Neotropical Primates* 11: 73-75. <http://www.primate-sg.org/PDF/NP11.2.EE.cebuella.pdf>
- De la Torre S, Campos F, De Vries T. 1995a. Home range and birth seasonality of *Saguinus nigricollis* *graei* in Ecuadorian Amazonia. *American Journal of Primatology* 37(1): 39-56. <https://doi.org/10.1002/ajp.1350370105>
- De la Torre S, Utreras V, Campos F. 1995b. An overview of primate studies in Ecuador: Primates of the Cuyabeno Reserve. *Neotropical Primates* 3(4): 169-171.
- De la Torre S, De la Torre L, Oña AI. 2003. Zonificación de las cabeceras del río Aguas Negras, Reserva de Producción Faunística Cuyabeno Zonificación de las cabeceras del río Aguas Negras, Reserva de Producción Faunística Cuyabeno - Ecuador, para su uso y manejo por el pueblo Secoya. *Lyonia* 5(1): 1-8.
- Di Fiore A. 2001. Investigación ecológica y de comportamiento de primates en el Parque Nacional Yasuní. In: Jorgenson J, Coello Rodríguez M. Conservación y desarrollo sostenible del Parque Nacional Yasuní y su área de influencia. Quito: Ministerio del Ambiente, UNESCO, Wildlife Conservation Society, Simbioe; p. 166-174.
- Di Fiore A. 2004. Diet and feeding ecology of woolly monkeys in a Western Amazonian rain forest. *International Journal of Primatology* 25(4): 767-801. <https://doi.org/10.1023/B:IJOP.0000029122.99458.26>
- Díaz S, Sánchez-Vendizú P, Graham-Angeles L, Pacheco V. 2021. Diversidad y conservación de los mamíferos mayores de Loreto, Perú. *Revista Peruana de Biología* 28: 1-34. <https://doi.org/10.15381/rpb.v28iespecial.21910>
- EcoCiencia. 2021. Territorios indígenas de Ecuador. Quito: EcoCiencia. <https://ecociencia.org>
- Elliot DG. 1913. A review of the primates. Volume I: Lemuroidea, Antropoidea. New York: Monograph 1, American Museum of Natural History; 317 pp.
- Ferrari SF, Veiga LM, Pinto LP, Marsh LK, Mittermeier RA, Rylands AB. 2013. Family Pitheciidae (titis, sakis and uacaris). In: Mittermeier RA, Rylands AB, Wilson DE, editors. Handbook of the mammals of the world. Volume 3: Primates. Barcelona: Lynx Edicions; p. 432-483.
- Garbino GST, Casali DM, Nascimento FO, Serrano-Villavicencio JE. 2019. Taxonomy of the pygmy marmoset (*Cebuella* Gray, 1866): Geographic variation, species delimitation, and nomenclatural notes. *Mammalian Biology* 95: 135-142. <https://doi.org/10.1016/j.mambio.2018.09.003>
- GBIF. 2024. GBIF occurrence download. Global Biodiversity Information Facility. Accessed 2024-10-11. <https://doi.org/10.15468/dl.fwkkun>
- Google Maps. 2024. Accessed: 2024-09-17. <https://www.google.com.ec/maps>
- Groves CP. 2001. Primate taxonomy. Washington DC: Smithsonian Institution Press; 350 pp.
- Groves CP. 2005. Order Primates. In: Wilson DE, Reeder, DM, editors. *Mammal species of the World, a taxonomic and geographic reference* (3rd edition). Baltimore: The Johns Hopkins University Press; p. 111-184.
- Guevara JE, Pitman NCA, Cerón C, Rivas G, Beltrán L, Castro R. 2013. Bosque inundable de la llanura aluvial de los ríos de origen andino y de cordilleras Amazónicas. In: MAE, editor. Sistema de clasificación de ecosistemas del Ecuador continental. Quito: Ministerio del Ambiente del Ecuador; p. 163-165.
- Gutiérrez EE, Marinho-Filho J. 2017. The mammalian faunas endemic to the Cerrado and the Caatinga. *ZooKeys* 644: 105-157. <https://doi.org/10.3897/zookeys.644.10827>
- Hames RB, Vickers WT. 1982. Optimal diet breadth theory as a model to explain variability in Amazonian hunting. *American Ethnologist* 9(2): 358-378. <https://doi.org/10.1525/ae.1982.9.2.02a00090>
- Hershkovitz P. 1983. Two new species of night monkeys, genus *Aotus* (Cebidae, platyrrhini): A preliminary report on *Aotus* taxonomy. *American Journal of Primatology* 4(3): 209-243. <https://doi.org/10.1002/ajp.1350040302>

- Hershkovitz P. 1987. The taxonomy of South American sakis, genus *Pithecia* (Cebidae, Platyrrhini): A preliminary report and critical review with the description of a new species and a new subspecies. *American Journal of Primatology* 12(4): 387-468. <https://doi.org/10.1002/ajp.1350120402>
- IGM. 2013. Geoportal Ecuador. Cartografía de libre acceso escala 50k. Accessed 2019-12-30. <http://www.geoport-taligm.gob.ec/portal/index.php/cartografia-de-libre-acceso-escala-50k/>
- iNaturalist. 2024. Accessed 2024-10-11. <https://www.inaturalist.org/>
- Ipenza Peralta CA. 2018. Evidenciando la estrecha relación entre áreas protegidas y pueblos indígenas. La categoría VI de la UICN como punto de encuentro. *Letras Verdes* 2: 11-13.
- ITTO, Fundación Natura, CI. 2005. Paz y conservación binacional en la cordillera del Cóndor Ecuador-Perú. Quito: Organización Internacional de Maderas Tropicales, Fundación Natura, Conservación Internacional.
- IUCN. (2025). The IUCN Red List of Threatened Species. Version 2025-1. International Union for Conservation of Nature and Natural Resources. <https://www.iucnredlist.org>
- Jentink FA. 1892. Catalogue systématique des mammifères (Singes, Carnivores, Ruminants, Pachydermes, Sirènes et Cétacés). Muséum d'Histoire Naturelle des Pays-Bas; 219 pp.
- Longton RE, Hedderson TA. 2000. What are rare species and why conserve them? *Lindbergia* 25(2-3): 53-61. <https://doi.org/10.2307/20150038>
- MAE. 2013. Sistema de clasificación de ecosistemas del Ecuador continental. MAE, editor. Quito: Subsecretaría de Patrimonio Natural, Ministerio del Ambiente del Ecuador; 232 pp.
- MAE. 2018. Mapa interactivo ambiental. Deforestación del Ecuador continental (período 1990-2018). <http://mapainteractivo.ambiente.gob.ec/portal/>
- Mammal Diversity Database. 2025. Mammal Diversity Database (Version 2.0) [Data set]. <https://doi.org/10.5281/zenodo.15007505>
- Marsh LK. 2004. Primate species at the Tiputini Biodiversity Station, Ecuador. *Neotropical Primates* 12(2): 75-78.
- Marsh LK. 2014. A taxonomic revision of the saki monkeys, *Pithecia* Desmarest, 1804. *Neotropical Primates* 21(1): 1-163. <https://doi.org/10.1896/044.021.0101>
- Marsh LK, De la Torre S, Moscoso P. 2018. *Pithecia napensis*. In: The IUCN Red List of Threatened Species 2018 (2024-2). IUCN. <https://doi.org/10.2305/IUCN.UK.2018-2.RLTS.T39955A70609585.en>
- Mena-Valenzuela P, Cueva Loachamín RD. 2015. Mamíferos de la comunidad shuar Uuntsuants, cordillera del Kutukú, provincia de Morona Santiago, Ecuador. *Boletín Técnico* 12, Serie Zoológica 10-11: 68-94. <https://espe.edu.ec/ojs/index.php/revista-serie-zoologica/article/view/1468>
- Mittermeier RA, Robles-Gil P, Mittermeier CG. 1997. Megadiversidad. Los países biológicamente más ricos del mundo. Mexico City: CEMEX S.A., Agrupación Sierra Madre and Conservación Internacional; 501 pp.
- Mittermeier RA, Rylands AB, Wilson DE. 2013. Handbook of the mammals of the world. Volume 3: Primates. Barcelona: Lynx Edicions; 951 pp.
- Morales MP, Schjellerup I. 1998. The Shuar of Makuma and Mutints. In: Borgtoft H, Skov F, Fjeldsa J, Schjellerup I, Ollgaard B, editors. *People and Biodiversity: two case studies from the Andean foothills of Ecuador*. Ronde, Denmark: Centre for Research on Cultural and Biological Diversity of Andean Rainforests (DIVA), DIVA Technical Report 3; p. 83-111.
- Moreno CE. 2001. Métodos para medir la biodiversidad. Zaragoza, España: M&T-Manuales and Tesis SEA, vol 1; 84 pp.
- Morrone JJ. 2014. Biogeographical regionalisation of the Neotropical region. *Zootaxa* 3782: 1-110. <https://doi.org/10.11646/zootaxa.3782.1.1>
- Orellana-Vásquez HA, Gavilanez-Endara MM. 2023. Taxonomic, functional, and phylogenetic diversity of primate communities in Ecuador. *Therya* 14(2): 269-280. <https://doi.org/10.12933/therya-23-1022>
- Papworth S, Milner-Gulland EJ, Slocumbe K. 2013. Hunted woolly monkeys (*Lagothrix poeppigii*) show threat-sensitive responses to human presence. *PLoS ONE* 8(4): 1-11. <https://doi.org/10.1371/journal.pone.0062000>
- Patzelt E. 2000. Fauna del Ecuador. 3rd ed. Quito: ImpreFepp; 320 pp.
- Pitman NCA, Ruelas E, Alvira Reyes D, Vriesendorp C, Moskovits DK, Del Campo Á, Wachter T, Stotz DF, Noningo SS, Tuesta CE, et al., editors. 2012. Perú: Cerros de Kampankis. Chicago, IL: The Field Museum; 452 pp. <https://doi.org/10.5962/bhl.title.96919>
- Pozo-Rivera WE. 2009. Uso preferencial de hábitat en primates atélidos en el Parque Nacional Yasuní, Ecuador. *Boletín Técnico* 8, Serie Zoológica 4-5: 25-34. [http://www.espe.edu.ec/encuesta/sitiorevistas/revistas/E-RevSerZoologica/8\(4-5\)/02WilmerMonos.pdf](http://www.espe.edu.ec/encuesta/sitiorevistas/revistas/E-RevSerZoologica/8(4-5)/02WilmerMonos.pdf)
- Pozo-Rivera WE, Youlatos D. 2005. Estudio sin ecológico de nueve primates del Parque Nacional Yasuni, Ecuador. *Politécnica (Biología)* 6(1): 83-107.
- Registro Oficial No. 449. 2008. Constitución de la República del Ecuador, 20 de octubre de 2008.
- Rodríguez-Segovia MA, Montenegro-García F. 2024. Catalog of specimens deposited in the Laboratorio-Museo de Zoología Gustavo Orcés at Universidad Central del Ecuador, Quito, Ecuador. Part 1: Mammals. *Mammalia aequatorialis* 6: 9-47. <https://doi.org/10.59763/mam.aeq.v6i.71>
- Ron SR. 2020. Regiones naturales del Ecuador. BIOWEB; Accessed 2019-01-31. <https://bioweb.bio/faunaweb/amphibiaweb/RegionesNaturales>
- Ruiz-García M, Pinedo-Castro MO, Shostell JM. 2014. How many genera and species of woolly monkeys (Atelidae, Platyrrhini, Primates) are there? The first molecular analysis of *Lagothrix flavicauda*, an endemic Peruvian primate species. *Molecular Phylogenetics and Evolution* 79(1): 179-198. <https://doi.org/10.1016/j.ympev.2014.05.034>
- Ruiz-García M, Sánchez-Castillo S, Castillo MI, Luengas-Villamil K, Ortega JM, Moreno-Cárdenas PA, Albuja VL, Pinto CM, Shostell JM. 2018. How many species, taxa, or lineages of *Cebus albifrons* (Platyrrhini, Primates) inhabit Ecuador? Insights from mitogenomics. *International Journal of Primatology* 39(6): 1068-1104. <https://doi.org/10.1007/s10764-018-0062-6>
- Rylands AB, Mittermeier RA. 2013a. Family Cebidae (squirrel monkeys and capuchins). In: Mittermeier RA, Rylands AB, Wilson DE, editors. *Handbook of the mammals of the world. Volume 3: Primates*. Barcelona: Lynx Edicions; p. 348-413.

- Rylands AB, Mittermeier RA. 2013b. Family Callitrichidae (marmosets and tamarins). In: Mittermeier RA, Rylands AB, Wilson DE, editors. Handbook of the mammals of the world. Volume 3: Primates. Barcelona: Lynx Edicions; p. 262–346.
- Rylands AB, Mittermeier RA. 2024. Taxonomy and systematics of the Neotropical primates: a review and update. *Frontiers in Conservation Science* 5: 1391303. <https://doi.org/10.3389/fcsc.2024.1391303>
- Rylands AB, Heymann EW, Lynch-Alfaro JW, Buckner JC, Roos C, Matauschek C, Boubli JP, Sampaio R, Mittermeier RA. 2016. Taxonomic review of the New World tamarins (Primates: Callitrichidae). *Zoological Journal of the Linnean Society*, 177(4): 1003–1028. <https://doi.org/10.1111/zoi.12386>
- Schlegel H. 1876. Les singes. Simiae. *Muséum d'Histoire Naturelle des Pays-Bas* 7(1): 1–356.
- Sclater PL. 1872. On the species of *Quadrumanus* collected by Mr. Buckley in Ecuador. *Proceedings of the Zoological Society of London* 1872: 663–664.
- Sirén A. 2004. Chapter 9: Hunting. In: Sirén A, editor. *Changing interactions between humans and nature in Sarayaku, Ecuadorian Amazon*. Uppsala: Acta Universitatis Agriculturae Sueciae: Agraria 447; p. 191–217. <http://diss-epsilon.slu.se/archive/00000498/>
- Sirén A. 2012. Festival hunting by the kichwa people in the Ecuadorian Amazon. *Journal of Ethnobiology* 32(1): 30–50. <https://doi.org/10.2993/0278-0771-32.1.30>
- Soini P. 1982. Ecology and population dynamics of the pygmy marmoset, *Cebuella pygmaea*. *Folia Primatologica* 39(1–2): 1–21. <https://doi.org/10.1159/000156066>
- Solórzano MF, Cervera L, Álvarez-Solas S, De la Torre S, Tirira DG. 2018. Mono ardilla de Humboldt *Saimiri cassiquiarensis* Lesson, 1840. In: Tirira DG, De la Torre S, Zapata Ríos G, editors. *Estado de conservación de los primates del Ecuador*. Quito: Grupo de Estudio de Primates del Ecuador y Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; p. 88–95.
- Tirira DG. 2004. Nombres de los mamíferos del Ecuador. Quito: Ediciones Murciélago Blanco and Museo Ecuatoriano de Ciencias Naturales. Publicación Especial sobre los mamíferos del Ecuador 5; 281 pp.
- Tirira DG. 2007. Guía de campo de los mamíferos del Ecuador (1st ed.). Quito: Ediciones Murciélago Blanco. Publicación Especial sobre los mamíferos del Ecuador 6; 576 pp.
- Tirira DG. 2017. A field guide to the mammals of Ecuador. Quito: Asociación Ecuatoriana de Mastozoología and Editorial Murciélago Blanco. Publicación Especial sobre los mamíferos del Ecuador 10; 600 pp.
- Tirira DG. 2021a. Primates del Ecuador: aportes al conocimiento de su diversidad, distribución y conservación. Salamanca: Universidad de Salamanca; Doctoral thesis in Biology. <https://doi.org/10.59763/mam.aeq.v3i.9>
- Tirira DG, editor. 2021b. Lista Roja de los mamíferos del Ecuador. In: Libro Rojo de los mamíferos del Ecuador. 3rd ed. Quito: Asociación Ecuatoriana de Mastozoología, Fundación Mamíferos y Conservación, Pontificia Universidad Católica del Ecuador & Ministerio del Ambiente, Agua y Transición Ecológica del Ecuador. Publicación Especial sobre los mamíferos del Ecuador 13; 82 pp.
- Tirira DG. 2023. Confirmed presence of *Pithecia aequatorialis* Hershkovitz, 1987 in Ecuador. *Neotropical Primates* 29(1): 73–79. <https://doi.org/10.62015/np.2023.v29.782>
- Tirira DG. 2024. Red Noctilio, unpublished database on mammals of Ecuador. Quito: Grupo Murciélago Blanco.
- Tirira DG, De la Torre S. 2018. Capuchino de cabeza grande *Sapajus macrocephalus* Spix, 1823. In: Tirira DG, De la Torre S, Zapata Ríos G, editors. *Estado de conservación de los primates del Ecuador*. Quito: Grupo de Estudio de Primates del Ecuador y Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; p. 82–87.
- Tirira DG, Ríos M. 2018. Monitoreo Biológico Yasuní. Volumen 8: Uso de la flora y fauna por el pueblo Waorani, Amazonía del Ecuador. Quito: Ecuambiente Consulting Group; 316 pp.
- Tirira DG, Reid FA, Engstrom MD. 2018a. Monitoreo Biológico Yasuní. Volumen 2: Mamíferos. Quito: Ecuambiente Consulting Group; 288 pp.
- Tirira DG, De la Torre S, Zapata Ríos G, editors. 2018b. Estado de conservación de los primates del Ecuador. Quito: Grupo de Estudio de Primates del Ecuador and Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; 276 pp.
- Tirira DG, De la Torre S, Zapata Ríos G, editors. 2018c. Plan de acción para la conservación de los primates del Ecuador. Quito: Ministerio del Ambiente del Ecuador; Grupo de Estudio de Primates del Ecuador and Asociación Ecuatoriana de Mastozoología; 74 pp.
- Tirira DG, De la Torre S, Zapata Ríos G. 2018d. Resumen de las principales amenazas identificadas para las especies de primates del Ecuador. In: Tirira DG, De la Torre S, Zapata Ríos G, editors. *Estado de conservación de los primates del Ecuador*. Quito: Grupo de Estudio de Primates del Ecuador and Asociación Ecuatoriana de Mastozoología. Publicación Especial sobre los mamíferos del Ecuador 12; p. 239–240.
- Tirira DG, Greeney HF, Omaca C, Baihua O, Killackey RP. 2020. Species richness and ethnozoological annotations on mammals at the Boanamo indigenous community, Waorani territory, Orellana and Pastaza provinces, Ecuador. *Mammalia* 84(6): 535–551. <https://doi.org/10.1515/mammalia-2019-0144>
- Tirira DG, Brito J, Burneo SF, Carrera JP, Comisión de Diversidad de la AEM. 2021a. Mamíferos del Ecuador: lista oficial actualizada de especies / Mammals of Ecuador: official updated species checklist. Version 2021.1. Quito: Asociación Ecuatoriana de Mastozoología; 60 pp. <https://aem.mamiferosdelecuador.com>
- Tirira DG, Sánchez-Sánchez L, Álvarez-Solas S. 2021b. An update of the geographic distribution of the Red-mantled Saddle-Back Tamarin, *Leontocebus lagothotus* (Callitrichidae), in Ecuador. *International Journal of Primatology* 42(4): 600–617. <https://doi.org/10.1007/s10764-021-00221-7>
- Tirira DG, Brito J, Burneo SF, Pinto CM, Salas JA, Comisión de Diversidad de la AEM. 2024. Mamíferos del Ecuador: lista oficial actualizada de especies / Mammals of Ecuador: official updated species checklist. Version 2024.1. Quito: Asociación Ecuatoriana de Mastozoología; 84 pp. <http://aem.mamiferosdelecuador.com>

- van Roosmalen MGM, van Roosmalen T, Mittermeier RA. 2002. A taxonomic review of the titi monkeys, genus *Callicebus* Thomas, 1903, with the description of two new species, *Callicebus bernhardi* and *Callicebus stephen-nashi*, from Brazilian Amazonia. *Neotropical Primates* 10(Suppl.): 1–52. <https://doi.org/10.1007/s10533-007-9087-1>
- Yela Dávalos DF. 2011. Ontologías no naturalistas y prácticas locales de uso y manejo del territorio en la comunidad Kichwa de Nina Amarun, provincia de Pastaza, Ecuador. Quito: FLACSO-sede Ecuador; 148 pp.
- Zapata Ríos G. 2001. Sustentabilidad de la cacería de subsistencia: el caso de cuatro comunidades quichuas en la Amazonía nororiental ecuatoriana. *Mastozoología Neotropical* 8(1): 59–66.
- Zapata Ríos G, Araguillín E, Jorgenson JP. 2006. Caracterización de la comunidad de mamíferos no voladores en las estribaciones orientales de la cordillera del Kutukú, Amazonía ecuatoriana. *Mastozoología Neotropical* 13(2): 227–238.
- Zapata Ríos G, Urgilés-Verdugo CA, Suárez E. 2009. Mammal hunting by the Shuar of the Ecuadorian Amazon: Is it sustainable? *Oryx* 43(3): 375–385. <https://doi.org/10.1017/S0030605309001914>

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This study is based on field observations and an analysis of previously published records. No specimens were captured or sampled during the research. Visits to indigenous territories and local communities, as well as interviews and discussions with local inhabitants, were conducted with informed consent and, where required, verbal authorization from community leaders.