Primates in Peril

The World's 25 Most Endangered Primates 2023–2025

Edited by

Russell A. Mittermeier, Kim E. Reuter, Anthony B. Rylands, Andie Ang, Leandro Jerusalinsky, Stephen D. Nash, Christoph Schwitzer, Jonah Ratsimbazafy and Tatyana Humle

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Stephen D. Nash

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Cover photo: Myanmar Snub-nosed Monkey, *Rhinopithecus strykeri*. Photograph by Wan Bing.

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ACKNOWLEDGMENTS

Here we present the twelfth edition of The World's 25 Most Endangered Primates, this one for 2023–2025, drawn up during an open meeting held on the evening of 22 August 2023, during the 29th Congress of the International Primatological Society (IPS), jointly organized with the Malaysian Primatological Society (MPS) in Kuching, Sarawak, Malaysian Borneo.

We have updated the profiles for those species remaining on the list from the 2022–2023 (2022) edition and for those from previous editions that were returned to the list. We have added profiles for newly listed species.

This publication is a joint initiative of the IUCN SSC Primate Specialist Group, the IPS and Re:wild.

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We thank all of the authors who contributed to the final 2023–2025 version. They are also listed as authors on the individual species accounts to which they contributed.

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THE WORLD'S 25 MOST ENDANGERED PRIMATES 2023–2025

Here we report on the twelfth edition of the biennial listing of a consensus of the 25 primate species considered to be among the most endangered worldwide and the most in need of conservation measures. The previous edition (Mittermeier *et al.* 2022)[1] covered the time period from 2022 to 2023.

The 2023–2025 list of the World's 25 Most Endangered Primates has six species from Africa, four from Madagascar, nine from Asia, and six from the Neotropics (Appendix: Table 1). Indonesia and Madagascar both have four, China, Nigeria and Vietnam have three, Brazil, Malaysia, and Tanzania have two, and Benin, Bolivia, Brunei, Cameroon, Colombia, Costa Rica, Democratic Republic of the Congo, Laos PDR, Myanmar, Panama, Peru, Singapore, Togo and Venezuela each have one.

Fifteen of the primates were not on the previous (2022–2023) list (Appendix: Table 2). Eight of them are listed as among the world's most endangered primates for the first time. Nine primates – the Red Ruffed Lemur, Cross River Gorilla, Pig-tailed Snub-nosed Langur, Cao-vit Gibbon, Olalla Brothers' Titi, Peruvian Yellow-tailed Woolly Monkey, Variegated Spider Monkey, Caatinga Titi Monkey and Pied Tamarin – were listed on previous iterations but were subsequently removed to call attention to other highly threatened species.

The changes made in this list compared to the previous iteration (2022–2023) were not because the situation of the 15 species that were dropped (Appendix: Table 3) has improved. In some cases, their situation has in fact worsened. By making these changes we intend rather to highlight other, closely related species that are enduring equally bleak prospects for their survival.

During the discussion of the 2023–2025 list at the IPS-MPS Joint Meeting in Kuching, a number of other highly threatened primates were considered for inclusion. For all of these, the situation in the wild is as precarious as it is for those that finally made it on the list, and they have been included as 'Other Species Considered'.

[1] Mittermeier, R.A., Reuter, K.E., Rylands, A.B., Jerusalinsky, L., Schwitzer, C., Strier, K.B., Ratsimbazafy, J. and Humle, T. (eds.), 2022. *Primates in Peril: The World's 25 Most Endangered Primates 2022–2023*. IUCN SSC Primate Specialist Group, International Primatological Society, Re:wild, Washington, DC. 163pp.

Table 1. The World's 25 Most Endangered Primates: 2023–2025.

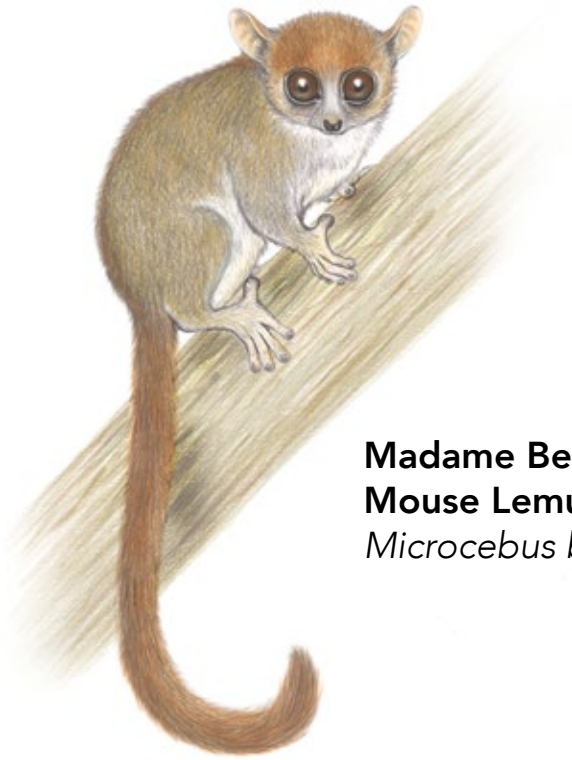
MADAGASCAR		
Microcebus berthae	Madame Berthe's Mouse Lemur	Madagascar
Lepilemur septentrionalis	Sahafary Sportive Lemur	Madagascar
Mirza coquereli	Coquerel's Giant Mouse Lemur	Madagascar
Varecia rubra	Red Ruffed Lemur	Madagascar
AFRICA		
Paragalogo rondoensis	Rondo Dwarf Galago	Tanzania
Cercocebus chrysogaster	Golden-bellied Mangabey	Democratic Republic of the Congo
Erythrocebus baumstarki	Southern Patas Monkey	Tanzania
Cercopithecus erythrogaster	Red-bellied Monkey	Benin, Nigeria, Togo
Piliocolobus epieni	Niger Delta Red Colobus	Nigeria
Gorilla gorilla diehli	Cross River Gorilla	Cameroon, Nigeria
ASIA		
Xanthonycticebus intermedius	Northern Pygmy Slow Loris	China, Lao PDR, Vietnam
Tarsius sangirensis	Sangihe Island Tarsier	Indonesia (Sulawesi)
Trachypithecus poliocephalus	Cat Ba Langur	Vietnam
Simias concolor	Pig-tailed Snub-nosed Langur	Indonesia (Mentawai Islands)
Rhinopithecus strykeri	Myanmar Snub-nosed Monkey	China, Myanmar
Presbytis femoralis	Raffles' Banded Langur	Malaysia, Singapore
Presbytis chrysomelas	Bornean Banded Langur	Brunei, Indonesia, Malaysia
Nomascus nasutus	Cao-vit Gibbon	China, Vietnam
Pongo tapanuliensis	Tapanuli Orangutan	Indonesia (Sumatra)
NEOTROPICS		
Plecturocebus olallae	Olalla Brothers' Titi	Bolivia
Callicebus barbarabrownae	Caatinga or Blond Titi Monkey	Brazil
Saguinus bicolor	Pied Tamarin	Brazil
Saimiri oerstedii	Central American Squirrel Monkey	Costa Rica, Panama
Lagothrix flavicauda	Peruvian Yellow-tailed Woolly Monkey	Peru
Ateles hybridus	Variegated Spider Monkey	Colombia, Venezuela

Table 2. Primate species that were added to the 2023–2025 list. An asterisk indicates those on the list for the first time.

MADAGASCAR		
*Mirza coquereli**	Sahafary Sportive Lemur	Madagascar
Varecia rubra	Red Ruffed Lemur	Madagascar
AFRICA		
*Cercopithecus erythrogaster**	Red-bellied Monkey	Benin, Nigeria, Togo
Gorilla gorilla diehli	Cross River Gorilla	Cameroon, Nigeria
ASIA		
*Xanthonycticebus intermedius**	Northern Pygmy Slow Loris	China, Lao PDR, Vietnam
Simias concolor	Pig-tailed Snub-nosed Langur	Indonesia (Mentawai Islands)
*Rhinopithecus strykeri**	Myanmar Snub-nosed Monkey	China, Myanmar
*Presbytis chrysomelas**	Bornean Banded Langur	Brunei, Indonesia, Malaysia
Nomascus nasutus	Cao-vit Gibbon	China, Vietnam
NEOTROPICS		
Plecturocebus olallae	Olalla Brothers' Titi	Bolivia
Callicebus barbarabrownae	Caatinga or Blond Titi Monkey	Brazil
Saguinus bicolor	Pied Tamarin	Brazil
*Saimiri oerstedii**	Central American Squirrel Monkey	Costa Rica, Panama
Lagothrix flavicauda	Peruvian Yellow-tailed Woolly Monkey	Peru
Ateles hybridus	Variegated Spider Monkey	Colombia, Venezuela

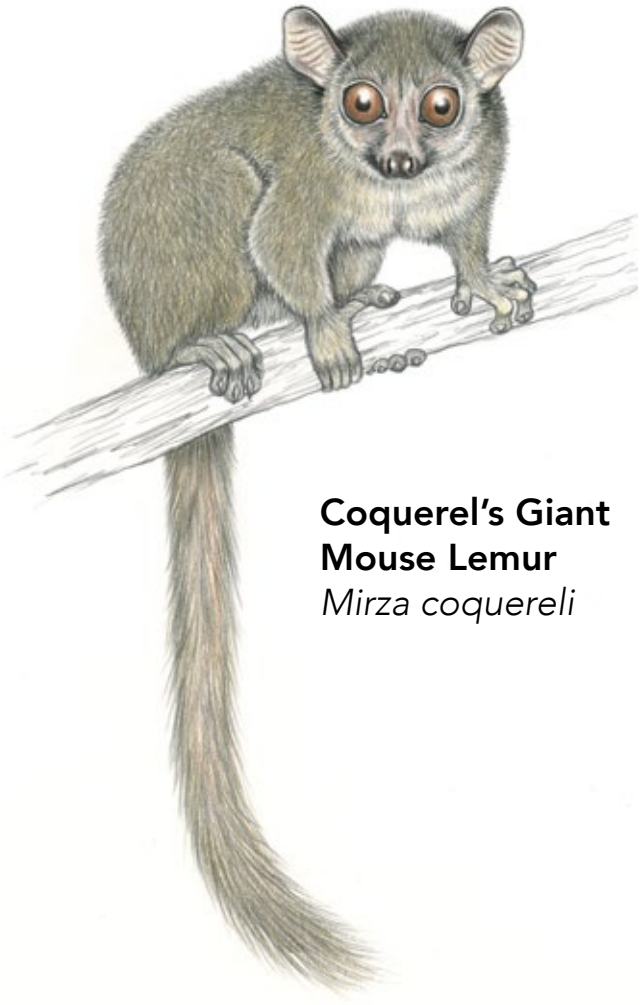
Table 3. Primate species included on the 2022–2023 list that were removed from the 2023–2025 list.

MADAGASCAR		
Eulemur flavifrons	Blue-eyed Black Lemur	Madagascar
Propithecus coquereli	Coquerel's Sifaka	Madagascar
AFRICA		
Cercopithecus roloway	Roloway Monkey	Côte d'Ivoire, Ghana
Pan troglodytes ellioti	Nigeria-Cameroon Chimpanzee	Cameroon, Nigeria
ASIA		
Semnopithecus vetulus	Purple-faced Langur	Sri Lanka
Rhinopithecus brelichi	Gray Snub-nosed Monkey	China
Hoolock tianxing	Skywalker or Gaoligong Hoolock	China, Myanmar
Nycticebus javanicus	Javan Slow Loris	Indonesia (Java)
NEOTROPICS		
Callithrix flaviceps	Buffy-headed Marmoset	Brazil
Cebus kaapori	Ka'apor Capuchin	Brazil
Cebus aequatorialis	Ecuadorian Capuchin	Ecuador, Peru
Plecturocebus grovesi	Groves' Titi Monkey	Brazil
Alouatta guariba	Brown Howler Monkey	Argentina, Brazil
Ateles fusciceps	Brown-headed Spider Monkey	Colombia, Ecuador, Panama
Ateles geoffroyi	Geoffroy's Spider Monkey	Belize, Colombia (?), Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama



Madame Berthe's Mouse Lemur
Microcebus berthae

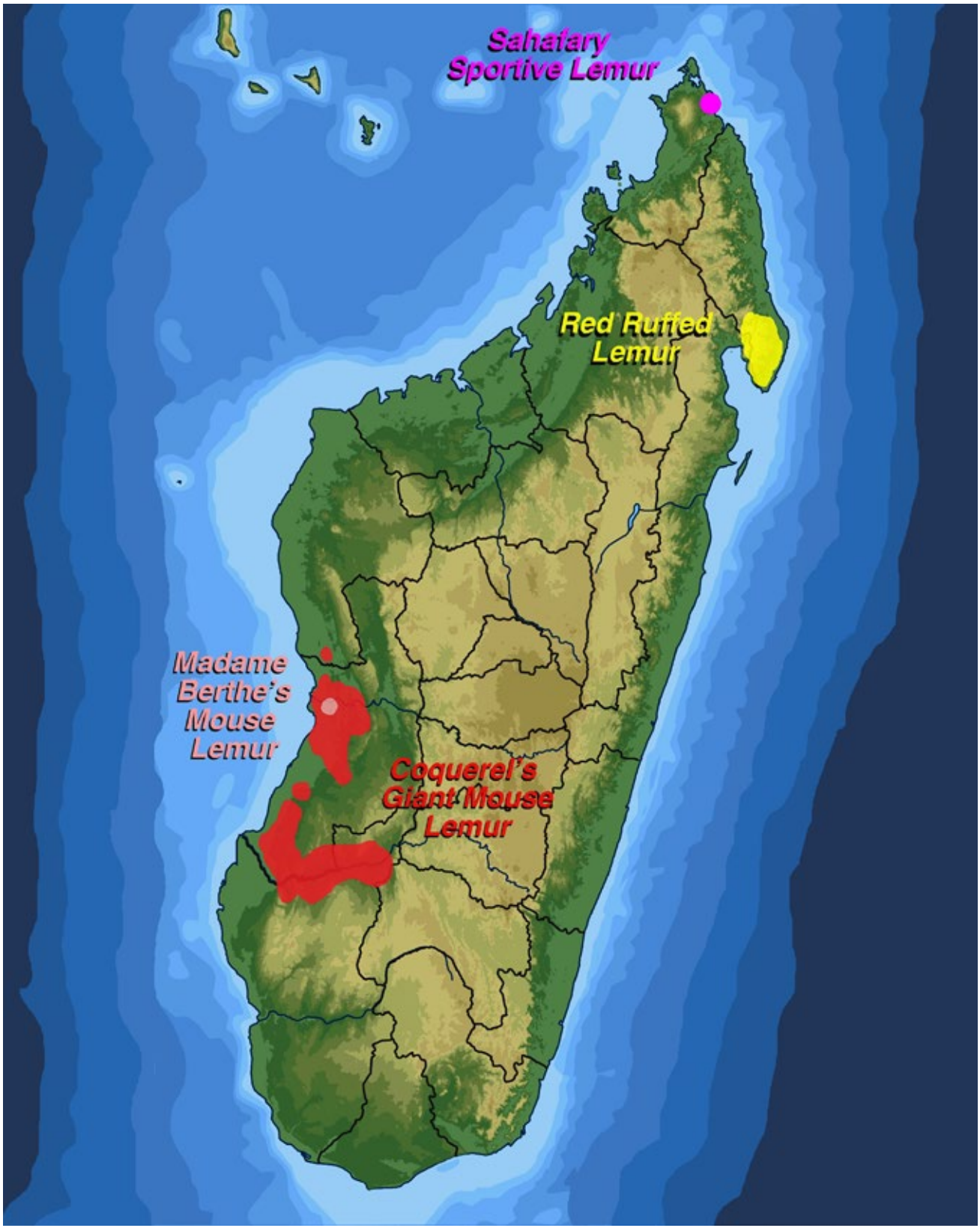
Sahafary Sportive Lemur
Lepilemur septentrionalis



Coquerel's Giant Mouse Lemur
Mirza coquereli

Red Ruffed Lemur
Varecia rubra

MADAGASCAR


Sahafary
Sportive Lemur
Red Ruffed
Lemur
Madame
Berthe's
Mouse
Lemur
Coquerel's
Giant Mouse
Lemur

MADAGASCAR

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MADAME BERTHE'S MOUSE LEMUR

***Microcebus berthae* Rasoloarison, Goodman and Ganzhorn, 2000**

Madagascar
(Previously included on this list in 2012 and 2022)

Livia Schäffler, Matthias Markolf and Peter M. Kappeler

Madame Berthe's Mouse Lemur (*Microcebus berthae*) of the family Cheirogaleidae is the smallest known species of all primates, with a mean adult body mass of 30 g and a biogeographic range confined to dry deciduous forests in the Central Menabe region of western Madagascar (Rasoloarison *et al.* 2000). Not all forest patches in the species' area of occurrence are suitable for *M. berthae* due to its specific habitat and dietary requirements (Dammhahn and Kappeler 2010) and its sensitivity to anthropogenic disturbances (Schäffler and Kappeler 2014). Since its recognition as a distinct species in 1992 (Schmid and Kappeler 1994), *M. berthae* has been among the rarest of the cheirogaleids in the Central Menabe region. During large-scale, range-wide surveys in 2003–2004 and 2006–2008, this mouse lemur was found in the forests of Kirindy and Ambadira as well as in the former corridor connecting them. A single visual detection made in the Réserve Spéciale Andranomena could not, however, be unequivocally confirmed for lack of a permit to trap them (Schäffler and Kappeler 2014).

A significant reduction of the population was documented from 2012 to 2019 in Kirindy Forest, and despite their efforts, scientists subsequently failed to capture any (Kappeler, unpubl. data). The collapse of the Kirindy population raised concerns that *M. berthae* may be close to extinction and range-wide surveys have been again carried out since 2022. Remnant populations of *M. berthae* were found in the northernmost parts of the Aire Protegée Menabe Antimena (APMA; Fig. 1) and in tiny forest fragments north of the Mandroatsy River, a small river that crosses the former corridor between the Ambadira and Kirindy forests. Although it was positive that *M. berthae* still persisted in degraded habitats, individuals were crowded into small fragments under high anthropogenic pressure and only strict protection or prompt animal relocations will save them from being extirpated. Given the recent population collapses and the lack of any captive population, every saved *M. berthae* individual counts. Despite considerable efforts, not a single individual has been detected or captured in any forest south of the Mandroatsy. There is reason, therefore, to believe that *M. berthae* is now extinct in the Kirindy Forest and absent from the southern part of the APMA (Schäffler *et al.* in prep.) and a reconnaissance of the Réserve Spéciale Andranomena has yet to be carried out in 2024). Recurring reports of *M. berthae* sightings in a tiny forest patch at the south-western corner of Kirindy in an ecotourist facility have turned out to be misidentifications.

Microcebus berthae coexists with *M. murinus*, a more widely distributed congeneric species in the Central Menabe region. Ecological differentiation of these two mouse lemurs has been considered insufficient to prevent competitive exclusion (Ganzhorn and Kappeler 1996; Schwab and Ganzhorn 2004; Dammhahn and Kappeler 2008, 2010). Interactions between the two sympatric cheirogaleids *Mirza coquereli* and *Cheirogaleus medius* stabilized mouse lemur coexistence on a landscape scale by providing *M. berthae* with refuges from competition with its congener and thereby prevented interspecific

spatial displacement (Schäffler *et al.* 2015, 2021). The localized *M. berthae* population collapse in Kirindy Forest was paralleled by captures of *Mirza coquereli* going down to zero and captures of *M. murinus* more than doubling compared to preceding years (Kappeler, unpubl. data). The recent region-wide survey confirmed dramatic population declines in *M. coquereli* and a massive increase in *M. murinus* numbers throughout Kirindy Forest, a pattern that becomes more pronounced with increasing habitat disturbance (Schäffler *et al.* in prep.).

In the latest IUCN Red List of Threatened Species update, *M. berthae* was assessed as Critically Endangered due to the impacts of habitat loss and degradation from rotational agriculture, which result in a continuing decline in Area of Occupancy and Extent of Occurrence (AOO and EOO; Markolf *et al.* 2020). A population decrease of more than 80% over ten years is expected as a direct consequence of ongoing habitat destruction. The forest in the Central Menabe region has been continuously reduced in size by unsustainable land use, particularly by slash-and-burn agriculture (*tavy*). Forest loss has been estimated at more than 30% since 2012 (Markolf *et al.* 2020) and forest cover has been shrinking continuously since 2015 despite formal protection through the APMA. The remaining forests are increasingly fragmented into patches of different sizes, quality and isolation (Kappeler *et al.* 2022). At this point, only two larger and interconnected forest patches are retained in the northern part of the APMA, whereas the formerly forested area adjoining to the south (altogether forming the forest of Ambadira in the past) has been severely affected by slash-and-burn agriculture and now consists merely of degraded patches. Kirindy still harbors continuous and apparently suitable habitat but no longer supports all the lemur species formerly occurring there (Schäffler *et al.* in prep.). Until some 15 years ago, the two large forests of Ambadira and Kirindy were connected by a corridor (Markolf *et al.* 2013), but which is now heavily degraded and severely fragmented into small remnant patches. Over the past few decades, the forests of Ampataka and the Andranomena Special Reserve in the southwest of the APMA have been increasingly isolated from Kirindy Forest because of habitat clearing around

villages, and they are now entirely isolated as well as degraded by natural resource exploitation.

As the protection of the remaining forest patches and the restoration of habitat quality and connectivity are critical to preserve biodiversity in the Central Menabe region, several conservation and education programs are being implemented by NGOs using *M. berthae* as a flagship species. Development projects, reforestation, and restoration campaigns have been initiated as well. However, loss of revenues from tourism and absence of foreign researchers during the COVID-19 pandemic hampered adequate forest protection. Despite recently intensified patrolling, the small forest fragments in the formerly large Ambadira Forest are still under intense pressure from local communities who clear the forest for rotational agriculture. As such, effective protection of the APMA will require addressing not only the needs of a growing human population, but also the need to reduce exploitation of natural resources while protecting biodiversity. Besides the current lack of sustainable agriculture, agroforestry, and livestock farming, there are numerous other problems to solve in order to preserve the remaining habitat of the iconic Madame Berthe's Mouse Lemur (Frank and Schäffler 2019; Kappeler *et al.* 2022).

Due to its high EDGE score (Evolutionarily Distinct and Globally Endangered) and lack of records in zoos or breeding programs, *M. berthae* was recently also listed among the 10 terrestrial Malagasy mammal species prioritized for ex situ conservation (Rose et al. 2024).

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MADAGASCAR

SAHAFARY SPORTIVE LEMUR

***Lepilemur septentrionalis* Rumpler and Albignac, 1975**

Madagascar
(Previously included on this list in 2008, 2010, 2012, 2014 and 2022)

Carolyn A. Bailey, Cynthia L. Frasier, Aubin Andriajaona, Lucile Rasoamazava, Timothy M. Sefczek and Edward E. Louis Jr.

Lepilemur septentrionalis is a small and Critically Endangered sportive lemur with a body weight of just 600–750 g (Louis Jr. *et al.* 2006, 2020). Originally, this species was thought to be distributed across the north of Madagascar, from Montagne d'Ambre south to the Mahavavy River close to Ambilobe (Rumpler and Albignac 1975). Cytogenetic and molecular data have since supported a narrower circumscription of this species, with a distribution restricted to only a few forested areas (Ravaoarimanana *et al.* 2004; Andriaholinirina *et al.* 2006; Louis Jr. *et al.* 2006).

In 2007, a survey in the western expanse of the range of *L. septentrionalis* in the forests of Sahafary and Analalava reported the presence of an estimated 100 individuals (Ravaoarimanana *et al.* 2009). The results of subsequent surveys conducted by Omaha's Henry Doorly Zoo and Aquarium and the Madagascar Biodiversity Partnership (MBP) in the same area indicated that these populations have since been extirpated. Now, the species is thought to exist only in forest fragments in the *ca.* 6100-ha protected area of Montagne des Français (Louis Jr. and Zaonarivelo 2015). The landscape is characterized by canyons covered in semi-deciduous forest with vegetation adapted to drier conditions on exposed, rocky limestone spires (Goodman and Wohlhauser 2018). Forty-nine individuals were observed during field surveys conducted between 2012 and 2013 (Louis Jr. and Zaonarivelo 2015), while in 2019, 87 individuals were detected, all of them in the central-eastern portions of Montagne des Français (Bailey *et al.* 2020). Whether this increase is based on protective steps taken by the *Direction Régionale de l'Environnement et du Développement Durable* (DREDD), ranger patrols organized by the MBP field team, or an artificial response to the collapse of the surrounding habitat is not known.

The recent availability of published data on the behavior and habitat use of *L. septentrionalis* (Dinsmore *et al.* 2016, 2021a, 2021b; Rasoamazava *et al.* 2022) has provided valuable insights in assessing the species' resilience to a changing environment. This lemur inhabits tropical dry, deciduous and gallery forest fragments (Dinsmore *et al.* 2016). Like all sportive lemurs, it is a folivore, but exhibits greater dietary diversity than other species in the genus and demonstrates flexibility in resource use by increasing fruit consumption during part of the rainy season, a time when they are not observed consuming mature leaves (Rasoamazava *et al.* 2022). The increased fruit consumption, as well as more time spent feeding, may be linked to increased anthropogenic disturbance (Dinsmore *et al.* 2016). This indicates the species can cope with some disturbance, but the degree of degradation it can withstand is unclear.

In 2023, patrols conducted by DREDD, the gendarmerie, community rangers, and MBP, recorded 246 incidences of illicit activities in Montagne des Français, with 77% of those related to timber extraction and 17% related to charcoal production (Aubin Andriajaona, pers. comm.). The remaining reports entailed agriculture, illegal encampments, one lemur trap with a dead crowned lemur, and mining (sapphires and gold). Eight arrests were made, but none for timber extraction, even though it is the most frequently reported infraction and

occurs in areas where *L. septentrionalis* still exists in Montagne des Français. Offenses for which people were arrested were charcoal production, gold mining, and illegal entry. Extensive charcoal production has resulted in the loss of large forested areas in Montagne des Français, most of them to the west and south of the known *L. septentrionalis* individuals. Although most of the habitat of *L. septentrionalis* is already gone, the species does benefit from some protection, given that Montagne des Français became a protected site in 2015 (Dinsmore *et al.* 2021a) and grant-supported patrols are ongoing. To ensure the area is adequately protected in the long term, Madagascar National Parks and the local management authority will need to develop a strategy that continues to engage local community organizations (i.e., Vondron'Olona Ifotany, Communauté de Base), non-profit organizations, and regional authorities in collaborative patrols and education efforts for years to come.

This species is on the verge of extinction and in need of special attention. Undertaking a captive breeding program is not an option for sportive lemurs since they have proven difficult to keep in zoos because of their specialized folivorous diet. As of 2024, *L. septentrionalis* is not being held in captivity (ZIMS 2024). Conservation actions should, therefore, focus on *in situ* efforts, with priority placed on expanding habitat through connecting forest fragments, especially in the central-eastern portion of the Montagne des Français protected area.

Additional efforts should focus on tracking population trends and include annual censuses of the species' remaining individuals. Research is needed to confirm if the recent population increase that was detected between the two previous censuses (Ranaivoarisoa *et al.* 2013; Bailey *et al.* 2020) was due to recruitment, seasonal variation, or the concentration of existing individuals into the eastern half of Montagne des Français due to habitat loss.

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COQUEREL'S GIANT MOUSE LEMUR

***Mirza coquereli* (A. Grandidier, 1867)**

Madagascar
(Not previously included on this list)

Amanda K. Rowe, Daniel Hending, Livia Schäffler and Matthias Markolf

Coquerel's Giant Mouse Lemur (*Mirza coquereli*) is a medium-sized, nocturnal species in the same taxonomic family as the dwarf, mouse, and fork-marked lemurs (Lemuriformes: Cheirogaleidae). With an average body mass of 300–320 g, this species gets its name by being 5–10 times the size of sympatric mouse lemurs (Mittermeier *et al*. 2023). It is one of just two known giant mouse lemurs – the northern (*M. zaza*) and southern (*M. coquereli*) (Kappeler *et al*. 2005; Mittermeier *et al*. 2023). Categorized as Endangered on the IUCN Red List of Threatened Species, the combination of an uncertain taxonomic resolution, a poorly known range and, to date, little ecological and behavioral research requires immediate attention for the survival of this species.

Mirza coquereli is restricted to low-elevation (<700 m) dry, deciduous, and gallery forests in western Madagascar (LaFleur 2020). Due to anthropogenic activities, only isolated regions of Malagasy dry forests remain, which are primarily threatened by deforestation and fragmentation due to intentional burning to clear land for grazing and agriculture (*tavy*). Additional threats include illegal exploitation of natural and mineral resources and charcoal production. Although *Mirza* shows some resilience to habitat degradation (Schäffler and Kappeler 2014; Hending 2021), many forests throughout western Madagascar have been cleared or burned in the last 20 years (Frappier-Brinton and Lehman 2022), and its continued presence at some sites where it was known to occur in the past is therefore questionable. While all cheirogaleid species face these threats, sympatric lemurs appear to be outcompeting *M. coquereli* in some communities, and the species generally occurs in much lower densities than sympatric cheirogaleids. In Zombitse-Vohibasia National Park, for example, *M. coquereli* has an estimated population size of 0.37 individuals/ha compared to 2.31 individuals/ha for *Cheirogaleus medius* (Martin *et al*. 2022). This relationship worsens for populations further from tourist areas (A.K. Rowe in prep.), highlighting the importance of current protections and active tourism and research.

Many of the occurrence records for *M. coquereli* date from the pre-21st century and need updating. Previous work shows its range extending north to south from the Mahavavy Sud to the Onilahy rivers (Mittermeier *et al*. 2023). *Mirza coquereli* is present in at least five protected areas, including Kirindy-Mitea and Zombitse-Vohibasia National Parks, and the protected areas of Ambondrobe, Menabe Antimena, and Tsimembo-Manambolomaty. It may also be present in unprotected areas throughout western Madagascar (Schüßler *et al*. 2021). Its presence was, for example, reported in unprotected forest fragments between the Manambolo and Tsiribihina rivers in 2007 (Dammhahn *et al*. 2009). The presence/absence status of *M. coquereli* has yet to be fully determined in Isalo National Park. In Namoroka and Tsingy de Bemaraha National Parks, in Beanka Protected Area, and Morombe, future studies are needed to determine whether present *Mirza* are indeed *M. coquereli*, *M. zaza*, or a new species.

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Population density estimates for *M. coquereli* are 0.66–1.00 individuals/ha in Tsingy de Bemaraha National Park (Bousquet and Rabetaliana 1992; Ausilio and Raveloanrinoro 1998), 1.24–2.06 individuals/ha in Masoarivo (Ralison 2008), 0.16–2.10 individuals/ha in Central Menabe Antimena (Petter *et al.* 1971; Schäffler and Kappeler 2014), and 0.21–0.37 individuals/ha in Zombitse-Vohibasia National Park (Martin *et al.* 2022; Rowe *et al.* in prep.). Kappeler (2003) reported that *Mirza coquereli* once occurred in high population densities in Kirindy Forest but, for unknown reasons, has experienced a steady population decline over the past decades (Markolf *et al.* 2008). During a survey in 2006–2008 covering most forests in the Central Menabe region, *M. coquereli* was found to occupy 83% of transects in the forest of Ambadira as well as in the former corridor to the south, 73% of transects in Kirindy Forest, and 50% in the Reserve Spéciale Andranomena (Schäffler and Kappeler 2014). Despite formal protection by the Aire Protégée Menabe-Antimena (APMA) since 2015, the forests of the Central Menabe region have become increasingly fragmented, with more than 40% loss of forest since 2012 (Markolf *et al.* 2020). A recent survey (2022 to the present) found that *M. coquereli*'s occupancy within APMA decreased to 75% of transects in Ambadira Forest and 43% in the corridor, which now consists of only degraded habitat. Additionally, no *M. coquereli* was found in the southwestern part of APMA. A dramatic population decline occurred in the Kirindy Forest, with individual detections restricted to 14% of transects (Schäffler *et al.* in prep.). In the northern parts of APMA, *M. coquereli* has also been encountered in degraded forest patches under severe *tavy* pressure (Schäffler pers. obs.). Increasing fragmentation poses a particular risk to the species, which compensates for population fluctuations by immigration from adjacent populations (Markolf *et al.* 2008). Prompt relocation programs could save the animals in those isolated fragments from being extirpated by ongoing habitat destruction.

In addition to habitat loss, the southwest of Madagascar has recently experienced severe drought (Hannah *et al.* 2008; Hending *et al.* 2022). The continued depletion of water, particularly in southern Madagascar, has grave implications for

the success of *M. coquereli*, which may be more susceptible to drought than conspecifics. While they have been shown to undergo torpor during the dry season (Dausmann 2008), an increase in periods of environmental hardship due to drought may put them at risk compared to the sympatric nocturnal species *C. medius*, which hibernates during these times.

Mirza coquereli is also hunted in parts of its range (Mittermeier *et al.* 2023) and may be targeted compared to other nocturnal species (Andriamanantena *et al*. in prep). *Mirza coquereli* spends the day in nests in the forks of large branches or among lianas. Although it switches sleeping sites every few days (Kappeler 2003), this behavior makes their locations relatively visible and thus susceptible to hunting. They are a preferred bushmeat source due to their size compared to mouse and dwarf lemurs (Andriamanantena *et al*. in prep).

Lastly, while there are active research programs in parts of its range, and much of the forest is protected, there are many remaining unprotected areas within the range of this species, and the effectiveness of national parks to protect this species is strongly limited by lack of funding. Although there is some evidence that *M. coquereli* densities increase in areas visited by tourists, few active conservation measures (including eco-tourism) are in place for this species. As such, the resolution of the taxonomy, a better understanding of the species' distribution and densities, and the creation of active conservation programs are urgently needed for this species.

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RED RUFFED LEMUR

***Varecia rubra* (É. Geoffroy Sainte-Hilaire, 1812)**

Madagascar
(Previously included on this list in 2012 and 2014)

Josia Razafindramanana, Cortni Borgerson, McAntonin Andriamahaihavana, Delaïd C. Rasamisoa, Rita I. Ratsisetraina, Delphine Roullet, Fidisoa Setranirina and Timothy M. Eppley

Varecia rubra is endemic to the tropical, moist, lowland and mid-altitude forests of northeastern Madagascar. This species has a very restricted range, confined to the Masoala Peninsula and the region immediately north of the Bay of Antongil in northeastern Madagascar (Petter and Petter-Rousseaux 1979; Tattersall 1982). The Antainambalana River appears to separate *V. rubra* from *V. variegata subcincta*, although it is suggested that, historically, the two species overlapped in this region north of the Bay of Antongil (Vasey and Tattersall 2002). Previous surveys have suggested that the westernmost distribution of *V. rubra* was near the confluence of the Antainambalana and Sahantaha rivers (Hekkala *et al.* 2007) but more recent surveys have indicated its presence throughout northern Makira Natural Park, north to northeast of the Antainambalana River (Eppley *et al.* unpubl. data). The species is not present in the southern part of the Anjanaharibe-Sud Special Reserve (E. Patel pers. comm.). As such, its northern limits would be the Besariaka region of northern Makira Natural Park (just south of Andapa; Eppley *et al.* unpubl. data) and the adjacent Antahakalava Private Reserve to the east of the limits of Makira (E. Patel unpubl. data).

Varecia rubra is categorized as Critically Endangered on the IUCN Red List of Threatened Species (Borgerson *et al.* 2020), a status based on a suspected reduction of the population of 80% in the past and upcoming 30 years. The principal threats are habitat loss and hunting (Simons and Lindsay 1987; Rigamonti 1996; Vasey 1996, 1997b; Borgerson 2015; Borgerson *et al.* 2019, 2022). The range of this species has been severely diminished by frequent cyclones and deforestation, primarily from subsistence agriculture, but also the subsistence collection of timber and non-timber forest products and the illegal trade of hardwood species (Holmes 2007; Allnutt *et al.* 2013; Zaehringer *et al.* 2017; Kling *et al.* 2024). Red Ruffed Lemurs are a preferred target for subsistence hunters and are widely hunted across their range, mostly because of low food security in the region (Golden *et al.* 2014; Borgerson 2015, 2016; Borgerson *et al.* 2016, 2017, 2019, 2022), and they are sometimes kept illegally as pets (Reuter and Schaeffer 2017). The species is officially protected only in Masoala National Park and the Makira Natural Park. Masoala was, however, the national park most heavily impacted by the rapid upsurge of illegal logging after the political events of early 2009. Increased regulation and management of illegal logging as well as food security interventions to reduce hunting within the range are essential to ensure the survival of this iconic Malagasy species.

Varecia rubra is characterized by extremely narrow niche dimensions. One of the best predictors of population size is the total crown volume of large trees (Borgerson 2016). Red Ruffed Lemurs move quadrupedally through the canopy most of the time, leaping just occasionally. Suspensory postures are common during feeding bouts (Vasey 1999). Fruits account for 61% to 88% of their diet, and the swallowing of intact seeds means that they play an important role in seed dispersal and forest regeneration (Vasey 2002;

Martinez and Razafindratsima 2014). Flowers, nectar, and leaves make up the rest of their diet. Females are reported to eat more low-fiber, high-protein items (e.g., young leaves and flowers) during gestation and lactation, presumably to meet the higher energy demands of reproduction (Vasey 2000a, 2002). Vasey (2000b) recorded that they ate items of 132 species from 36 plant families over a single year at Andranobe on the Masoala Peninsula. To maintain their narrow niche requirements in disturbed habitats, these lemurs expand their range and reduce the size of their community (Vasey 2000a, 2005). They are negatively impacted by habitat fragmentation (Eppley *et al.* 2020).

Population densities are variable and highly dependent on local ecology. Past density estimates range from 21–23 individuals/km² in Ambatonakolahy (Rigamonti 1993), 31–53 individuals/km² in Andranobe (Vasey 1997b), and a mean of 6.22 individuals/km² along the western Masoala coast (Rakotondratsima and Kremen 2001). Population numbers are in sharp decline due to illegal hunting and habitat loss from agriculture, illegal logging, and frequent cyclones. Density estimates from 2015–2020 show that while *V. rubra* may inhabit forests near villages, they do so at lower densities – a mean of 9.89 individuals/km² near villages vs. a mean of 15.14 individuals/km² in the uninhabited interior of the Masoala (Borgerson *et al.* 2022).

Reproduction varies considerably (Rakotondratsima and Kremen 2001; Vasey 2007). The mating season is May–July, with births occurring from September through early November after a gestation period of about 102 days. In captivity, litters can range from one to four infants but are usually one to three, each newborn weighing just under 100 g (Brockman *et al.* 1987; Schwitzer 2003; Roullet unpubl. data). In the wild, the mean litter size is 2.11 (Vasey 2007), while in captivity it is 2.04 (Roullet *et al.* unpubl. data). Recorded interbirth intervals are one to two years (Rakotondratsima and Kremen 2001) but can exceed five years at disturbed sites (C. Borgerson unpubl. data). Females reach sexual maturity at just under two years, while males take three to four years to attain maturity. Field observations

indicate that this species is polygamous and that multiple individuals participate in caring for the young (Vasey 1997a, 2007). The social organization is described as fission-fusion. Communities are usually multi-male/multi-female and range in size from 5 to 31 individuals.

Home ranges cover 23–58 ha and appear to be defended (Rigamonti 1993; Vasey 2006). These ruffed lemurs scent-mark during territorial battles and female greeting displays. Their vocal repertoire is extensive and employed in numerous contexts. The most characteristic vocalization is a very loud and raucous call, which appears to be used in territorial encounters and for intragroup spacing (Vasey 2003).

Variations in color pattern are well known in this species but have not been attributed to clear geographic regions. It may intergrade with *V. variegata subcincta*; the confluence of the Vohimara and Antainambalana rivers has been investigated as a possible contact or hybrid zone between the two, but without conclusive results (Tattersall 1982; Lindsay and Simons 1986; Vasey and Tattersall 2002; Hekkala *et al*. 2007).

Red Ruffed Lemurs are threatened by frequent cyclones in the northeastern part of Madagascar. From 2000 to 2017, the northeastern coast was impacted by nine tropical cyclones, five of which reached the severe categories of 4 (wind speeds between 210 km/h to 249 km/h) and 5 (wind speeds exceeding 249 km/h) (Probst *et al*. 2017). Notably, in April 2000, the Masoala Peninsula was hit by Cyclone Hudah, the most intense cyclone on record at that time, with wind speeds surpassing 250 km/h (Birkinshaw and Randrianjanahary 2007). Subsequent vegetation assessments and population monitoring of *V. rubra* at Antsahamanara and Sahafary in northeast Masoala revealed a decline in their population, potentially due to the severely damaged habitat (Ratsisetraina 2001, 2013). A follow-up study in 2018 revealed that structural modifications to the vegetation (e.g., the lack of large trees, which are particularly vital for the species) were probably responsible for the slow recovery of the *V. rubra* population in northeast Masoala (Ratsisetraina 2023). Conversely, long-term behavioral ecology data from *V. rubra* at Andranobe in western Masoala following a slightly less destructive cyclone revealed a relatively fast recovery time by the population (Eppley *et al*. unpubl. data).

As of 2024, there were 721 *V. rubra* reported in captivity worldwide (ZIMS 2024). Such populations in American and European zoos are a safeguard against extinction in the wild but they are unfortunately very limited in their genetic diversity (Schwitzer 2003). In the wild, the Extent of Occurrence of *V. rubra* is less than 6,500 km². The IUCN lemur conservation strategy for 2013–2016 (Schwitzer *et al*. 2013) proposed a suite of measures for Masoala National Park and Makira Natural Park to ensure the conservation of the Red Ruffed Lemur: further patrols and surveillance; campaigns of environmental education and awareness; and support for small-scale husbandry of domestic animals as a source of protein. These measures were expanded upon by a collective group of applied research and conservation programs, which advocated for eight conservation activities that help reduce threats and protect the environment, specifically: (1) empowering local conservation actors; (2) ensuring effectively protected habitat; (3) expanding reforestation; (4) establishing and continuing long-term research and monitoring; (5) reducing food insecurity; (6) supporting environmental education; (7) promoting sustainable livelihoods; and (8) expanding community health initiatives (Eppley *et al*. 2023). Among the boldest initiatives is a recent translocation project conducted jointly by IMPACT Madagascar, GERP Madagascar, and Antongil Conservation in 2018 and 2019. Two groups of five Red Ruffed Lemurs living in the unprotected area of Ambolohosy in the western Masoala Peninsula were translocated to Farankaraina, a small private reserve directly east of Maroantsetra. They have been monitored since the translocation in 2018, and after three years, two females gave birth (one having twins). This translocation (and reintroduction of the Red Ruffed Lemurs to Farankaraina) brings hope not only to the survival of this rare species but also to the preservation of local biodiversity.

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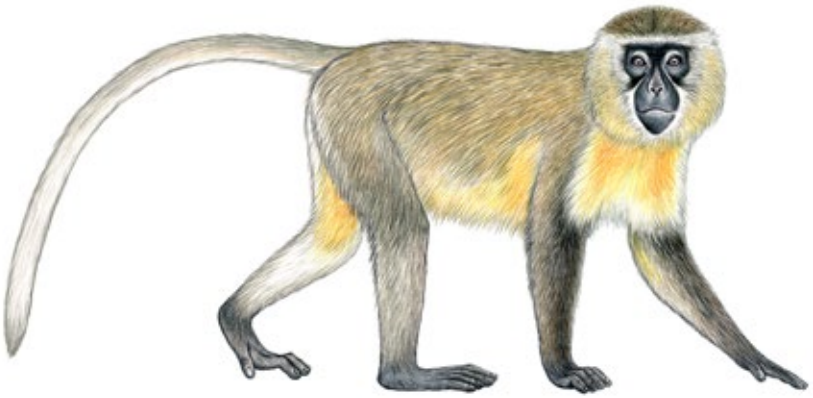
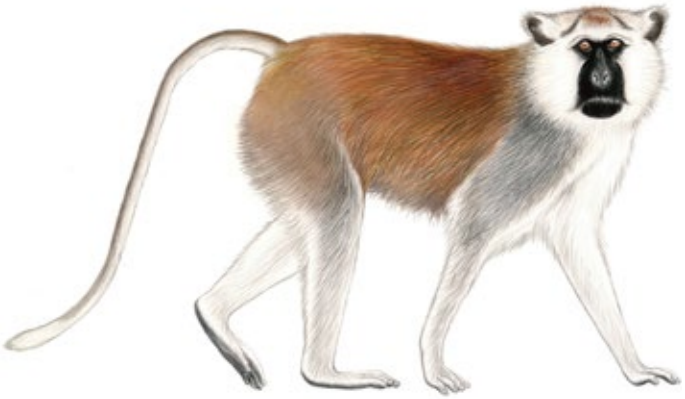
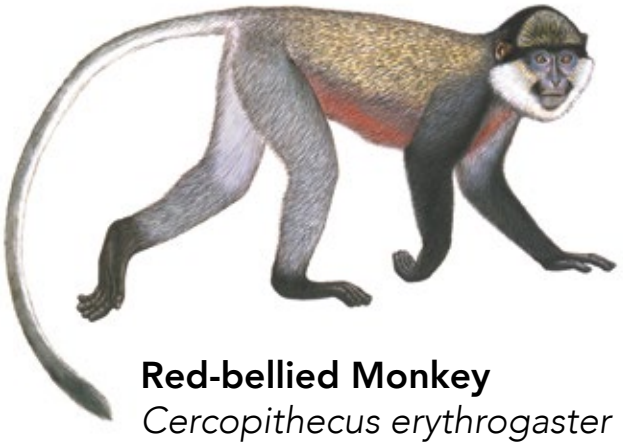
Rondo Dwarf Galago
Paragalago rondoensis



Golden-bellied Mangabey
Cercocebus chrysogaster



Southern Patas Monkey
Erythrocebus baumstarki



Red-bellied Monkey
Cercopithecus erythrogaster

Niger Delta Red Colobus
Piliocolobus epieni

Cross River Gorilla
Gorilla gorilla diehli

AFRICA


Red-bellied Monkey
Cross River Gorilla
Niger Delta Red Colobus
Golden-bellied Mangabey
Southern Patas Monkey
Rondo Dwarf Galago

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RONDO DWARF GALAGO

***Paragalago rondoensis* (Honess in Kingdon, 1997)**

Tanzania
(Previously included on this list in 2006, 2008, 2010, 2012, 2014, 2018 and 2022)

Andrew Perkin

Weighing approximately 60 g, the Rondo Dwarf Galago, *Paragalago rondoensis*, is the smallest of all galagos (Perkin and Honess 2013). It is distinct from other dwarf galagos in its diminutive size, a bottle-brush-shaped tail, its reproductive anatomy, and its distinctive "double unit rolling call" (Perkin and Honess 2013). Current knowledge indicates that *P. rondoensis* is endemic to the coastal forests of Tanzania. There are three spatially distinct sub-populations. One is in southeast Tanzania near the coastal towns of Lindi and Mtwara. The second is approximately 400 km north, in pockets of forest around the capital city of Dar es Salaam. The third sub-population is in Sadaani National Park, approximately 100 km north of Dar es Salaam. However, data (vocal and penile morphological) suggests the northern and southern populations may be phylogenetically distinct.

Rondo Dwarf Galagos have a mixed diet of insects and fruit. They often feed close to the ground, moving by vertical clinging and leaping in the shrubby understory. They build daytime sleeping nests, usually in the canopy (Bearder *et al.* 2003). As with many small primates, *P. rondoensis* is probably subject to predation from owls and other nocturnal predators, such as genets, palm civets and snakes. The presence of these predators invokes intense episodes of alarm calling (Perkin and Honess 2013).

Across its known range, the Rondo Dwarf Galago can be found in sympatry with a number of other galagos, including two much larger species in the genus *Otolemur*: Garnett's Greater Galago *O. garnettii* (Least Concern: De Jong *et al.* 2019a) and the Thick-tailed Galago, *O. crassicaudatus* (Least Concern: Masters and Bearder 2019). In the northern parts of its range (for example, in Zaraninge Forest, the Pugu/Kazimzumbwi Forest Reserve [FR] and Pande Game Reserve [GR]), the Rondo Dwarf Galago is sympatric with the Zanzibar Galago, *P. zanzibaricus* (Near Threatened: Perkin *et al.* 2000) and in the southern parts of its range (for example, in Rondo, Litipo and Noto), it is sympatric with Grant's Galago, *P. granti* (Least Concern: De Jong *et al.* 2019b).

Paragalago rondoensis, considered Endangered on the IUCN Red List of Threatened Species (Perkin 2020), has an extremely limited and fragmented range across a number of remnant patches of East African coastal dry forest (Burgess and Clarke 2000) in Tanzania. This species prefers the moist patches of forest that remain evergreen during the dry season, which maintain the moist leaf litter layer where they take prey from. These are at Zaraninge Forest (06°08'S, 38°38'E) in Sadaani National Park (Perkin 2000), Pande GR (06°42'S, 39°05'E), Pugu/Kazimzumbwi (06°54'S, 39°05'E) (Perkin 2003, 2004), and Rondo Nature Reserve (NR) (10°08'S, 39°12'E). Records from Ziwani (10°20'S, 40°18'E) Forest Reserve (Honess 1996b; Honess and Bearder 1996) have not been confirmed since 1992. New sub-populations were identified in 2007 in southeastern Tanzania near Lindi town in Chitoa FR (09°57'S, 39°27'E) and the Ruawa FR (09°44'S, 39°33'E), and, in 2011, in Noto Village FR (09°53'S, 39°25'E) (Perkin *et al.* 2011, 2013), and, of the northern population, at the Ruvu South FR (06°58'S, 38°52'E). A recent survey to Noto Forest in May 2024 reconfirmed the presence of Rondo Dwarf Galagos (Perkin unpubl. data). Specimens of *P. rondoensis*, originally described as *Galagoides demidoffi phasma*, were collected by Ionides from the Rondo Plateau, southeast Tanzania in

1955, and by Lumsden from Nambunga, near Kitangari (approximately 10°40'S, 39°25'E), on the Makonde Plateau, Newala District in 1953. There are doubts as to the persistence of the species on the Makonde Plateau Litipo (10°02'S, 39°29'E) Forest Reserve, which has been extensively cleared for agriculture. In 1992, surveys there failed to detect any extant populations (Honess 1996). Distribution surveys have been conducted in the southern (Honess 1996; Perkin *et al.* unpubl. data) and northern coastal forests of Tanzania (29 surveyed) and Kenya (seven surveyed) (Perkin 2000, 2003, 2004; Perkin *et al.* 2013).

For reasons not fully understood, the Rondo Dwarf Galago does not occur in all evergreen forest patches, such as the lowland Eastern Arc forests. There is the possibility of discovering new populations in unexplored patches of coastal forest and thicket in the Lindi and Kilwa regions. Absolute population sizes remain undetermined, but recent surveys have provided density estimates of: 3–6/ha at Pande GR (Perkin 2003) and 8/ha at the Pugu FR (Perkin 2004). Relative abundance has also been estimated from encounter rates: 3–10/hr at Pande GR and Pugu/Kazimzumbwi FR (Perkin 2003, 2004), and 3.94/hr at Rondo FR (Honess 1996b).

The major threat facing the Rondo Dwarf Galago is loss of habitat. All sites are subject to some level of agricultural encroachment, charcoal manufacture, and/or logging. In 2008, the known Area of Occupancy of *P. rondoensis* was <101.6 km^2. In 2022, this estimate had fallen to 87.4 km^2 despite an Extent of Occurrence of 21,196 km^2 (Perkin 2020). Forest cover change estimates suggest that this figure has not decreased but has not increased either. In the Pande GR (2.4 km^2), Chitoa (5 km^2) and Rondo (25 km^2) forest reserves, forest cover remained the same between 2008 and 2014. However, forest cover between 2008 and 2014 declined in the Zaraninge Forest from 20 km^2 to 15 km^2, in Pugu/Kazimzumbwi FR from 33.5 km^2 to 8 km^2, in Ruawa FR and Litipo FR from 4 km^2 to 3 km^2, and in Ziwani FR from 7.7 km^2 to 1 km^2. Two recently discovered Areas of Occupancy are Ruvu South, in which forest cover fell from 20 km^2 to 5 km^2, and Noto, in which forest cover fell from 21 km^2 to 20 km^2, in the same time period (Burgess and Clarke 2000; Doggart 2003). The general pattern of habitat


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degradation since 2014 has continued but has stabilized in Sadaani, Pande, Pugu, Noto, Chitoa, Ruawa and Rondo. The status of Kazimzumbwi is now very degraded, offering only small patches of potential habitat up to 2 km^2, but has potential to 'rewild'. We feel that Litipo does not contain any Rondo Dwarf Galagos as it is a strip of riverine forest surrounded by dry thicket that is unsuitable for this species. There is an increasing awareness and efforts to protect coastal forests by the Tanzanian authorities.

As habitat availability decreases, the population trend must also be assumed to be declining, the rate varying according to the level of protection of each forest fragment. The following sites are nominally nationally protected: Pande GR, Zaraninge (in Saadani National Park), Pugu

Nature Reserve and Rondo Nature Reserve. These sites, along with Noto Plateau Village Forest Reserves, are the best protected sites for the Rondo Dwarf Galago. They are also important for Rondo Dwarf Galago conservation given their relatively large size (except Pugu NR). Given current trends in charcoal production for nearby Dar es Salaam, the forest reserves of Ruvu South, Pugu and Kazimzumbwi were predicted to disappear over the next 10–15 years (Ahrends 2005). However, habitat destruction has diminished as the best timber trees have been cleared and it is possible for Rondo Dwarf Galagos to live in degraded forest. A new railway line has also been widened in the northern part of Pugu FR, which was already heavily degraded. Some habitat restoration efforts are now being initiated in Pugu as mitigation for impacts of the railway. Pande, as a Game Reserve, is relatively secure, and thicket forest may even be expanding there. Zaraninge Forest is the most protected part of the range of the northern population of *P. rondoensis* as it is a national park, although external population pressures are growing there as well from agricultural expansion. In the south, the Noto, Chitoa and Rondo populations remain the most secure, as they are buffered by tracts of woodland; however, recent boundary changes have meant some forest was lost in the Rondo Nature Reserve. Litipo and Ruawa FRs are under great threat from bordering village lands but appear to still remain intact. Ziwani is now mostly degraded scrub forest, thicket and grassland.

The following conservation actions are recommended to safeguard the future of this species: 1) site-based action plans for each known habitat patch drawn up mainly focused around habitat restoration, 2) continued monitoring of habitat loss rates, 3) surveying new areas for remnant populations, 4) implementation of community-based conservation and awareness, 5) implementation of the planned REDD-based carbon-trading scheme in the Noto Plateau, and 6) assessment of population status and phylogenetic relationships between the sub-populations and confirmation of suspected phylogenetic distinctions. Until such time that the latter has been carried out, each subpopulation must be considered to be of high conservation value.

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AFRICA

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GOLDEN-BELLIED MANGABEY

***Cercocebus chrysogaster* Lydekker, 1900**

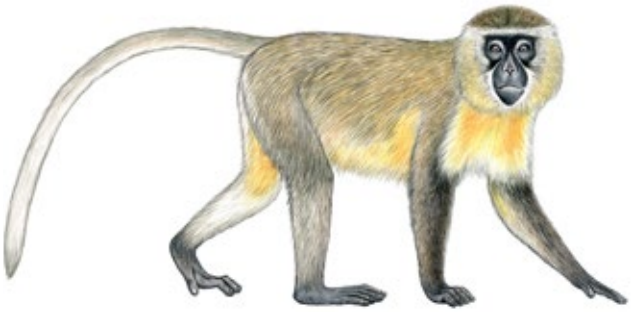
Democratic Republic of the Congo
(Previously included on this list in 2022)

Edward McLester, Sandra E. Altherr, Franck Chantereau, Iris Ho, Héritier Mpo, Jo A. Myers Thompson and John A. Hart

More than 120 years after being first described, the Golden-bellied Mangabey remains one of Africa's least-known primates. Previously considered Data Deficient, it is now listed as Endangered on the IUCN Red List of Threatened Species (Hart and Thompson 2020). Found only in a limited range in the central Congo basin, Golden-bellied Mangabeys are highly threatened throughout their distribution and face continuing, and potentially rapid, declines. In 2022, Golden-bellied Mangabeys were identified as one of the world's 25 most endangered primates (McLester *et al*. 2022).

The largest of the seven *Cercocebus* mangabeys, these monkeys are characterized by vivid yellow-orange fur that covers the belly and abdomen. Golden-bellied Mangabey ecology is poorly known and there have been no detailed behavioral studies of this species in the wild. Almost all insight is limited to anecdotes reported prior to the year 2000 and preliminary data recorded in 2021 from two habituated groups at LuiKotale (a study site of the Max Planck Institute of Animal Behavior) in the Lokolama sector, bordering the southern sector of the Salonga National Park (SNP). Group sizes typically number 50–70 individuals (Ehardt and Butynski 2013). Home ranges are also relatively large for cercopithecine monkeys in tropical forest (20–25 km²). At LuiKotale, home ranges and daily ranging distances exceed those of sympatric Bonobo (*Pan paniscus*) communities (McLester and Fruth 2023). Individuals travel almost exclusively terrestrially, and generally climb arboreally only to sleep or forage in large fruit trees, or during heavy rainfall. The diet consists primarily of fruit, with considerable time also spent feeding on seeds and insects on the ground, particularly in large patches of leaf litter. Similar to Agile Mangabeys (*C. agilis*) north of the Congo River, Golden-bellied Mangabeys are notable for relatively high rates of mammal consumption, with adult males observed regularly catching and eating Blue Duikers (*Philantomba monticola*) at LuiKotale (McLester 2022). Given that Golden-bellied Mangabeys at LuiKotale have been protected from hunting for at least five years (and more than twenty years, for some groups), it is possible these behaviors differ from groups elsewhere that are regularly hunted or range in disturbed habitat.

Golden-bellied Mangabeys are endemic to the Democratic Republic of the Congo (DRC). The species is known to occur in two subpopulations separated by approximately 300 km (a western and an eastern population – Ehardt and Butynski 2013; Hart and Thompson 2020). Surveys conducted between 1994 and 2007 (Inogwabini and Thompson 2013) and between 2016 and 2018 (Bessone *et al*. 2019, 2020) identified the western population as occurring in an area of 68,000 km², bordered by the Lokolo River to the north, the Luilaka River to the east, the Kasai and Sankuru rivers to the south, and the Congo River to the west. The eastern range covers about 12,000 km² with identified populations known between the Sankuru and Lubefu rivers in an area locally termed the Kapula Block (Thompson and Hart 2015). There is no evidence to support the suggestion by Erhardt and Butynski (2013) that the two populations are connected by a forest corridor along the Lukenie or Sankuru rivers. The combined range for both the western and eastern populations is around 80,000 km².



However, Golden-bellied Mangabey occurrence is highly patchy within this large range, and their distribution and abundance remain poorly known over many areas.

The western sub-population has been reported to range into the southern sector of the SNP, which is the only protected area in which Golden-bellied Mangabeys occur. Areas of reported occurrence in the southern sector of SNP are patchy, with observations restricted to the northern and eastern areas of the park (n = 22 observations from about 4,000 km of line transects and recces covering 93.5% of the sector – Bessone *et al.* 2019). There are no records of *C. chrysogaster* from the southwestern area of SNP's southern sector or from the northern sector of SNP (J. Eriksson, F. Maisels and G. Reinartz pers. comm.; J. Thompson unpubl. data).

The typical elevational range for this species is 300–500 m and habituated groups at LuiKotale almost exclusively use high and dry terra firma vegetation at ≥400 m and rarely venture into swamps or riparian areas (McLester and Fruth 2023). Approximately 60% of the habitat in the western distribution is permanent swamp or seasonally flooded and riparian forest, within which areas of terra firma forest comprise an even lower percentage (Inogwabini and Thompson 2013). The Kapula Block, in contrast, and despite its smaller area, is entirely terra firma. Savanna islands cover a small portion of the block. The forest-savanna ecotone habitats are preferred by mangabeys in this area (H. Mpo pers. obs.). In the absence of detailed estimates of population density, the limited habitat choice and large home range sizes suggest that they are likely to be low.

Golden-bellied Mangabeys are in decline throughout their distribution. In the past 20 years, at least 32% of the total potential habitat has been lost and an estimated 40% of the population extirpated (Hart and Thompson 2020). A major threat is unsustainable hunting, with high numbers of Golden-bellied Mangabeys killed for the commercial bushmeat trade in both the western and eastern populations. In the western population, surveys from 2001 to 2007 found Golden-bellied Mangabeys comprised as much as 70% of the bushmeat available in some

markets (Inogwabini and Thompson 2013). In other areas, hunting is likely exacerbated because Golden-bellied Mangabeys are considered to be agricultural pests (Inogwabini and Thompson 2013). In the eastern range, surveys of markets conducted in 2010 found that this species made up about 10% of all bushmeat recorded. That number fell considerably by 2015, when the Golden-bellied Mangabey population was also reported to have declined significantly in some localities (Thompson and Hart 2015). Hunting of Golden-bellied Mangabeys remains especially prevalent around Lusambo, Ikongo, and Kapula localities: Muma, Mbangumbangu, Salongo Shekena, Garibu, and Ozembe, in the eastern distribution. In Lusambo, five or more individuals can typically be found in the central market for sale on any one day (H. Mpo pers. obs.). Along the Lubefu river bordering Kapula Block, hunting associated with mining for diamonds poses a threat, even in remote areas (H. Mpo pers. obs.). Hunting varies across the distribution, however. In the western distribution, rates of human activity in the northern half of the southern sector of SNP, where the species was reported to be found, were lower than in the south of the sector, where no observations of Golden-bellied Mangabeys were made (Bessone *et al*. 2019). In some Lokolama sector villages in the center of the species' distribution, Golden-bellied Mangabeys are rarely consumed as bushmeat and hunting may be reduced because larger or more conspicuous species (e.g., colobus monkeys) are easier targets for hunters (N. Bondjengo and B. Fruth unpubl. data).

Golden-bellied Mangabeys are threatened by habitat loss due to both small-scale and larger industrial logging operations. Inogwabini *et al*. (2013) reported that west of Lake Mai-Ndombe, where the species no longer occurs, local communities reported its disappearance over the course of two decades following the arrival of intensive logging. Currently, small-scale logging is particularly widespread in the western range, further decreasing the availability of suitable habitat for this species. In total, more than 30% of the remaining habitat has been ceded to logging concessions (Hart and Thompson 2020).

The illegal pet trade is also a significant threat. Wild-caught individuals kept in captivity are frequently seen in both the western and eastern subpopulations, as well as in Kinshasa (Hart and Thompson 2020). Franck Chantereau (pers. obs.) observed wild-caught infants kept in captivity in Lusambo and offered for sale on the streets of Kinshasa as recently as 2023. Wild-caught animals are typically trafficked along the Kasai and Congo rivers and can reach Kinshasa in around a week (H. Mpo pers. obs.). The trade also extends internationally. In 2021, for example, a single shipment confiscated in Zimbabwe contained 11 individuals that were being smuggled to South Africa (Fobar 2020; F. Chantereau pers. comm.). Of the 120 individuals officially recorded as exported from the DRC between 2018 and 2022, all were wild-caught (UNEP-WCMC trade database 2023). Most individuals originating from the DRC were re-exported from Thailand (20 individuals) and Uzbekistan (18 individuals). Infants are advertised for sale over social media in both these countries, as well as in China (F. Chantereau pers. comm.). These observations are an alarming indicator of the threats this species is under from both the pet trade and hunting, given that wild-caught infants are likely a byproduct of adult individuals killed for bushmeat.

Golden-bellied Mangabeys are one of Africa's most threatened but least known primates. The official captive population in the US, Europe, and Asia currently totals just 24 individuals in nine zoos. *Ex situ* populations thus are unlikely sources for reintroductions as a conservation measure. To effectively address ongoing declines, research is needed on wild Golden-bellied Mangabey distribution, population sizes, and ecology, as well as on the impact of hunting and habitat transformation. Studies of wild groups should provide insights into the behavioral ecology of this species and can directly inform conservation planning by providing data on habitat use, ranging behavior, and dispersal patterns. At the landscape level, a priority is to determine genetic distinctiveness of the eastern and western populations, and to establish the current and past extent of connectivity between them.

There is a critical need to confirm where Golden-bellied Mangabeys still occur, both inside and outside protected areas, and investigate the drivers of any absences across their large range. SNP is a high conservation priority, given that it is

the only protected area in the species' range. At present, land conversion and commercial logging are relatively uncommon in the SNP, but illegal hunting remains a significant threat, especially in villages that do not practice agriculture and for which bushmeat is the only source of income. Moreover, the park is threatened by an increase in uncontrolled commercial hunting (Bessone *et al.* 2019). Areas in the SNP where this species has been reported should be a high priority for further surveys. The Oshwe Domaine de Chasse also occurs within the range limits of the western subpopulation; however, the occurrence and status of Golden-bellied Mangabeys in this site are unknown. Surveys should be undertaken to establish if Golden-bellied Mangabeys are present in the Oshwe Domaine de Chasse, as the presence of this species could merit upgrading at least part of the reserve to a higher protection status.

There is a particular need to survey and implement a new protected area for the eastern subpopulation in the Kapula Block, in the Batetela, Basonge and Ndjovu administrative sectors. In a workshop held in Kinshasa in March 2024, the Sankuru Provincial Minister of the Environment confirmed that the establishment of a Community Forest Conservation Concession (CFCL) with the objective to protect the Golden-bellied Mangabey is a priority for the Sankuru administration (H. Mpo and J. Hart pers. comm.). Establishing a new protected area to conserve this species would align with the global commitment to the Kunming-Montreal Global Biodiversity Framework (GBF) to halt and reverse biodiversity loss. Specifically, Target 3 of the GBF aims to ensure and enable that at least 30 percent of terrestrial areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected, and equitably governed systems of protected areas and other effective area-based conservation measures.

Reducing the trade in wild caught Golden-bellied Mangabeys for captivity and commercial purposes is a major conservation priority. Golden-bellied Mangabeys are currently listed under CITES Appendix II, under which individuals can be traded internationally. Moving the Golden-bellied Mangabey to Appendix I would ban all international commercial trade in this species and recognize the immediate threat of extinction that the trade in wild-caught Golden-bellied Mangabeys likely poses. This urgent risk of extinction should also be recognized in national legislation. Golden-bellied Mangabeys are not listed as having either full or partial protection in the most recently legislated list of DRC protected species (Interministerial Decree No. 006/CAB/MIN/EDD/2020). This means that this species has no formal protective status against the capturing, hunting, and trading of individuals across its range. Conservation of Golden-bellied Mangabeys requires legislation for protection, and community support to implement effective protection of the species across its remaining range.

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AFRICA

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SOUTHERN PATAS MONKEY

***Erythrocebus baumstarki* Matschie, 1906**

Kenya (Extirpated), Tanzania
(Previously included on this list in 2022)

Yvonne A. de Jong and Thomas M. Butynski

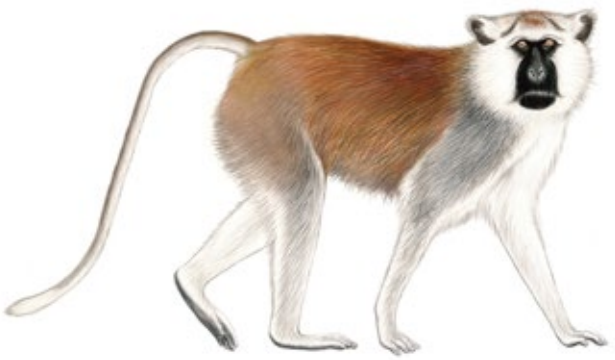
The Southern Patas Monkey (*Erythrocebus baumstarki*) was treated as a synonym or subspecies of *Erythrocebus patas* but has recently been reinstated as a species (De Jong and Butynski 2021). *Erythrocebus baumstarki* is a large, slender, long-limbed, semi-terrestrial guenon that typically lives in one-male, multi-female groups. This species remains poorly known. Its geographically closest relative, the Eastern Patas Monkey (*Erythrocebus patas pyrrhonotus*), has been studied in Uganda and Kenya and is used here as a proxy for the natural history of *E. baumstarki*.

Erythrocebus baumstarki lives in open, short grass, Acacia woodlands, and wooded savannas where it occurs at low densities (*E. p. pyrrhonotus*: 0.03–1.50 individuals/km²). It has long day ranges (*E. p. pyrrhonotus*: 1,380–7,500 m) and large home ranges (*E. p. pyrrhonotus*: 23–52 km²; Hall 1965; Chism and Rowell 1988; Isbell 1998, 2013; Isbell and Chism 2007). These characteristics, together with its typically shy and flighty behavior and ability to run at high speed (55 km/hr; Hall 1965), make *Erythrocebus* especially difficult to locate and observe (Makacha and Sirolli 2005; De Jong *et al*. 2008; Loishooki *et al*. 2016).

Erythrocebus baumstarki is an ecological specialist, being highly dependent on large areas of healthy Whistling Thorn Acacia (*Acacia drepanolobium*), its primary food plant. In the early 20th century, *E. baumstarki* occupied large parts of the Serengeti-Mara Ecosystem and Amboseli Ecosystem of southern Kenya and northern Tanzania (geographic distribution about 66,000 km²; De Jong *et al*. 2008, 2009, 2020). Its geographic distribution has since declined by about 85% to roughly 9,700 km² (De Jong and Butynski 2021). It was extirpated from Kenya in about 2015 and from the Kilimanjaro Region in Tanzania in about 2011. The protected areas of the western Serengeti are currently its stronghold (Serengeti National Park, Grumeti Game Reserve, Ikorongo Game Reserve, and Ikona Wildlife Management Area). In recent years, however, this monkey has been rarely reported (Butynski and De Jong 2024). The present Extent of Occurrence (EOO) is about 2,150 km². The number of individuals remaining in the wild is likely 100–200, with 50–100 mature individuals (De Jong and Butynski 2021). There is no captive breeding population.

Erythrocebus baumstarki is listed as Critically Endangered on the IUCN Red List of Threatened Species. This is based on its small EOO, fragmented distribution, rapid decline in distribution and abundance, small population size, and small effective population size (De Jong and Butynski 2020). All of these parameters are expected to worsen as the causes of its decline are ongoing and unlikely to be reversed in the foreseeable future.

The ultimate threat to *Erythrocebus*, and to other primates in Tanzania and Kenya, is the rapidly growing human population, which is doubling about every 25–30 years. The main proximate threats are the widespread unsustainable exploitation of natural resources by humans, primarily due to agricultural expansion and intensification (both crops and livestock), charcoal production, fire, and development activities (settlements, roads, dams, power-lines), which have resulted in widespread habitat degradation, loss, and fragmentation, and extreme declines in wildlife populations (Homewood *et al*. 2001;



Makacha and Sirolli 2005; BurnSilver *et al*. 2008; Ogutu *et al*. 2014, 2016; Loishooki *et al*. 2016).

Acacia drepanolobium woodlands, on which *E. baumstarki* heavily relies, continue to rapidly disappear due to over-use by livestock and conversion to cropland. Other major concerns are competition with people and livestock for habitat and water (particularly during droughts), hunting by poachers and domestic dogs (*Canis familiaris*), climate change, and loss of genetic variation. Although these threats apply mostly to regions outside protected areas, pastoralists now move livestock illegally into the protected areas that support *E. baumstarki* (Veldhuis *et al*. 2019).

In the western Serengeti, poaching, primarily using wire snares, is a serious problem (Loibooki 2002; Holmern *et al*. 2007; Nyahongo *et al*. 2009). Although *E. baumstarki* is not a target species for poachers, it is likely that some individuals are captured in snares (Makacha and Sirolli 2005; Loishooki *et al*. 2016; De Jong and Butynski 2020, 2021). In addition, this monkey is probably hunted in retaliation for raiding crops (Makacha and Sirolli 2005; Loishooki *et al*. 2016).

Erythrocebus requires perennial sources of drinking water (Chism and Rowell 1988; Isbell and Chism 2007; De Jong *et al*. 2008). The all-day presence of herders and livestock at increasingly scarce sources of water appears to be a serious problem for *E. baumstarki*, particularly because of the attacks by herders and domestic dogs.

Although data are lacking, it is likely that *E. baumstarki* experiences increased exposure to parasites and diseases at water sources as they wait, forage, and drink in an environment that is densely populated by humans and livestock. In addition, climate change and loss of genetic diversity likely impact this small population. Although it seems inevitable that these impacts are negative, they pale against the more immediate threats posed by human population growth and the related degradation, loss, and fragmentation of *A. drepanolobium* woodlands and water sources.

Despite increased attention to the dire state that *E. baumstarki* is in, it has never been the focus of conservation activities, and no conservation actions are planned to secure its long-term

survival. Indeed, with fewer than 200 individuals, an EOO of only about 2,150 km², and the absence of focused conservation actions, it appears that *E. baumstarki* will be among the first primate extinctions in historic times for continental Africa.

Conservation action is urgently required. De Jong and Butynski (2021) recommend the following: (1) Conduct detailed surveys every two years to re-assess geographic distribution, abundance, population structure, conservation status, and threats; (2) Undertake a detailed, long-term, ecological and behavioral study; (3) Implement molecular research projects to assess the level of genomic erosion; (4) Establish dedicated, reliable, wildlife water sources where *E. baumstarki* occurs; (5) Stop poaching and illegal livestock grazing, and keep domestic dogs out of the protected areas; (6) Study and monitor the impacts of browsing on *A. drepanolobium* by livestock and wildlife, and how this affects *E. baumstarki*; (7) Bring the plight of *E. baumstarki* to wider attention; and (8) Produce an '*Erythrocebus baumstarki* Conservation Action Plan' and ensure that this plan is implemented.

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AFRICA

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RED-BELLIED MONKEY

***Cercopithecus erythrogaster* Gray, 1866**

Benin, Nigeria, Togo
(Not previously included on this list)

Reiko Matsuda Goodwin, Rachel Ashegbofe Ikemeh, Gabriel Hoinsoudé Segniagbeto, Chabi A. M. Sylvestre Djagoun and John F. Oates

The Red-bellied Monkey (*Cercopithecus erythrogaster*) of West Africa is a small arboreal guenon that feeds mainly on fruits and insects. It is one of the least-studied primates. Two subspecies are recognized: the Red-bellied Monkey (*C. e. erythrogaster*) with copper-red pelage on the belly, and the Nigeria White-throated Monkey (*C. e. pococki*) with a dark gray belly (Oates 2011).

Cercopithecus erythrogaster occurs in areas adjacent to some of West Africa's most densely settled cities, where human populations are growing at rates of 2% to 3.5% per year (substantially higher than the global average of 1%; World Population Review 2023). *Cercopithecus e. erythrogaster* occurs from southeastern Togo to the southwestern corner of Nigeria in the Dahomey Gap, an area of low annual rainfall with a mosaic of farmland, derived savanna, and patches of semi-deciduous forest (Matsuda Goodwin *et al.* 2017a). The range of *C. e. pococki* extends from southwestern Nigeria to the east of the Orashi River in the Niger Delta in the Lower Guinean Forest Zone (Oates 2011). West of the Orashi, there is a narrow zone of hybridization with Sclater's Monkey (*C. sclateri*) (Oates 1985).

The preferred habitats of *C. erythrogaster* are seasonally or permanently flooded forests, dense low vegetation in lowland tropical rainforests, and semi-deciduous forests (Oates 1985; Nobimé *et al.* 2009). Despite an extensive range, the species' population is highly fragmented. In southeastern Togo, Red-bellied Monkeys occur only in the Togodo Protected Area, the Godjè-Godjiun sacred forests, and a few other forest patches (e.g., Afito hippo ponds), while illegal logging and the expansion of farms and the felling of trees for charcoal production are reducing their habitat (Ségniagbeto *et al.* 2018). These scattered habitats could be lost forever if the Adjarala hydroelectric dam at the southern Benin-Togo border becomes a reality. In Benin, Red-bellied Monkeys occur in the Lama Classified Forest and several isolated forests in the Ouémé Valley, including the Lokoli swamp forest, which are undergoing degradation and fragmentation (Matsuda Goodwin *et al.* 2017a, 2017b). The National Timber Office of Benin regularly conducts patrols in Lama, but hunting of primates for food and medicine continues there (Djagoun *et al.* 2022). Although habitat loss threatens the long-term survival of Red-bellied Monkeys, hunting poses the most severe threat. Hunters in Togo, Benin, and Nigeria use social media apps to recruit friends and schedule hunting parties, often accompanied by dogs, and to trade bushmeat (R. Matsuda Goodwin pers. obs.; Moloney *et al.* 2023).

The forests of southwestern Nigeria are also severely fragmented. Although *C. e. pococki* occurs in the forest reserves of Ise, Idanre, Omo, Oluwa, Shasha, Akure-Ofosu, and Akure, most of these reserves receive little protection from hunting and logging, except for recent protection efforts in Ise and the Omo Elephant Sanctuary within the Omo Reserve. A key habitat for the Nigeria White-throated Monkey is the Okomu National Park in Edo State, which has been threatened until very recently by illegal logging and hunting. Large areas of the northern Okomu Forest Reserve adjacent to the park have been converted to oil palm plantations, while logging has thinned much of the southern part of the

reserve (Morgan *et al.* 2011). In the Niger Delta, the primary threat to Nigeria White-throated Monkeys is forest loss and degradation, along with pollution from the petroleum industry and conflicts between local armed groups. Hunting is a secondary threat (Ikemeh 2015; Ansah *et al.* 2022).

There have been no range-wide comprehensive population studies of *C. erythrogaster*, but localized surveys have been conducted in Togodo, Lama, and Okomu, the three strongholds where *C. erythrogaster* receives some degree of official protection. In Togodo, Segniagbeto *et al.* (2018) estimated a density of 5.07 individuals/km^2 in 2014. In Lama, the encounter rate of Red-bellied Monkeys decreased by 55.5% from 0.09 groups/km in 1995–1997 to 0.04 groups/km in 2014–2015 (Matsuda Goodwin *et al.* 2017b). In Okomu, the encounter rate of Nigeria White-throated Monkeys declined by 26.7% between 1982 and 2010 (Oates 1985; Akinsorotan *et al.* 2011). In the Niger Delta, there is a continuing decline in encounter rates of all primate species, including Nigeria White-throated Monkeys (Ikemeh 2015). For these reasons, the threatened status of *C. erythrogaster* was elevated in 2020 from Vulnerable to Endangered in the IUCN Red List of Threatened Species, the red-bellied subspecies to Critically Endangered from Endangered, and the white-throated subspecies to Endangered from Vulnerable (Matsuda Goodwin *et al.* 2020).

Although *C. erythrogaster*'s future is precarious, not all is lost if immediate action is taken. Strictly enforcing laws against illegal activities in protected areas and instituting effective education programs to strengthen the sustainable use of forest resources in the face of impending climate change are crucial. Some recent hopeful news comes from Ise and Okomu in southwestern Nigeria. For instance, since 2021 the SW/Niger Delta Forest Project has been managing the Ise Forest Conservation Area, which is the last stronghold for chimpanzees in southwestern Nigeria, and where *C. e. pococki* and other wildlife populations are rebounding. In 2022, the Africa Nature Investors Foundation (ANI) and the Nigeria National Park Service signed a 30-year co-management agreement aimed at countering illegal logging and hunting and developing ecotourism in the Okomu National

Park and adjacent forest reserves (ANI 2022). We recommend developing similar co-management programs between the government and NGOs at Lama in Benin and Togodo in Togo.

Research is also needed to estimate the size of *C. erythrogaster* populations at key sites. Due to hunting pressure, these monkeys are usually wary and difficult to observe. Therefore, this research should consider employing remote cameras, drones, and eDNA to complement foot surveys. Involving local communities in research efforts will also contribute to a better understanding of the behavioral ecology and population dynamics of *C. erythrogaster* and the more effective conservation of the species.

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AFRICA

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NIGER DELTA RED COLOBUS

***Piliocolobus epieni* (Grubb and Powell, 1999)**

Nigeria
(Previously included on this list in 2008, 2010, 2016, 2018 and 2022)

Rachel Ashegbofe Ikemeh, Aniekan-Abasi Uwatt and Ebibaikebuna D. Erepawei

The Niger Delta Red Colobus (*Piliocolobus epieni*) is endemic to the marsh forests in the central part of the Niger Delta of Nigeria (Oates 2011). Its species name is derived from its name in the language of the Ijaw people who inhabit the limited area of about 1,500 km^2 in Bayelsa State where it occurs. *Piliocolobus epieni* only became known to science in 1993 during a biodiversity survey coordinated by C. Bruce Powell (Powell 1994). Studies of vocalizations and mitochondrial DNA suggest that this population is not closely related to its closest relatives geographically, the Bioko Red Colobus (*P. pennantii*) and Preuss's Red Colobus (*P. preussi*) of eastern Nigeria and western Cameroon, leading Ting (2008) to treat this monkey not as a subspecies of *P. pennantii* (see Groves 2001, Grubb *et al.* 2003) but as a distinct species. Groves (2007) regarded almost all the different red colobus monkeys, including *epieni*, *pennantii* and *preussi*, as separate species in the genus *Piliocolobus* – a taxonomy that we follow here. Since 2008, the IUCN Red List of Threatened Species has assessed *P. epieni* as Critically Endangered (Ikemeh *et al*. 2019).

The marsh forests where the Niger Delta Red Colobus is found have a high water table all year round, but do not suffer deep flooding or tidal effects. The most intensive ecological study of this monkey, by Lodjewijk Werre in 1994–1996, suggested that the clumped distribution of food species in the marsh forest is a key factor restricting *P. epieni* to its limited range, which is demarcated by the Forcados River and Bomadi Creek in the northwest, the Sagbama, Osiama and Apoi creeks in the east, and the mangrove belt to the south (Werre 2009). At the time of its discovery in the mid-1990s, this red colobus was locally common, especially in forests near the town of Gbanraun, but it was beginning to come under intense pressure from degradation of its habitat and commercial hunting. Important colobus food trees, especially *Fleroya ledermannii* (Rubiaceae), were being felled at a high rate by artisanal loggers, and the logs were floated out of the Delta on rafts to processing centers in Lagos and elsewhere. In addition, large canals dug as part of oil extraction activities, as well as smaller canals dug by loggers into the interior swamps, were changing local hydrology (Werre and Powell 1997, Grubb and Powell 1999). The Ijaw people are traditionally fishermen, but outside influences introduced by the oil industry have encouraged commercial bushmeat hunting and logging throughout the Niger Delta.

In 2013, the conclusions of a range-wide assessment of *P. epieni* indicated that prolonged habitat destruction and hunting had resulted in a drastic population decline since the 1990s, and that the population may now be around 90% smaller than estimated 25 years ago (Ikemeh 2015). In the 2013 survey, the presence of *P. epieni* was confirmed only in four forest areas, and it was considered extirpated from 11 other forests where it had been reported in the 1990s by Werre (2009). Cumulative survey data indicate that the current number of individuals surviving in the wild may be only a few hundred (Ikemeh 2015). Insecurity in the region and the consequences of poor governance, amongst other factors, have exacerbated the major threats of habitat degradation and commercial hunting. Because red colobus monkeys are known to be sensitive

to habitat disturbance and hunting in other parts of Africa (Struhsaker 2005), it is feared that the Niger Delta Red Colobus, with its very restricted range, is at high risk of extinction.

The red colobus monkeys are probably more threatened than any other taxonomic group of primates in Africa (Oates 1996, Struhsaker 2005). *Piliocolobus preussi* (western Cameroon and eastern Nigeria), *P. pennantii* (Bioko Island, Equatorial Guinea) and *P. rufomitratus* (Tana River, Kenya) are all regarded as Critically Endangered from different combinations of habitat loss and hunting, while *P. waldroni* (eastern Côte d'Ivoire and western Ghana) may already be extinct (Oates 2011).

The Niger Delta Red Colobus shares its marsh forest habitat with two other threatened primates: the Nigerian White-throated Guenon (*Cercopithecus erythrogaster pococki*) and the Red-capped Mangabey (*Cercocebus torquatus*) (Ikemeh 2015). Also found in these forests are the Putty-nosed Monkey (*Cercopithecus nictitans*), the Mona Monkey (*Cercopithecus mona*) and the Olive Colobus (*Procolobus verus*) (Efenakpo *et al.* 2018). However, political instability in the Delta, related in large part to disputes over the allocation of oil revenues, has hindered biodiversity conservation for most parts of the region (Ikemeh 2015). This forest-dependent primate has never been successfully bred in captivity.

The 2013 survey identified two important areas for *P. epieni* conservation: 1) the Apoi Creek Forests, flanked by the communities of Gbanraun, Apoi and Kokologbene, and 2) forests near Kolotoro (Ikemeh 2015). Unfortunately, and in the absence of conservation intervention, the forest near Kolotoro was devastated by excessive logging activities, driving the population in that area to extinction. In 2021, a community-based conservation area was established, which covers 1,109 hectares within the Apoi Creek Forest. This area, named the Apoi Community Conservation Area, is under the customary authority of the Apoi community where rangers are on patrol protecting 150–300 Niger Delta Red Colobus monkeys, possibly the most significant population anywhere. The effort to create and manage the community conservancy has been coordinated by a local conservation group (Southwest Niger

Delta Forest Project) and provides the only lifeline for this species' survival. It is crucial that adjacent communities are involved in the conservation process to ensure a sustainable future for the species. To this end, the Southwest Niger Delta Forest Project has launched habitat restoration projects in Gbanraun and Kokologbene to increase the availability of suitable habitat. Further priority actions needed to secure the survival of this species include establishing appropriate laws at the state and national level to protect the species and its habitat, and conducting new surveys to identify sites where other viable populations still exist and where additional protected areas might be created.

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CROSS RIVER GORILLA

***Gorilla gorilla diehli* Matschie,1904**

Cameroon, Nigeria
(Previously included on this list in 2000, 2002, 2004, 2006 and 2008)

Jacqueline L. Sunderland-Groves, Inaoyom Imong, Andrew Dunn, Roger Fotso, Dirck Byler and John F. Oates

The Critically Endangered Cross River Gorilla (*Gorilla gorilla diehli*) is the most threatened of all great ape taxa recognized (Dunn *et al.* 2014; Bergl *et al.* 2016). Less than 250 mature individuals are estimated to survive in 11 hill and montane forest locations across a broad landscape of 12,000 km² spanning the Nigeria-Cameroon border (Oates *et al.* 2007; Bergl *et al.* 2012; Dunn *et al.* 2014). Geographically, they are separated from the nearest Western Lowland Gorilla (*G. g. gorilla*) population by around 300 km and by approximately 250 km from the small gorilla population located in the Ebo Forest in Cameroon. Numerous human settlements occur throughout the gorillas' range, and local livelihoods rely heavily on forest utilization, with the result that habitat loss and fragmentation, in addition to hunting, have led to a steep historical decline in the population (Bergl *et al.* 2008). Since the last range-wide population estimate (reported by Dunn *et al.* 2014), habitat erosion and fragmentation throughout the region have intensified, and remote sensing analysis combined with field survey data indicate that movement between subpopulations may now be unfeasible due to diminished forested corridors and human disturbance (Imong *et al.* 2014). Conservation interventions in Cameroon have been further hampered by the emergence of civil unrest, which has been ongoing throughout the Southwest and Northwest Provinces since 2016. This unrest has led to thousands of people migrating across the border into Nigeria and access to Cross River Gorilla habitat in this region of Cameroon by outsiders being severely restricted. The seriousness of these threats clearly imperils the survival of this subspecies.

Intensive field research between 1987 and 2016 provided a strong knowledge base on Cross River Gorilla behavior, population size, distribution and genetic diversity (summarized in Oates *et al.* 2007; Dunn *et al.* 2014; Bergl *et al.* 2016). Approximately one-third of the population is situated in Nigeria in the Afi Mountain Wildlife Sanctuary, Mbe Mountains Community Forest and the Okwangwo Division of the Cross River National Park. The larger Cameroon population has been recorded at several locations in Takamanda National Park, and in the Mone Forest Reserve, the upper Mbulu forest, the Kagwene Gorilla Sanctuary, and the Tofala Hills Wildlife Sanctuary (Bergl *et al.* 2016).

Although about 70% of the *G. g. diehli* population occurs in nominally protected areas, the reduction and fragmentation of its habitat continues as a result of farming, logging, fire to clear pastoral lands, and large-scale development projects, such as new road construction. Historically, hunting has also been a serious threat to the gorillas in this region, with genetic evidence indicating a sharp bottleneck in the population around 100–200 years ago (Bergl *et al.* 2008; Thalmann *et al.* 2011). In recent years, gorilla hunting was reduced to very low levels due to conservation initiatives, the presence of researchers, and the support of local communities. However, current civil unrest within the gorillas' habitat in Cameroon may have led to increased hunting; given the small population size, the loss of even one individual is of serious concern. Disease also poses a potential threat to these gorillas given their close proximity to human activity and livestock in some areas (Strahan *et al.* 2024). Limited genetic diversity and connectivity further threaten these

gorillas (Bergl *et al.* 2008; Thalmann *et al.* 2011; Alvarez-Estape *et al.* 2023), as do the likely effects of climate change (Carvalho *et al.* 2021).

Based on emerging knowledge of Cross River Gorilla ecology and threats, new conservation efforts were established in the region in the early 2000s. These have been described in two IUCN Primate Specialist Group Regional Action Plans (Oates *et al.* 2007; Dunn *et al.* 2014). These plans have provided the backbone for focused conservation activities across the gorillas' range. Approximately 70% of the recommended actions have since been implemented and, in some locations, have led to improved law enforcement, cross-border patrols, and educational and alternative livelihood programs. New protected areas were established in Cameroon (Takamanda National Park and Kagwene Gorilla Sanctuary in 2008 and the Tofala Hills Wildlife Sanctuary in 2014), and further efforts to strengthen transboundary conservation between Nigeria and Cameroon have included the nomination of parts of the gorillas' range for designation as a World Heritage Site. Encouraging images of several infants captured by remote camera traps in the Mbe and Afi Mountains in Nigeria demonstrate reproductive success when given the opportunity. However, habitat loss continues in areas of Afi Mountain, the Okwangwo enclaves and important forested corridors, which threatens the gorillas in those areas and diminishes hope of future connectivity and genetic exchange between subpopulations. Human conflict over the past eight years in these gorillas' Cameroonian range is likely to have increased the degree of threat to the long-term survival of *G. g. diehli*. Anthropogenic pressures across the range of this subspecies must be alleviated if its populations are to survive and recover. As a first step, updated population data across its range is required to inform renewed conservation action planning so as to effectively preserve both the gorillas and their remaining habitat.

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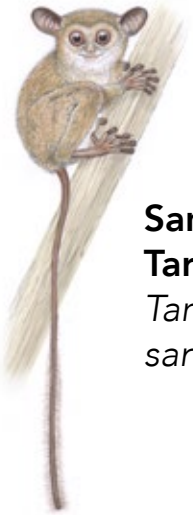
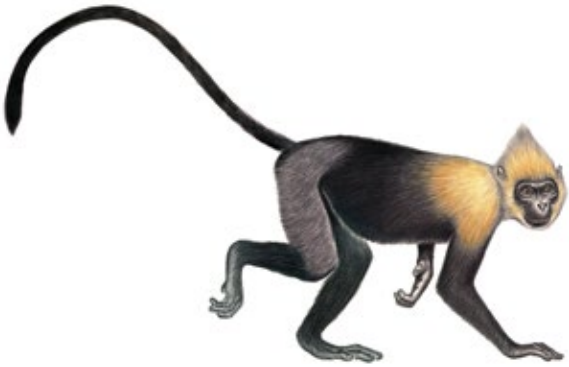
summer

winter

Northern Pygmy Slow Loris
Xanthonycticebus intermedius



Sangihe Island Tarsier
Tarsius sangirensis



Cat Ba Langur
Trachypithecus poliocephalus

Pig-tailed Snub-nosed Langur
Simias concolor

Myanmar Snub-nosed Monkey
Rhinopithecus strykeri

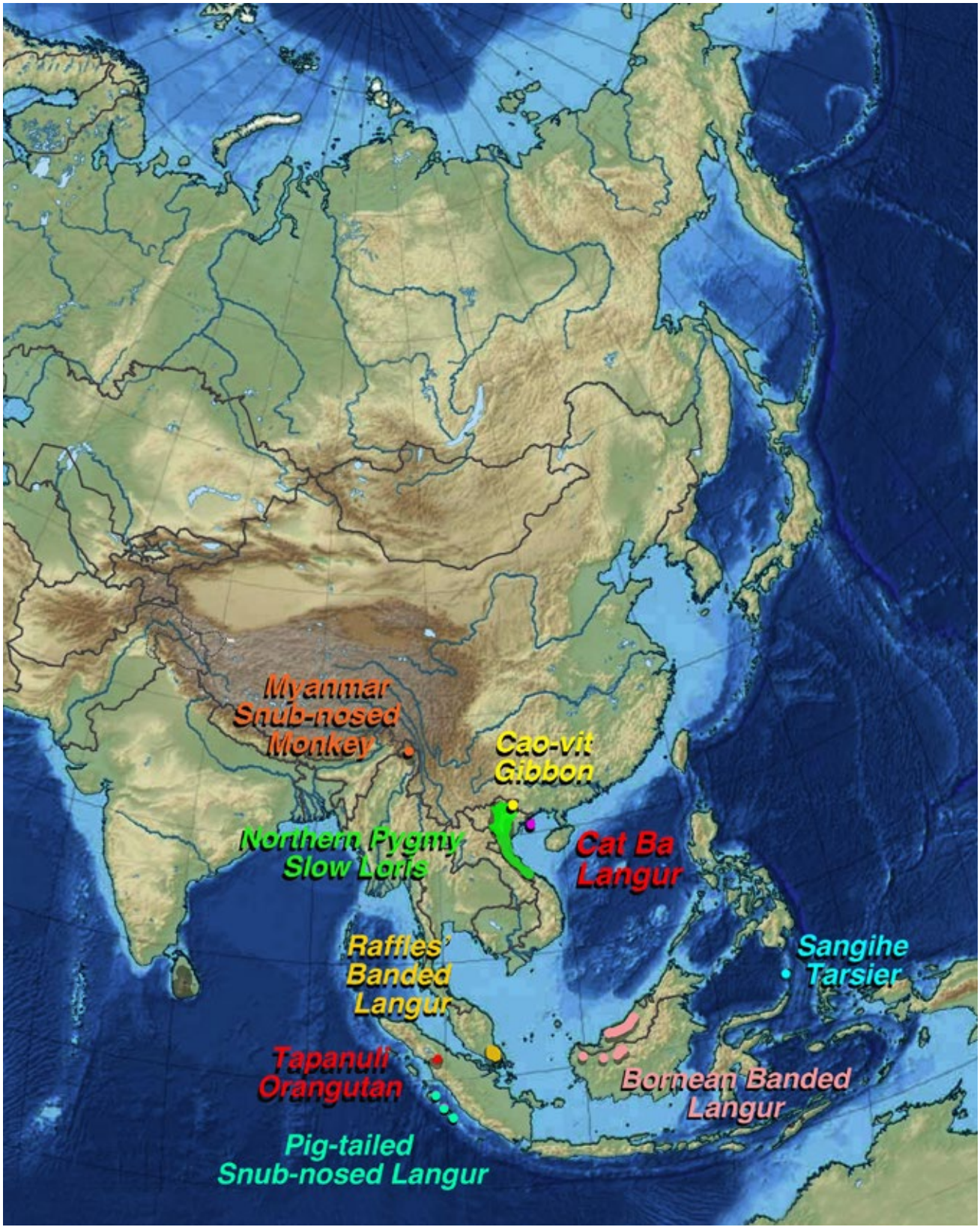
Raffles' Banded Langur
Presbytis femoralis

Bornean Banded Langur
Presbytis chrysomelas

Cao-vit Gibbon
Nomascus nasutus

Tapanuli Orangutan
Pongo tapanuliensis

ASIA


Myanmar
Snub-nosed
Monkey
Cao-vit
Gibbon
Northern Pygmy
Slow Loris
Cat Ba
Langur
Raffles'
Banded
Langur
Sangihe
Tarsier
Tapanuli
Orangutan
Bornean Banded
Langur
Pig-tailed
Snub-nosed Langur

ASIA

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NORTHERN PYGMY SLOW LORIS

***Xanthonycticebus intermedius* (Dao Van Tien, 1960)**

China, Laos PDR, Vietnam
(Not previously included on this list)

K. Anna I. Nekaris

The pygmy slow lorises are possibly the best known of the Asian lorises for several reasons. For over 25 years, they have been the main loris species targeted by captive accredited breeding programs and thus, although uncommon, are found in many zoos. They have a relatively wide distribution, occurring in Vietnam, Cambodia, Laos PDR, and China. Amongst the nocturnal lorises, they have always stood out with their smaller size, naked ears, black noses, and their regularly giving birth to twins. They stand out as well as the loris most commonly featured on illegal and often cruel social media videos and memes, being fed awful diets, holding tiny cocktail umbrellas, and most notoriously raising their hands in the air as a V or peace sign gesture or as a seeming solicitation to be tickled (Nekaris *et al.* 2013). This latter notoriety is linked also to their greatest threat – the illegal wildlife trade. Indeed, pygmy lorises are common pets in all of their range countries as well as internationally, with frequent confiscations occurring in countries such as Japan, Thailand, Russia, Czech Republic, and Oman (Thach *et al.* 2018). They have also been seen paraded as photo props in Turkey and Thailand and, in the latter country, Osterberg and Nekaris (2015) confirmed documented cases of them being released in their hundreds outside of their native range. They are also considered a cure in traditional medicine for over 100 diseases and ailments, including healing wounds, curing eye diseases, and providing strength to women after pregnancy (Starr *et al.* 2010).

The very factors that allowed pygmy lorises to be distinguished easily from other lorises led in 2022 to their being named a distinct genus, with *Xanthonycticebus* diverging from *Nycticebus* some 11.3 mya (Nekaris and Nijman 2022; Blair *et al.* 2023). This distinction was followed shortly thereafter by the recognition of two species, *X. pygmaeus* and *X. intermedius.* The former, the Southern Pygmy Slow Loris is found in mainland Southeast Asia east of the Mekong River, in eastern Cambodia, in Vietnam as far north as the Hai Van Pass in Quang Nam Province, and historically south to the vicinity of Ho Chi Minh City and southern Laos PDR. The Northern Pygmy Slow Loris occurs in mainland Southeast Asia east of the Mekong River, historically in northern Laos PDR as far west as Phongsali, north of the Hai Van Pass in Quang Nam Province in Vietnam and, historically, in southern China north to Luchun (Blair *et al.* 2023). Field surveys have shown both species to be rare with declining populations. *Xanthonycticebus intermedius* may be almost completely extirpated in China (Ni *et al.* 2020). Before this division, *X. pygmaeus* was listed as Endangered on the IUCN Red List of Threatened Species.

The ecology of the pygmy lorises remains little known. A radio tracking study of *X. pygmaeus* in Cambodia helped to confirm the large home ranges and specialized exudativorous diet of pygmy lorises. These assertions have been confirmed in translocation studies in both *X. pygmaeus* in southern Vietnam and in *X. intermedius* in northern Vietnam (Streicher 2009; Kenyon *et al.* 2014; Poindexter *et al.* 2017). They are one of the few primates outside of Madagascar that can enter multi-day torpor, which could have important implications in choice of release sites as well as relating to the effects of climate change (Xiao *et al.* 2010; Ruf *et al.* 2015). They are also confirmed to be venomous, with a bite that can cause permanent damage or even death in humans (Hagey *et al.* 2007; Gardiner *et al.* 2018).

Conservation initiatives are available mainly in the form of rescue centers in Vietnam and China. Without knowledge of their wild ecology, translocations have had varying levels of success (Streicher and Nadler 2003, Kenyon *et al.* 2014, Poindexter *et al.* 2017). Survival rates in China are particularly low (Ni, pers. comm.). Outreach programs by the Endangered Asian Species Trust have been developed targeting the Southern Pygmy Slow Loris, including education packs and puppet shows (Cardinal *et al.* 2020). Work has also been done to improve captive care of pygmy lorises, including those confiscated from the wildlife trade outside their range countries (Yamanashi *et al.* 2021). Overall, the threats that face the Northern Pygmy Slow Loris – declining habitat, persistent trade, exploitation on social media and the fact that even in the best known of the lorises, new species are being uncovered – are those facing all their cousins, and this group is likely to become even more threatened as their diversity becomes better known.

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ASIA

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SANGIHE ISLAND TARSIER

***Tarsius sangirensis* Meyer, 1897**

Indonesia
(Previously included on this list in 2022)

Myron Shekelle and Susan Paparang

Just south of the Philippines, a small piece of the Pacific Ocean sea floor known as the Molluca Sea Plate is being forced under the much larger Eurasian Plate, forming the Sangihe Arc and sending up a string of volcanoes 500 km long (Morrice *et al.* 1983). Two of these, Mt. Awu and Mt. Sahendarumen, arose from the ocean floor millions of years ago to form the peanut-shaped island that the indigenous people call Sangihe. Every living thing on that island had to fly, swim, or float from somewhere else. These peculiar biogeographic conditions are effectively the same as those that created the unique, highly distinctive, and severely threatened biotas of the more famous Galapagos and Hawaiian islands. One of these unique, highly distinctive, and severely threatened creatures is a tiny nocturnal primate called the Sangihe Island Tarsier that is not much larger than a stick of butter.

Roughly equidistant from the Philippine Island of Mindanao and the Indonesian island of Sulawesi, both of which have tarsiers, the Sangihe Island tarsiers clearly came from Sulawesi, probably on a large raft of floating vegetation (Shekelle 2022). This is because, like Sulawesian tarsiers and unlike Philippine tarsiers, they live in small family groups composed of an adult pair and their offspring, and the male and female sing a complex duet call to unite the family, usually at dawn shortly before they go to sleep for the day (Shekelle 2013). DNA studies have shown that this species of tarsier, found on Sangihe Island and nowhere else in the world, has been isolated from all other tarsiers for a few million years (Shekelle *et al.* 2019).

Sangihe Island Tarsiers are listed as Endangered on the IUCN Red List of Threatened Species (Shekelle 2020), with their Extent of Occurrence being smaller than 5000 km². Indeed, with a surface area of only 547 km² (Shekelle and Salim 2009), Sangihe Island is slightly smaller than the island of Singapore. Furthermore, the species is known from just a single location, Sangihe Island, where a single threatening event can affect all individuals of the species, and there is a continuing observed decline in the extent and quality of its habitat. This is due in part to the burgeoning human population on the island that has more than 140,000 people (Badan Pusat Statistik 2022), giving it a population density similar to a crowded European country. Shekelle and Salim (2009) found that the Sangihe Island tarsier was at risk from a small Extent of Occurrence and Area of Occupancy, small population size, high risk of volcanism, high human population density, fragmented populations (many of which are in marginal habitat), and the lack of conservation areas to protect it. Mt. Awu, which dominates the northern half of the island, is ranked among the most deadly volcanoes in Indonesia's "Ring of Fire" (Bani *et al.* 2020). There are currently no *ex situ* conservation options for any tarsier species, should their extinction in the wild become imminent.

To all of this we can add the additional threat of gold. The BBC dubbed Sangihe Island, "Indonesia's Gold Island" (BBC 2021), and the gold mine concession covers the southern half of the island…*all* of it! Unfortunately, the southern half, which is dominated by the extinct volcano, Mt. Sahendaruman, has all of the high conservation value land. Three critically endangered species of birds, the Cerulean Flycatcher (*Eutrichomyias rowleyi*), the Sangihe Shrike-Thrush (*Coracornis sanghirensis*) and the Sangihe White-Eye (*Zosterops nehrkorni*), all

rely on a tiny patch of forest in the gold mine concession that enjoys only limited community protection. According to Burung Indonesia, a total 2,157 ha of forested area was agreed to be protected by the community in three villages, with the understanding that mining should not enter this area.

Legal battles over the legitimacy of the mine concession have gone back and forth, such that it is hard to say what is legal and what is illegal. Regardless, small-scale wild cat gold mining has moved in, and it seems that there will be gold mining one way or another. Our observations are that wild cat mining is taking place, using manual excavation and chemicals, such as cyanide and mercury, for the gold refining process. Air and water will be polluted by these activities, and harm the environment and the local community. In a sad irony, large-scale controlled mining might be preferable to wild cat mining.

Imagine three Critically Endangered species of birds all relying on a forest patch only slightly more than six times the size of New York's Central Park, and now, one of the world's most endangered primates as well. Listing *Tarsius sangirensis* among The World's 25 Most Endangered Primates helps to focus the eyes of the world on the complex struggle to keep this species, and the other unique, highly distinctive, and severely threatened creatures of Sangihe Island, from dropping off the brink of extinction.

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ASIA

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CAT BA LANGUR

or Golden-headed Langur

***Trachypithecus poliocephalus* (Trouessart, 1911)**

Vietnam
(Included in all previous editions of this list – 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014, 2016, 2018, 2020 and 2022)

Neahga Leonard, *Richard J. Passaro*, *Daniela Schrudde* and *Roswitha Stenke*

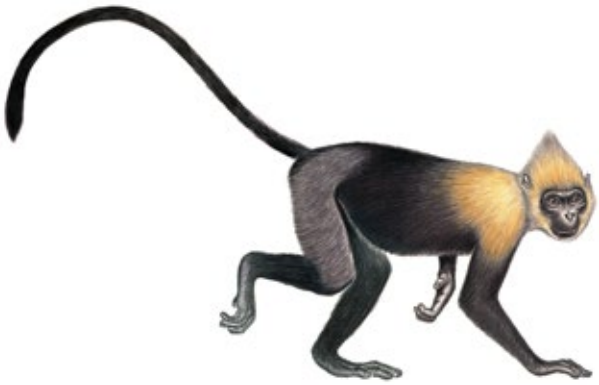
The Cat Ba Langur, *Trachypithecus poliocephalus*, is the rarest primate in Vietnam, and currently assessed as Critically Endangered on the IUCN Red List of Threatened Species (Rawson *et al.* 2020). It is endemic to Cat Ba Island off the northeast coast of the country (Stenke and Chu 2004). The Cat Ba Archipelago is part of the greater Ha Long Bay region, a spectacular karst formation repeatedly invaded by the sea during interglacial periods. Cat Ba Langurs are limestone specialists with habitat preferences similar to several other species in the *Trachypithecus francoisi* group.

Current genetic studies and preliminary habitat analysis provide databased estimates that suggest the historical Cat Ba population was much smaller than previously thought. Revised population estimates for the 20th century suggest that the population was around 250 individuals in 1900, gradually declining to around 100 individuals by 1920, 75 individuals by the 1960s, 50 individuals by 2000 (Zang *et al.* 2022), and to the observed low point of 40 individuals by 2003 (Leonard *et al.* 2016). The discrepancy between these numbers and previous estimates of 2,400–2,700 (Nadler and Ha 2000) can largely be explained by a greater understanding of the distribution of high-quality habitat on Cat Ba, and observer bias due to high-quality langur habitat overlapping with high-quality human habitat, resulting in the perception of a higher population than existed. The genetic assessment overlaps with, and closely matches, observed population counts, thereby providing confidence that the population values given by the genetic assessment are reasonable. Additional research on this topic, however, is needed.

Habitat analysis, based on potential sleeping site availability, provides an independent method for assessing the maximum carrying capacity of Cat Ba Island under various human-footprint scenarios. Preliminary optimistic habitat assessment indicates a maximum potential population with no human presence of approximately 1,400 individuals and a potential carrying capacity at the maximum 20th century human footprint, not accounting for tourism, of approximately 400 individuals (Leonard *et al.* 2023).

Population declines in this species have been attributed to hunting for use in traditional medicine and for sport (Nadler and Ha 2000, Stenke 2005). Implementation of strict protection measures and conservation activities in 2000 stabilized the population (Nadler *et al.* 2003), with the population increasing since 2003 (Leonard *et al.* 2016). In the latter half of 2015, numbers fell from the middle 60s to the low 50s and climbed to the high 70s by mid-year 2023 (Leonard *et al.* 2023) and to the low 90s by mid-year 2024.

The overall condition of the species is still precarious, and the total population is worryingly small despite consistent population growth. Habitat fragmentation and hunting have divided the remnant population into three isolated sub-populations, only two of which are reproductively active. A surplus of bachelor males is a cause



for concern as take-over attempts can lead to infanticide, inadvertent infant deaths, and group fragmentation, all of which have been recorded since 2018 (N. Leonard pers. comm.). Reproduction appears to only take place in groups above a threshold size, making group fragmentation a particular cause for concern.

The total reproductive output of *T. poliocephalus* has been low due to the small population and the long inter-birth cycle, but the birth rate is increasing as the population grows. Half of the total births recorded between 2000 and 2023 have taken place in 2019–2023. Births occur all year long, peaking in February–April, just prior to the rainy season (Leonard *et al.* 201; N. Leonard pers. comm.), and conception peaks in August–October at the conclusion of the rainy season. Approximately 30% of the reproductively active females give birth annually (N. Leonard pers. comm.).

In 2012, two females were successfully translocated from an islet where they had become stranded in a Strictly Protected Area of the Cat Ba National Park established for langur conservation. They were successfully integrated into actively reproducing groups, demonstrating the prospect of further active population management.

The Cat Ba Archipelago and adjacent Ha Long Bay are nationally and internationally recognized for their importance to biodiversity conservation. Cat Ba National Park was established in 1986 and expanded in 2004 to include more than half of Cat Ba Island when the Cat Ba Man and Biosphere Reserve was established. Ha Long Bay was established as a World Heritage site in 1994 and expanded to include the Cat Ba Archipelago in 2023. The combined archipelago includes 1,500–2,000 large and small islands, cliffs, and rocks. Despite these conservation designations and laws to protect the region, nature and wildlife protection on Cat Ba Island is deficient. Environmental awareness and commitment among the local communities is slowly increasing, and hunting/trapping of all wild animals is illegal on Cat Ba Island. Efforts to effectively conserve the langurs and their habitat continue to face major obstacles from increasing tourism development, increasing human populations, and severe deficiencies in law enforcement (Stenke

2005; Leonard 2018). As is common elsewhere in the region, poaching by local people is driven by livelihood issues, due to poverty and lack of employment opportunities. Immense local and regional demand for wildlife and animal parts for food and traditional medicines of dubious efficacy provide a market for poached animals and plants. Although langur hunting ostensibly stopped years ago, the 2015 decline in numbers raises doubts as to the permanence of the hunting cessation (Leonard *et al.* 2016). Regardless, locals continue to poach other animals and plants in langur habitats, thus jeopardizing them. Strict enforcement of established protections is therefore necessary for the survival of all species on Cat Ba Island that are targeted by the illegal Asian wildlife trade.

A conservation program for the Cat Ba Langur is supported by Zoo Leipzig, the Zoological Society for the Conservation of Species and Populations (ZGAP), and the Allwetterzoo Münster in Germany. The project was initiated on Cat Ba Island in November 2000 by Allwetterzoo Münster and ZGAP. The Cat Ba Langur Conservation Program aims to provide protection for the langurs and their habitat, to conduct research that will help inform future population management decisions, and to conserve the overall biodiversity of the Cat Ba Archipelago.

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ASIA

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PIG-TAILED SNUB-NOSED LANGUR

***Simias concolor* G.A. Miller, 1903**

Indonesia
(Previously included on this list in 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014, 2016 and 2018)

Rizaldi, Arif Setiawan and Andie Ang

The Pig-tailed Snub-nosed Langur (*Simias concolor*) is categorized as Critically Endangered on the IUCN Red List of Threatened Species (Quinten *et al.* 2020) and serves as the representative taxon for all the six threatened endemic primate species of the Mentawai Islands, Indonesia, which also include Kloss's Gibbon (*Hylobates klossii*), the Southern Mentawai Macaque (*Macaca pagensis*), the Siberut Macaque (*M. siberu*), the Southern Mentawai Langur (*Presbytis potenziani*) and the Siberut Langur (*P. siberu*) (Table 1).

The Mentawai Islands are a group of about 70 islands off the west coast of Sumatra, covering an area of 6,011 km², with a human population of only about 88,000 people (based on a 2020 census, BPS-Statistics Indonesia 2022). The Mentawai Islands have been recognized as a global priority for conservation since the 1970s, and the first comprehensive plan for their conservation, entitled "Saving Siberut: A Conservation Master Plan", was published by WWF in 1980 (WWF 1980). A conservation plan for the island's primates followed shortly thereafter (Eudey 1987). Since the 1980s, attention to, and support for, conservation in the Mentawai Islands has come and gone, with some major, short-term investments and long periods of little to no attention (Whitten 2009). This lack of long-term support has led to a serious degradation in the Mentawai ecosystem and a collapse of the primate populations. The last in-depth primate studies even on Siberut, the largest and most easily accessible island, is now more than a decade old (Quinten *et al.* 2010, Setiawan *et al.* 2020), and the few studies on Sipora, North Pagai, and South Pagai islands date back at least 15 years (Paciulli 2004; Paciulli and Viola 2009;

Table 1: Distribution of primate taxa in Mentawai Islands.

Islands / Taxa	***Hylobates klossii***	***Simias concolor concolor***	***Simias concolor siberu***	***Presbytis potenziani***	***Presbytis siberu***	***Macaca pagensis***	***Macaca siberu***
	EN	CR	CR	CR	EN	CR	EN
Sipora	Y	Y		Y		Y	
North Pagai	Y	Y		Y		Y	
South Pagai	Y	Y		Y		Y	
Sinakak	Y	Y		Y		Y	
Siberut	Y		Y		Y		Y
Simalegu		Y					
Simatapi		Y					

Yanuar and Supriatna 2018). Whilst Siberut Island has a national park that covers 47% of the island, the smaller islands have no such protected areas.

Simias is a monotypic genus with two subspecies: *S. concolor concolor* (local name "Masepsep") on Sipora, North Pagai, and South Pagai; and *S. concolor siberu* (local name "Simakobu") only on Siberut Island. The fur coat of *S. concolor* is generally blackish-brown with lighter-colored hair on the neck, shoulders, and upper back. A creamy buff-colored fur coat has also been reported as a different morph. Populations of *S. c. concolor* on Pagai Island are threatened by forest conversion to oil palm plantations, forest clearings, product extraction by local people and opportunistic hunting (Paciulli 2004; Whittaker 2006). In the mid-2010s, populations of *S. c. siberu* on Siberut Island were faced with plans for a 1,000-km^2 oil palm plantation development as well as a 200-km^2 timber plantation for biomass energy production. Both plans were cancelled as a result of local opposition, protests, and environmental assessments (Gaworecki 2016; Paciulli and Pannick 2019). In March 2023, however, a new logging permit was issued that would deforest nearly half of the 60,000 ha of Sipora Island in the next 30 years (Febrianti 2023). Besides being threatened by the loss and conversion of habitat, *S. concolor* is also significantly affected by hunting as it is the preferred game species, with its meat being considered a delicacy by local people (Mitchell and Tilson 1986; Fuentes 2002; Febrianti 2015; Paciulli and Sabbi 2017).

Given the heavy hunting of *S. concolor* and other primates, and the fact that logging and other forms of deforestation continue on these islands, there is a very urgent need for field surveys to gather key new information on conservation status and habitat integrity. In 2017, a rapid assessment of Kloss's Gibbons in Siberut National Park found 25 individuals in six locations (Febrianti 2020). In June and July of 2023, a preliminary field survey was conducted by Andalas University students, who documented continued hunting of the primates with the presence of several active logging areas (Rizaldi pers. obs.). Habitat degradation and conversion to agricultural land for banana plantations continues to contribute to the decline of primate populations.

It is crucial to develop an up-to-date conservation action plan for the primates of the Mentawai Islands. Some of the recommended next steps include (1) stakeholder engagement with relevant government agencies and the local community on the Mentawai Islands, (2) a large-scale conservation education campaign to raise awareness about the rich biodiversity and endemism of not only the primates, but also other taxonomic groups, (3) the development of conservation tourism, following the model of the flourishing surfing industry on the islands, (4) enforcement against illegal hunting and extraction in Siberut National Park, and (5) the protection of at least one priority, representative site for primates on each of the five main islands on Siberut, Sipora, North Pagai, South Pagai, and Sinaka.

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ASIA

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MYANMAR SNUB-NOSED MONKEY

or Black Snub-nosed Monkey

***Rhinopithecus strykeri* Geissmann, Ngwe Lwin, Saw Soe Aung, Thet Naing Aung, Zin Myo Aung, Tony Htin Hla, Grindley & Momberg, 2011**

China, Myanmar
(Not previously included on this list)

Ngwe Lwin, Yin Yang, Xiao Wen, Aung Ko Lin and Frank Momberg

The Myanmar or Black Snub-nosed Monkey *Rhinopithecus strykeri* is assessed as Critically Endangered on the IUCN Red List of Threatened Species (Geissmann *et al.* 2020). The distribution of *R. strykeri* is restricted to the transboundary landscape between Kachin state (Myanmar) and Yunnan province (China), between the N'mai Kha (in the west) and Salween rivers (in the east), which includes the middle segments of the Gaoligong Mountains in western China and the contiguous Imawbum Mountain range in Myanmar (Yang 2019; Geissmann *et al.* 2020). This species dwells in extremely harsh, mountainous terrain; its habitat consists of cool temperate rainforest, mixed temperate forest, and bamboo forest with an altitudinal range of 1720–3300 m asl (Geissmann *et al.* 2011; Ma *et al.* 2014; Li *et al.* 2014). A total remaining population of 520–600 individuals has been estimated, with six confirmed sub-populations, four of which are present only in the Imawbum National Park in Myanmar, and two are only in the Gaoligong Mountains National Nature Reserve (GLGMNNR) in China (Yang *et al.* 2022). Ren *et al.* (2017) estimated that the suitable habitat of this species is 3,575 km², including 2,170 km² of core habitat and 1,405 km² of edge, disturbed, or fragmented habitat. Of this area, 1,723.3 km² of suitable habitat for *R. strykeri* is located in established protected areas (754.3 km² in Gaoligong Mountains National Nature Reserve in China and 969 km² in Imawbum National Park in Myanmar) (Ren *et al.* 2017; Yang *et al.* 2022).

Hunting, habitat degradation, and habitat loss are the main threats to *R. strykeri* (Geissmann *et al.* 2020). Hunting is a major threat in Myanmar, particularly in the border area. At least 48 individuals were killed in 27 hunting events by 35 hunters from 15 villages between 1992 and 2013 (Nijman 2015; Meyer *et al.* 2017), and at least five individuals were shot or captured as pets near the border area between 2016 and 2021 (Chen *et al.* 2022; Yang *et al.* 2022). In China, hunting used to be a significant threat to *R. strykeri* until 2013 but has been declining ever since due to continuous patrolling and monitoring (Yang *et al.* 2022). Ma *et al.* (2014) documented 19 individuals killed before 2013. Chen *et al.* (2022) stated there were only a few documented incidents of hunting of *R. strykeri* in recent years.

Before 2016, this species was seriously threatened in Myanmar by habitat degradation due to large-scale commercial logging in the high-altitude forest of the Imawbum mountain area (Meyer *et al.* 2017; Ren *et al.* 2017; Geissmann *et al.* 2020). In response to strict implementation by the Chinese Government of a transboundary logging ban in 2015, however, large-scale commercial logging in Myanmar has decreased significantly (Yang *et al.* 2022). Ren *et al.* (2017) informed that at least 91.2 km² of *R. strykeri* habitat were lost in Myanmar due to slash-and-burn cultivation and logging between 2000 and 2015. In China, and until 2020, habitat degradation caused by illegal logging to service the highly profitable

market for wood from old growth native trees for furniture, occurred both inside and outside of the Gaoligong Mountains reserve (Yang 2019; Yang *et al.* 2022). However, in 2020 and 2021, illegal logging stopped almost entirely due to COVID-19 restrictions, which made it difficult for people to enter and exit the border area for wood extraction and sale (Yang *et al.* 2022).

In addition to hunting and habitat destruction, forest fires and mining at the border area are becoming a growing threat. In Myanmar, Chen *et al.* (2022) recorded a transboundary forest fire damaging *c.* 1.83 km^2 of *R. strykeri* forest habitat in January 2017, as well as two mining sites located close to the species' range.

The Imawbum mountain range is home to 1,600 families in 25 village tracts, who rely on shifting cultivation, non-timber forest products, and hunting for their livelihoods (Yang *et al.* 2022). Since the discovery of *R. strykeri* in the Imawbum mountain range, Fauna & Flora International has launched a community-based conservation and livelihoods program, reducing dependency on forest resources, while improving the wellbeing of local villagers (Meyer *et al.* 2017). Although this program has experienced some interruptions due to limited access during the rainy season and temporary security issues, the plan has been supported by the majority of the local communities, and *R. strykeri* hunting events have significantly declined (Meyer *et al.* 2017). Imawbum Mountain National Park was established to protect *R. strykeri* and other threatened wildlife in 2020 (Yang *et al.* 2022). However, in the absence of site-based operations and government staff due to the remoteness of the site as well as the current unstable security and political situation, Fauna & Flora International is continuing to work with the local conservation groups to protect *R. strykeri* populations (Ngwe Lwin pers. obs.). It is expected that, in the absence of formal governance, and given the current political and security situation, threats will increase, in particular hunting, shifting cultivation, and mining on the Myanmar side (Mendiratta *et al.* 2021, FFI field observations 2022–2023). In China, *R. strykeri* research and conservation interventions, started about 10 years ago, with increasing financial support by central and local government, have led to a continuous decline

of pressures from illegal hunting, logging, and habitat conversion (Yang Yin pers. obs.).

Based on the recommendations in Meyer *et al*. (2017) and Yang *et al*. (2022), the authors recommend the following actions to protect *R. strykeri* and its habitat:

1. Monitoring, research, and transboundary conservation cooperation: Determine and monitor the size and composition of all sub-populations;
   - Prioritize field research to develop evidence-based strategies for effective conservation actions;
   - Formally negotiate a legal agreement with multi-stakeholders; and
   - Create an international peace park in the long term along the northern Sino-Myanmar border.

2. Mitigating hunting and deforestation in the transboundary area:
   - Parallel implementation of sustainable community development projects, reducing the dependencies of local communities on hunting and shifting cultivation;
   - Transboundary exchange of innovative approaches and lessons learned for effective community-based conservation and community development interventions;
   - Secure and expand job opportunities for local villagers;
   - Implement programs to plant economically valuable species and develop improved, biodiversity-friendly value chains for local products;
   - Provide technical support to small land holders to initiate regenerative agriculture such as agroforestry;
   - Retrain displaced or unemployed loggers for jobs in nature-based tourism, ecotourism and agritourism;
   - Carry out targeted awareness raising and conservation education programs in villages throughout the species' range; and
   - Engage with local religious and customary leaders to reduce hunting, wild meat consumption and wildlife trade.

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ASIA

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RAFFLES' BANDED LANGUR

***Presbytis femoralis* (Martin, 1838)**

Malaysia, Singapore
(Previously included on this list in 2022)

Andie Ang, Sabrina Jabbar, Zan Hui Lee and Nadine Ruppert

Raffles' Banded Langur (*Presbytis femoralis*) is found only in Singapore and southern Peninsular Malaysia (in Johor state and a small part of Pahang state). The populations in Singapore and Malaysia are isolated from one another by the Strait of Johor. In Singapore, this primate is found mainly in the Central Catchment Nature Reserve (CCNR), the largest protected area in the country. The CCNR comprises 2,880 ha of lowland primary and secondary forest, and freshwater swamp forest. In Malaysia, most populations occur in the state of Johor in areas that are isolated from each other (Endau Rompin National Park, Gunung Arong, Gunung Belumut, Gunung Lambak, Gunung Panti, Gunung Pulai, and Kampung Johor Lama). There are also two known populations in the state of Pahang (Rompin State Park and Pekan Peat Swamp).

As of 2024, there are 76 individuals in the Singapore population with a sex ratio (male:female:unknown) of 28:26:22 (updated from Ang and Jabbar 2022). There are no reliable population estimates available for the conspecifics in Malaysia, but it is believed that only a few hundred individuals remain (Abdul-Latiff *et al.* 2019; Ang and Jabbar 2022). The overall population of *P. femoralis*, therefore, could be less than 250 mature individuals in the wild.

Presbytis femoralis eats young leaves, fruits, seeds, and flowers. A total of 61 plant species from 34 families were identified in their diet in Singapore (Srivathsan *et al.* 2016; Ang and Jabbar 2022). In Malaysia, 27 plant species from 17 families in Kampung Johor Lama (Najmuddin *et al.* 2019a) and no less than 38 species from 20 families in Gunung Lambak (Z. H. Lee unpubl. report) were documented as food for the langurs.

The species is classified as Critically Endangered on the IUCN Red List of Threatened Species (Ang *et al.* 2022) and is listed in Appendix II of CITES. It is protected in Peninsular Malaysia under Schedule 2 of the Wildlife Conservation (Amendment of Schedule) Order 2012 under the *Presbytis* spp. group. In Singapore, it is protected under the Protected Wildlife Species Rules 2020 of the Wildlife Act (Chapter 351) as *Presbytis femoralis femoralis*.

Deforestation and habitat conversion continue to be the major threats to this species. It is particularly affected by forest clearance and disturbance from urban development in Singapore and from oil palm plantations, agriculture, mining, and other forms of development in Malaysia. Known populations are distributed in fragmented habitats, and fragmentation is thus recognized as an additional stressor. *Presbytis femoralis* shows low genetic variability in Singapore (Ang *et al.* 2012; Srivathsan *et al.* 2016), and there is still a lack of data on this species from Malaysia, including up to date population numbers and its distribution.

Casualties in both countries have been recorded as individuals attempt to travel between fragmented habitats using roads and electric cables (Ang and Jabbar 2020; N. Ruppert pers. obs.). Predation events are rare, although the langurs have been seen to be killed by eagles (Fam and Nijman 2011) and dogs (Yang and Lua 1988; Najmuddin *et al.* 2019b). Human-wildlife interactions might be an additional threat when the langurs enter suburban and residential areas to eat garden fruits (Z.H. Lee pers. obs.).

In 2016, an IUCN Species Action Plan for the conservation of *P. femoralis* was developed, and

the Raffles' Banded Langur Working Group was formed with representatives from government agencies, non-governmental organizations, universities, and experts from both countries. The goals of the action plan are threefold: (i) to recover and protect *P. femoralis* in the wild; (ii) to gather key data through ongoing studies; and (iii) to secure the necessary resources and commitments for the long-term conservation of the species (Ang *et al.* 2016).

In Singapore, two experimental rope bridges were installed by the National Parks Board to facilitate safe crossing of the langurs over roads (Ow *et al.* 2022). In Malaysia, a rope structure was installed by the Malaysian Nature Society (Johor branch) in Gunung Panti for primates, including *P. femoralis* (see Chong 2020). In 2016, a citizen science program was set up in Singapore where volunteers are trained to collect data on the langurs in the CCNR (Ang *et al.* 2021). In Malaysia, Universiti Sains Malaysia in collaboration with the Malaysian Primatological Society, WWF (Malaysia and Singapore) and Malaysian Nature Society (Johor), assesses the behavior and ecology of the species and is planning for public outreach and stakeholder engagement programs. Studies on the behavior and potential for nature-based tourism activities of this species have also been conducted by the Tun Hussein Onn University of Malaysia in Johor in recent years.

A recent population viability assessment modelled the growth of the population in Singapore under different threat and management scenarios and found that the greatest current threat to the population was the loss of unprotected habitat, whilst the most effective management strategy would be to enhance connectivity between forest fragments in their current habitat (Woolloff *et al.* 2023).

In the long term, conservation translocation of individuals of *P. femoralis* between Singapore and Malaysia might need to be considered to restore and maintain the genetic diversity of the populations and increase their genetic adaptive potential. The recognition of *P. femoralis* as one of the Top 25 Most Endangered Primates can expedite urgent communication and collaboration between stakeholders in Singapore and Malaysia to foster more effective research

and conservation actions to protect this species, its habitat, and the shared natural heritage of the two countries.

The recent publication of a genus-level action plan, the *Asian Langurs (*Presbytis*) Conservation Action Plan* 2024–2034, recognizes the urgency of scaling-up current efforts through region-wide collaboration to protect this group of highly threatened primates (Ang *et al*. 2024).

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BORNEAN BANDED LANGUR

***Presbytis chrysomelas* (Müller, 1838)**

Brunei, Indonesia, Malaysia
(Not previously included on this list)

Mohd Kasyfullah bin Zaini, Chien Lee, Melvin Gumal, Vincent Nijman and Noel Rowe

The Bornean Banded Langur or Cross-marked Langur (*Presbytis chrysomelas*) is an understudied, rare primate, which is endemic to the northwestern corner of Borneo. It is also known as the Sarawak Langur (Phillipps and Phillipps 2018). There are two subspecies or morphs. *Presbytis chrysomelas chrsyomelas* is the Western Cross-marked Langur (black) and *P. chrysomelas cruciger* (Thomas, 1892) (orange with a pale chest and black on the arms) is the Eastern Cross-marked Langur (Phillipps and Phillipps, 2018; Beausejour *et al*. 2021). Both have been assessed as Critically Endangered (Nijman *et al*. 2020) on the IUCN Red List of Threatened Species. It has one of the most limited distributions among langurs on the island of Borneo (Bennett 1992). Initially, this species was considered to be a subspecies of *P. melalophos* (Raffles, 1821), which inhabits the island of Sumatra and is not found in Borneo (Oates *et al*. 1994, Md-Zain 2001). Subsequent research, however, both morphological (Groves 2001) and molecular (Vun *et al*. 2011), led to its reclassification as *P. chrysomelas*.

In the early twentieth century, *P. chrysomelas* was considered common, but now the current Area of Occupancy (AOO) of this species is less than 5% of its historical range, with an approximate population of between 200 and 500 individuals (Nijman *et al*. 2020a). Historical records show that this species was found in protected areas such as the national parks of Tanjung Datu, Maludam, Similajau, Sedilu, Gunung Pueh and Niah, besides the Lanjak Entimau and Samunsam wildlife sanctuaries, all in Sarawak, Malaysia, and the Danau Sentarum National Park in West Kalimantan, Indonesia (Groves 2013; Phillipps and Phillipps 2018; Santoso *et al*. 2023; Santoso and Mas'yud 2023). The most recent records of their occurrence in all but the first two (in Sarawak) and the latter (in Indonesia) parks date back, however, more than a decade, with an incidental report of the species spotted in Lambir Hills National Park (Sarawak) in 2021 (Chien Lee pers. obs.) and Gunung Pueh National Park (Sarawak) prior in 2016–2017 (Jayasila 2022). As such, questions remain about the current range limits of this species.

Their historical habitat is declining, partially because of cash crop plantations, forest fragmentation, land-use conversion, and forest fires. The areas identified and made into protected areas have expanded in the last two decades: Maludam (2000) and its extensions in 2013, Samunsam (1979) and its extensions in 2000, Similajau (1976) and two extensions in 2000. Sedilu was also made into a protected area in 2010. Intermittent hunting is sometimes reported and is a continuing threat in their habitat, including in the protected areas. Despite its classification as Critically Endangered, this species has received comparatively less attention and research focus than other primate species in Borneo. Significantly increased research efforts are imperative to facilitate the timely and comprehensive implementation of conservation measures aimed at preventing the extinction of this species.

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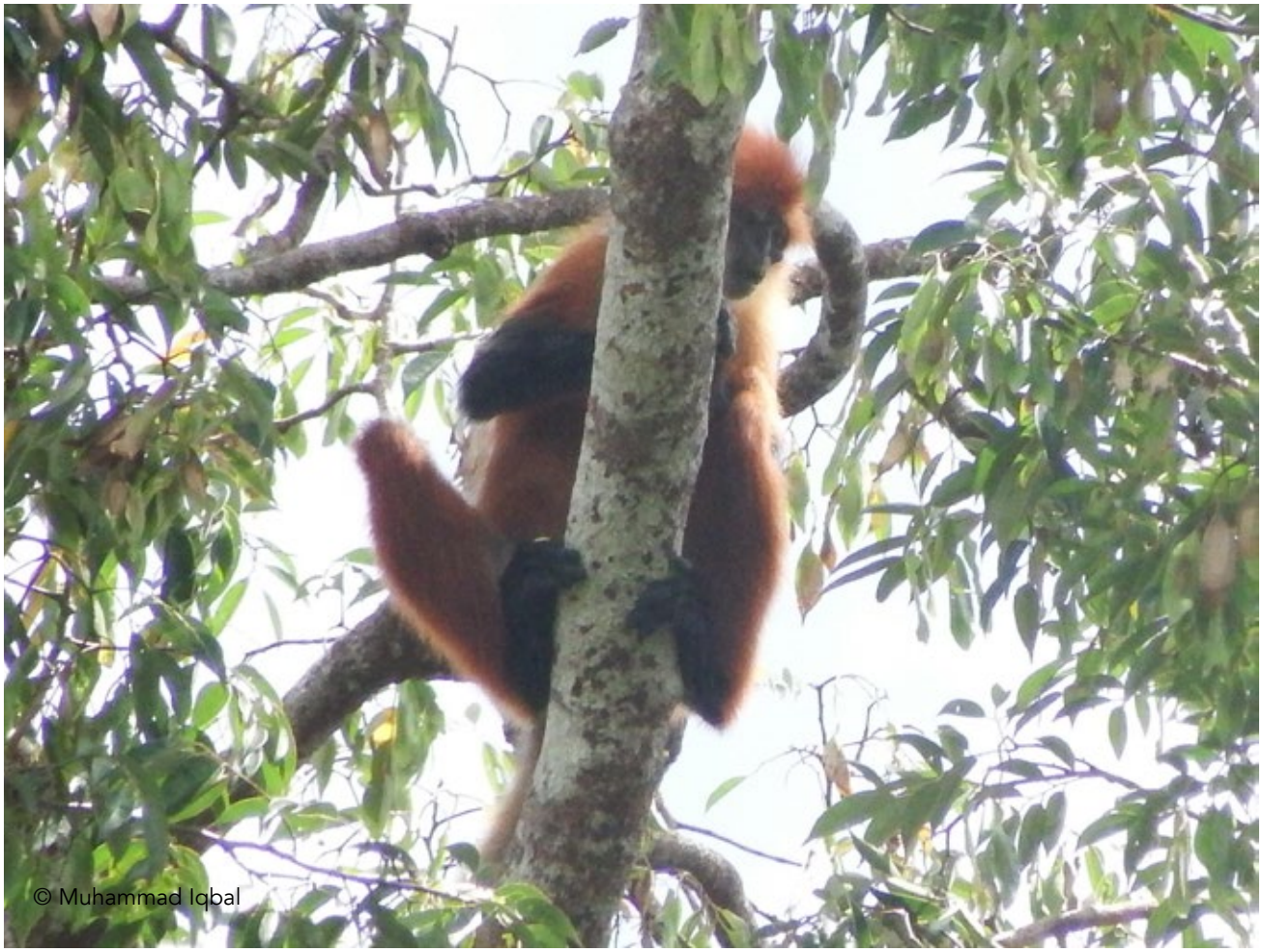
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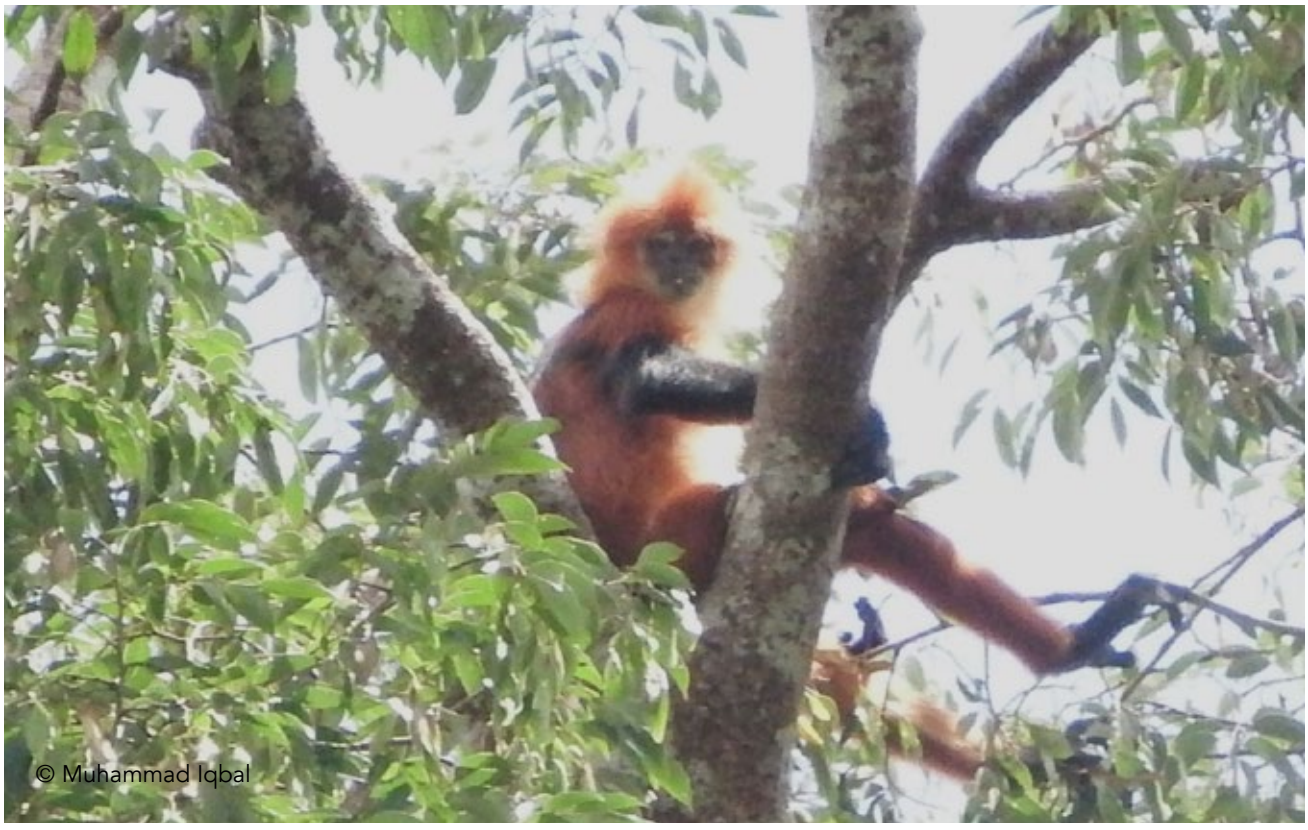
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CAO-VIT GIBBON

***Nomascus nasutus* (Kunkel d'Herculais, 1884)**

Vietnam, China
(Previously included on this list in 2008, 2010 and 2012)

Oliver R. Wearn and Pengfei Fan

The Cao-vit Gibbon (*Nomascus nasutus*) is one of the rarest and most range-restricted primates on Earth. It was long presumed to be extinct, with reliable scientific records ending in the 1950s in China and 1960s in Vietnam. But a concerted effort to find the species at the turn of the century led, in 2002, to its rediscovery in a remote patch of limestone forest in far northern Vietnam, on the border with China (Geissmann *et al.* 2003). In 2006, the species was discovered persisting on the Chinese side of the border as well (Chan *et al.* 2008). Today, we know that this transboundary population, occupying an area of only 12 km², is the last remaining population of the species. Historically, the species would have extended over much of north-eastern Vietnam (east of the Red River) and south-eastern China. The current distribution of the species can therefore be understood as the tail end of a dramatic and protracted shrinking of its natural range. This contraction in the species' range likely occurred over several centuries, but greatly accelerated in the 20th century.

The species is considerably better known now than when it last featured on this list in 2012. Long-term monitoring of groups, since 2007 in China and since 2020 in Vietnam, has revealed its ecology and behavior with greater clarity. In particular, the species has been found to have a much larger home range than other gibbon species (in common, also, with its congeners *N. concolor* and *N. hainanus*), typically around 100 ha, but showing high variability (Fan *et al.* 2010, Ma *et al.* 2020). Compared to other gibbon species in tropical areas, the species also shows more marked seasonal variation in its diet, becoming more folivorous in periods of fruit scarcity (Fan, Fei and Ma 2012). Polygyny, rather than being a temporary aberration as in most other gibbon species, also appears to be the typical social structure for the Cao-vit Gibbon (Fan *et al.* 2015), with all groups currently under study (four groups in China and four groups in Vietnam) containing two adult females. This also means that group sizes are larger than is typical for gibbons (5–8 individuals). Rather than being due to a 'crowding effect', it appears that polygyny may be due to the unique ecological pressures faced by gibbons living in cold, seasonal forests with lower fruit production (Guan *et al.* 2018).

Long-term monitoring has also shed light on the viability of the population. In particular, infant and juvenile survival in the groups studied in China was observed to be relatively high (>80% by age-class) and females also bred relatively frequently, approximately every third year (Fan *et al.* 2015). Several male 'takeover' events have also been observed in China and Vietnam (occurring approximately once every 15 years per group), leading to suspected infanticide, as has also been observed in other gibbon species (Ma *et al.* 2019).

The population size of the species is also better known than before. Indeed, recent improvements in the survey methods for the species have uncovered a much smaller population than previously thought (around 40% lower), contributing to its inclusion in this 25 Most Endangered Primates list. Previous surveys relied on expert judgement and, it appears, were susceptible to double-counting of groups. This led to population estimates of around 20 family groups and 120 individuals, implying a high-density population likely at carrying capacity for the habitat. The latest survey (in 2021) used

acoustic data to study the vocal 'fingerprints' of individual male gibbons and made group size counts using drone-mounted thermal cameras (Wearn *et al.* 2023, 2024). The result was an estimate of just 11 family groups and 74 individuals. This estimate is also more in line with the expected abundance given the large home-range sizes of studied groups. There is no evidence that the lower population estimate for 2021 is due to a population decline; the difference is thought to be entirely due to the more accurate methods


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used. In fact, the population appears to be stable or possibly increasing, with evidence of two new groups forming in recent years in China (in 2015 and 2017) leading to a gradual recolonization of habitat. Data are too sparse to demonstrate any comparable changes on the Vietnamese side of the border (although robust, long-term monitoring is now in place).

The very small size of the population leaves the species vulnerable to extinction from small population size effects, including stochasticity (environmental or demographic), inbreeding depression, and the loss of genetic diversity. The species' occurrence in just a single forest patch makes it susceptible to any catastrophe that could simultaneously affect the whole population (e.g., a disease outbreak). Protected areas cover the entirety of the species' range, namely the Cao-vit Gibbon Species and Habitat Conservation Area (Trung Khanh District, Cao Bang Province, Vietnam) and Bangliang National Nature Reserve (Jingxi, Guangxi, China), established in 2007 and 2009, respectively. No incidences of gibbon hunting have been detected by authorities since conservation efforts for the species began in 2002, but other illegal activities do still occur in the two protected areas, including gun hunting (rarely), trapping of small animals, grazing (cattle in Vietnam and goats in China), and the collection of firewood and non-timber forest products (Wearn *et al*. 2021).

The limestone forest habitat of the species is extremely degraded due to the combined effects of timber extraction (much of the valuable timber was removed in the past), intensive charcoal production (now ceased), grazing of domestic animals, agriculture in low-lying valleys (much reduced following the gazettement of the protected areas), and firewood collection. Indeed, the Cao-vit Gibbon appears to inhabit forests with the lowest stature of any known gibbon population, with canopy height averaging just 11 m in the core occupied areas (Fan *et al*. 2011). The poor state of the habitat, in concert with human disturbance at the edges of the forest, means that gibbons occupy just 25% of the 48-km² forest patch they are restricted to (O. R. Wearn / Fauna & Flora 2023 unpubl. data).

Conservation efforts for the species have spanned more than 20 years, with Fauna & Flora International, local communities, and local and regional authorities in Vietnam and China, all playing key roles. Conservation successes have included: the gazettement of two protected areas covering the species' global range; sustained and long-term engagement of local communities in the conservation of the species, including the formation of community patrol groups, employment of local people in survey and monitoring work, and inclusion of community members in Vietnam in an advisory committee to the protected area; restoration of former agricultural areas of gibbon habitat through tree planting and assisted natural regeneration; and the support of more sustainable local livelihoods in local villages, for example, reducing the need for timber and firewood and improving access to livestock fodder. The long-term prospects for the population have likely been much improved due to these conservation efforts, with the population saved from immediate extinction (Wearn *et al*. 2021).

Despite the successes to date, if the species is to survive over the long term, conservation efforts need to be urgently stepped up. Given the degraded state of the habitat, habitat restoration is a top priority. This would allow the population to expand and grow, reducing the risk of its extinction through small population size effects. Habitat restoration should also be used to reconnect areas of currently inaccessible habitat for the gibbons. Over the long term, well-planned habitat corridors may even allow the species to naturally cross into a second block of habitat to the west of the currently inhabited area, thereby re-establishing a second population of the species (Fan *et al*. 2013). Gibbons typically disperse from their natal groups only a short distance, making natural colonization a slow process. So, the option to translocate individuals should also be thoroughly explored, despite the immense technical, practical, and ethical challenges this poses, most especially in the limestone habitat in which the Cao-vit Gibbon lives.

Direct threats to the gibbons remain low, due to the positive attitudes of local people towards the gibbon and the protection efforts by patrol

groups, but incursions into the protected area for grazing and non-timber forest product collection are likely continuing to hold back natural forest recovery and leading to the disturbance of gibbon groups. Reconciling the habitat needs of the gibbon with the dependence of local people on the forest for certain resources, especially in the context of the limited availability of land for local people, also remains a key conservation challenge going forward.

There remain some important knowledge gaps, which are undermining effective conservation management of the species. Most pressingly, an understanding of the population's genetic health is urgently needed (including relatedness within and among groups, and levels of genetic diversity). An understanding, also, of the potential food competition with the three other co-occurring macaque species (Assamese Macaque *Macaca assamensis*, Rhesus Macaque *M. mulatta* and Stump-tailed Macaque *M. arctoides*) would also be beneficial. Macaque populations appear to have increased in recent years, and they likely consume substantial food resources that are also critical to gibbons, potentially leading to expanded home range sizes and longer inter-birth intervals. Finally, effective methods of habitat restoration in limestone forests are also urgently needed. The lack of above-ground water, difficult site selection and accessibility, and lack of soil substrate in many areas, remain key challenges that further research and development may be able to help solve.

In 2021, a new, transboundary action plan for the Cao-vit Gibbon was collaboratively devised and agreed among all key stakeholders (Wearn *et al.* 2021). This presents a comprehensive set of conservation actions (of which the highest priorities are echoed above) for the period 2021–2030, as well as a longer-term vision for the species to 2050. With the proper financial and technical support, this plan has the potential to define a new period for the Cao-vit Gibbon, setting the species on a course not just towards survival, but towards a broader recovery of its cultural and ecological role in the forests of Vietnam and China.

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TAPANULI ORANGUTAN

***Pongo tapanuliensis* Nurcahyo, Meijaard, Nowak, Fredriksson and Groves in Nater *et al.*, 2017**

Indonesia (Sumatra)
(Previously included on this list in 2018 and 2022)

Serge Wich, Erik Meijaard, Didik Prasetyo, Panut Hadisiswoyo and Jatna Supriatna

The Tapanuli Orangutan, *Pongo tapanuliensis*, was formally described in 2017 when it was shown, through morphological, vocalization, and genetic data, that an isolated orangutan population in the Batang Toru region is distinct from other Sumatran and Bornean populations (Nater *et al.* 2017). Due to high levels of habitat conversion and fragmentation, along with illegal hunting and poaching, the Tapanuli Orangutan is estimated to have experienced an extensive population decline in the past 150 years (Nowak *et al.* 2017; Meijaard *et al.* 2021). With a population estimate of 767 individuals (95% confidence intervals: 231–1,597 individuals, Wich *et al.* 2019), the Tapanuli Orangutan with the Cross River Gorilla, is the least numerous of all great ape species. A combination of small population size, population fragmentation, and suboptimal ecological conditions is of particularly high conservation concern. Inbreeding depression (Hedrick and Kalinowski 2000) is a risk and could threaten population persistence (Allendorf *et al.* 2013). Nater *et al.* (2017) recorded extensive runs of homozygosity in the genomes of two Tapanuli Orangutan individuals, pointing to the occurrence of recent inbreeding.

The population of Tapanuli Orangutans is found in the uplands of the Batang Toru Ecosystem, an area of roughly 1,500 km² consisting of three forest blocks, of which 1,023 km² is suitable orangutan habitat (Wich *et al.* 2016, 2019; Rahman *et al.* 2019; Kuswanda *et al.* 2021a). Most of this is, for orangutans, ecologically suboptimal upland forest (>500 m asl, up to 1800 m asl), covering the upper watersheds of nine river systems and providing freshwater for over 100,000 people (Putro *et al.* 2019). Forest loss data indicate that orangutan habitat below 500 m asl was reduced by 60% between 1985 and 2007 for both the Tapanuli and the Sumatran Orangutan (Wich *et al.* 2008; Wich *et al.* 2011). A recent analysis indicated that the current Tapanuli Orangutan distribution is approximately a mere 2.5% and 5.0% of what it was in the 1890s and 1940s, respectively (Meijaard *et al.* 2021). The habitat of the Tapanuli Orangutan consists of 7% conservation forest, 64% protection forest, 4% production forest and the remaining 25% in other use areas/cultivated land (Putro *et al.* 2019).

Due to the extremely rugged terrain, external threats have been primarily limited to illegal clearing of protected and production forests, hunting and killing during crop conflict, and trade in young orangutans (Wich *et al.* 2012, 2016, Kuswanda *et al.* 2021b). Across the species' range, the protected areas are not immune from the above threats (Wich *et al.* 2008, 2011, 2016) and orangutan hunting occurs there as well (Wich *et al.* 2012). Due to their slow life history, with a generation time of at least 25 years, and an interbirth interval of 8–9 years, orangutans on Sumatra are unable to sustain substantial and continual loss of individuals (Wich *et al.* 2004, 2009; Marshall *et al.* 2009; Kuswanda *et al.* 2021b). Recent studies indicate that the eastern subpopulation may be experiencing growth (Kuswanda *et al.* 2021b). Nevertheless, annual removal rates (killing, translocations, rescues) appear to exceed those needed for maintaining viable populations (Meijaard *et al.* 2021), while disease risk poses another significant threat (Sherman *et al.* 2021). It is predicted that more Tapanuli Orangutan habitat will be lost, especially in the ecologically valuable lowland parts of the

range (Wich *et al.* 2016, 2019; Sloan *et al.* 2018), with threats from habitat conversion for small-scale agriculture, crop-conflict and related killing, extractive industry and agricultural plantations.

Two large projects are of particular concern. In the southwest corner of the Batang Toru Ecosystem, a large gold and silver mine has converted key lowland habitat of the Tapanuli Orangutan and retains mining activities overlapping parts of its remaining range. Recent expansion of the mine has led to exploration in the area where the Tapanuli Orangutan occurs. Since 2017, a hydro-electric project has been under development in the Tapanuli Orangutan's range (Laurance *et al.* 2020; Prasetyo *et al.* 2021). Opinions about impacts differ significantly, even among orangutan conservation scientists and practitioners. Opponents of the dam argue that the dam could impact roughly 100 km² of Tapanuli Orangutan habitat, or nearly 10% of the entire species population (Sloan *et al.* 2018). The dam would jeopardize the chances of maintaining and restoring habitat corridors between the western and eastern Tapanuli Orangutan ranges and a strict nature reserve with a small population of Tapanuli Orangutans (Wich *et al.* 2019). If the connectivity between these populations is not restored, it has been argued that the long-term survival of the Tapanuli Orangutan will be severely threatened (Wich *et al.* 2019).

Safeguarding the future of the great ape species with the lowest estimated number of individuals requires all possible efforts to prevent any further degradation of Tapanuli Orangutan habitat, and to reconnect its three habitat fragments to restore genetic exchange. As it currently stands, two of the three habitat fragments do not contain viable populations, leaving only one viable and highly threatened population as the future of the species. Lastly, field management activities need to be established to prevent further hunting and encroachment, with clear and enforced boundary demarcation, and active human-orangutan conflict mitigation efforts put in place.

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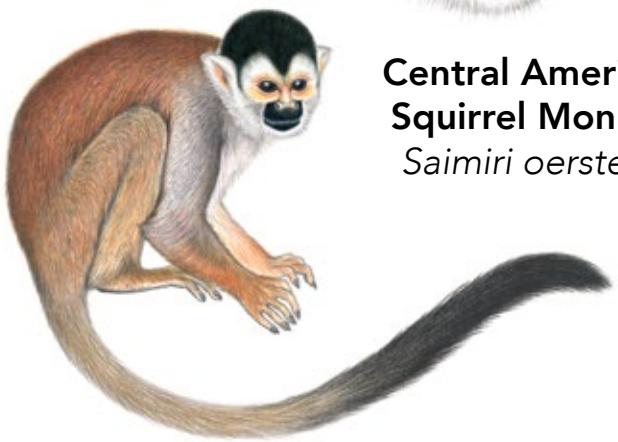
Olalla Brothers' Titi
Plecturocebus olallae

Caatinga Titi Monkey
Callicebus barbarabrownae



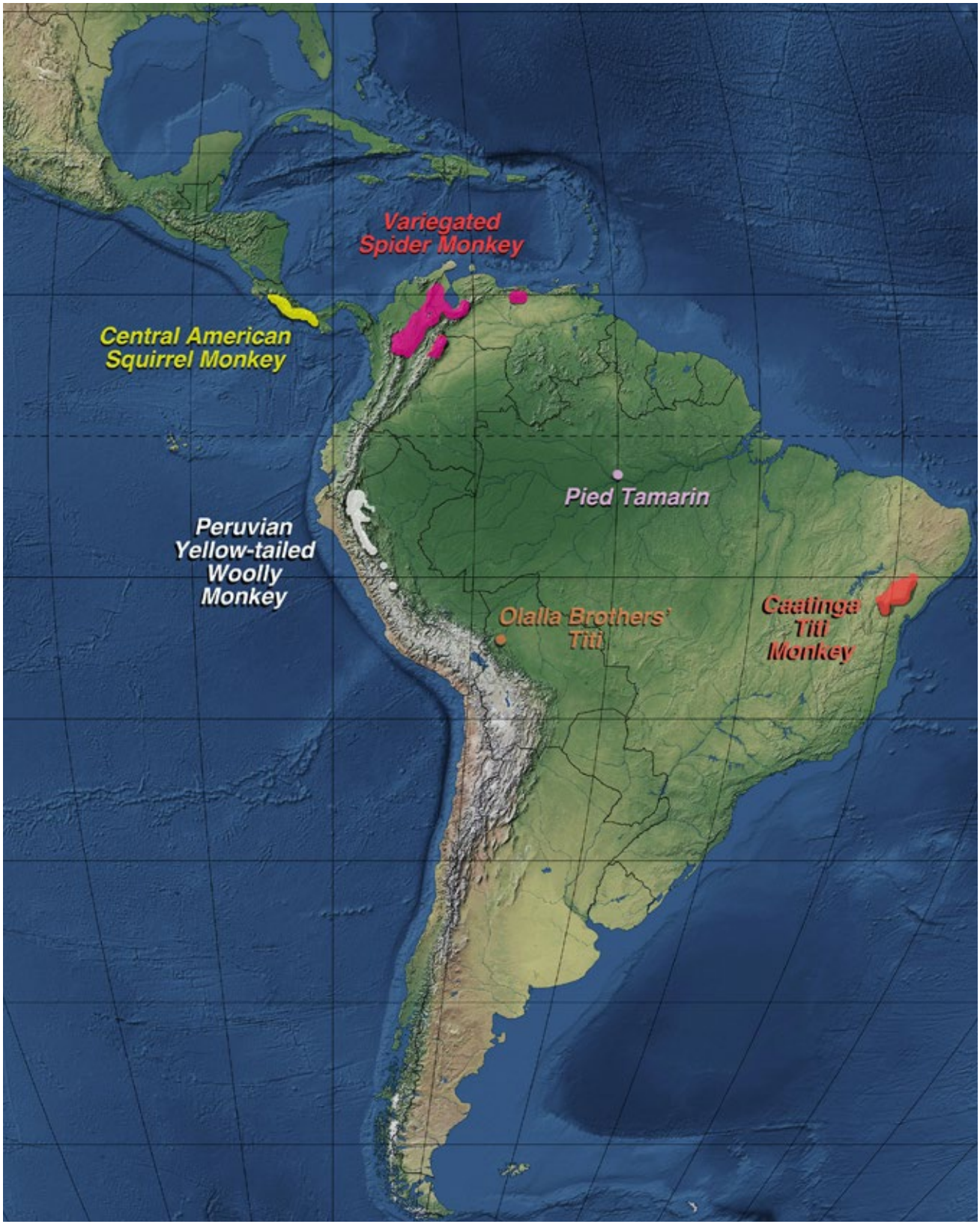
Central American Squirrel Monkey
Saimiri oerstedii

Pied Tamarin
Saguinus bicolor

Variegated Spider Monkey
Ateles hybridus

Peruvian Yellow-tailed Woolly Monkey
Lagothrix flavicauda

NEOTROPICS


Variegated
Spider Monkey
Central American
Squirrel Monkey
Pied Tamarin
Peruvian
Yellow-tailed
Woolly
Monkey
Olalla Brothers'
Titi
Caatinga
Titi
Monkey

NEOTROPICS

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OLALLA BROTHERS' TITI

***Plecturocebus olallae* (Lönnberg, 1939)**

Bolivia
(Previously included on this list in 2018)

Jesús Martínez and Robert Wallace

Bolivia has two endemic primates, the Olalla Brothers' Titi, *Plecturocebus olallae*, and the Río Beni Titi, *P. modestus* (Martinez and Wallace 2010; Byrne *et al.* 2016; Martínez et al. 2023). Considering its reduced population (2,855 individuals) and extremely restricted distribution (383.4 km^2) in a naturally fragmented forest threatened by increasing deforestation (Martínez and Wallace 2021a), *P. olallae* is listed as Critically Endangered on the IUCN Red List of Threatened Species (Martínez and Wallace 2021b) and at the national level (Martinéz *et al.* 2023; Martínez and Wallace in press).

Although *P. olallae* has been included in taxonomic reviews since its description in 1939, no information on wild populations was available for more than 60 years until the field study of Felton and colleagues in 2002 (Felton *et al.* 2006). Subsequent research revealed a small population of this species restricted to the forests of the upper Río Yacuma, in the western part of the Beni Department. There, flooding regimes have shaped the Moxos savannah ecosystem into a landscape of gallery forest and naturally fragmented forest immersed in a grassland matrix (Martínez and Wallace 2007, 2013, 2021a; Wallace *et al.* 2013; López-Strauss and Wallace 2015). These primates are primarily frugivorous (53.7%), although they also eat leaves (29.9%) and other foods found in their home ranges of approximately 7 ha (Martínez *et al.* 2022). As a monogamous species, *P. olallae* forms family groups of up to five individuals (Martínez and Wallace 2007, 2010). Gestation lasts for around 4 months, but females do not produce offspring every year (Martinez and Wallace 2010). Individuals reach sexual maturity at around two years of age, when both sexes leave their natal groups (Martínez and Wallace 2010; Bicca-Marques and Heymann 2013).

Habitat loss is the main threat to *P. olallae*, especially due to the reduced forest coverage in their range. Deforestation is primarily linked to cattle-ranching, the main economic activity in the region, for which grasslands are burned annually to promote their regeneration as pasture. The burning often results in uncontrolled fires that can reach areas inhabited by titi monkeys (Martínez and Wallace 2021a). High levels of forest fragmentation can force unusual and risky ground displacements, and smoke from nearby fires can lead to the loss of group territories (Martínez and Wallace 2011). This highlights the urgent need for alternative grassland management methods in the region. An additional risk is related to the Northern Corridor highway improvements, a main road that passes about 10 km from the range of *P. olallae*. The conversion of this road from dirt to asphalt could promote an increase in the number and size of human settlements, besides intensifying cattle ranching and agricultural activities (Martínez and Wallace 2007, 2021b; Wallace *et al.* 2013; Porter *et al.* 2013). Although most of the properties adjacent to the road are private, reducing the chances of the establishment of new human settlements, encroachment remains a risk. Recent national development policies carry the risk that private landowners may become interested in intensive agricultural activities, leading to a massive regional loss of forest cover (Martínez and Wallace 2021b). The above data highlight the need for conservation actions for *P. olallae*, the conservation status of which was updated from

Vulnerable to Endangered in 2008 and, in 2016, to Critically Endangered (Martínez and Wallace 2016, 2021b).

Improved knowledge on the status of *P. olallae* has led to work on its conservation and its habitat. Initial outreach activities included talks with local authorities of the Reyes and Santa Rosa municipalities, within which most of the *P. olallae* range falls. Both municipalities were already interested in consolidating ecotourism, the second largest economic activity in the region. The information on the presence of the endemic *P. olallae* and other wildlife resulted in the creation of two municipal protected areas where this species is a conservation priority (Martínez and Wallace 2010; Wallace 2013). Posters were designed and distributed to schools and public offices. Between 2011 and 2012, an intensive outreach project delivered talks to students in the main towns and several communities, along with contests and fairs oriented to raise awareness in local people and promote their support to conserve *P. olallae* as a unique symbol of the local natural patrimony (Martínez *et al.* 2015). These efforts succeeded in promoting considerable local interest in biodiversity conservation reflected in a remarkable involvement of local authorities, the assignation of "lucachi rojizo" (reddish titi monkey) as the new local name for *P. olallae*, as suggested by schoolchildren, and its incorporation into local insignia and symbols.

Strengthening the management of the Santa Rosa and Reyes municipal protected areas is crucial for the conservation of *P. olallae*, through conservation plans with protection and monitoring actions (MMAyA 2009, 2014). In 2016, a management plan was elaborated for the Santa Rosa municipal protected area "Pampas del Yacuma" (GAMSR 2016) and a similar effort in Reyes municipality resulted in the creation of the municipal protected area "Rhukanrhuka" (HCMR 2019), which means titi monkey in the native Maropa language, reflecting the current local ownership towards these primates. Strategic conservation planning tools were developed for these protected areas with an area of nearly 1.4 million ha that covers 90% of the range of *P. olallae*.

The protected areas began to work with cattle-ranchers to promote improved methods for grassland and cattle management to reduce negative effects on titi monkeys and other wildlife. The basis for further population monitoring of *P. olallae* is being developed and mitigation actions for uncontrolled fires initiated with the municipalities. Initial coordination with the National Road Authority seeks to promote mitigation measures for wildlife along the Northern Corridor, as well as their effective monitoring.

Looking forward, the consolidation of the municipal protected areas will establish a regional wildlife protection system to preserve *P. olallae* and the local biodiversity, and aims to establish ecotourism as a sustainable pathway for local development. Research is still required to improve the biological and ecological knowledge on the endemic *P. olallae* to better understand how distinct pressures derived from human activities affect these monkeys and to then develop protection measures.

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NEOTROPICS

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CAATINGA TITI MONKEY

***Callicebus barbarabrownae* Hershkovitz, 1990**

Brazil
(Previously included on this list in 2010)

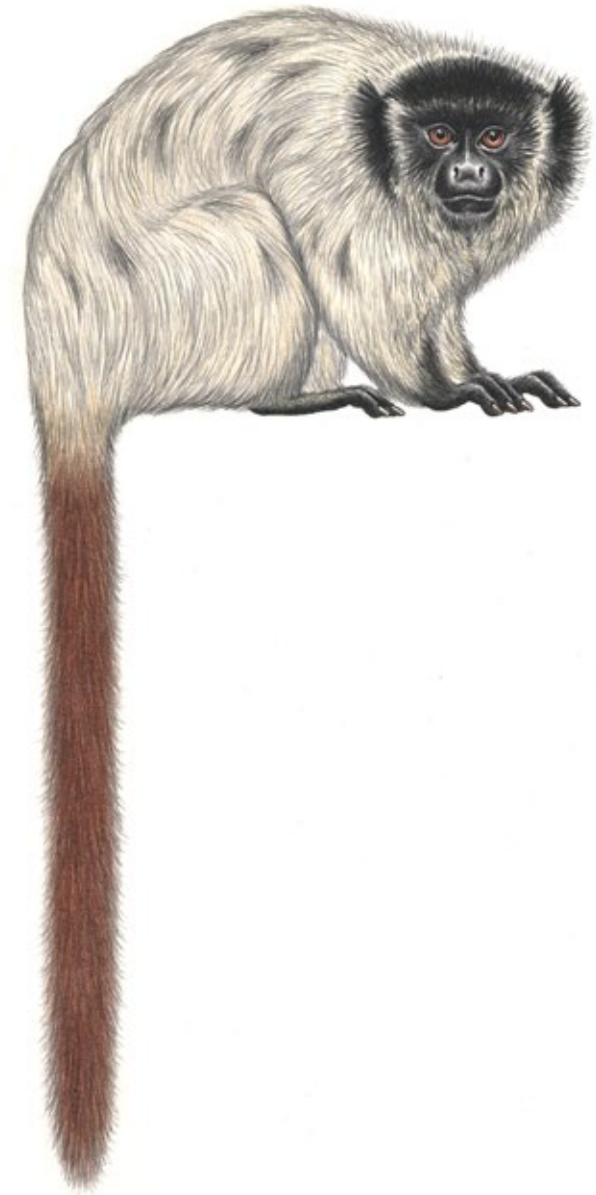
Leandro Jerusalinsky, André Chein Alonso, Raone Beltrão-Mendes, Miriam Plaza Pinto, Hamilton Ferreira Barreto, Mônica Mafra Valença-Montenegro, Eduardo Marques Santos Júnior, Sidney F. Gouveia and Stephen F. Ferrari

Five *Callicebus* species are endemic to eastern Brazil, with three – *Callicebus personatus*, *Callicebus melanochir*, and *Callicebus coimbrai* – being restricted to the Atlantic Forest and one (*Callicebus nigifrons*) also occurring in the Cerrado. The fifth species is the blond (or Caatinga) titi monkey (*Callicebus barbarabrownae*), which is found in the states of Bahia and Sergipe, and is endemic to the Caatinga, the seasonal dry forest biome exclusive to Brazil. Hershkovitz (1990) described this species 34 years ago, but it has only recently received more attention, with studies on its distribution and conservation status (Estrela *et al*. 2011; Printes *et al*. 2011; Marques *et al*. 2013; Alonso *et al*. 2022), demography (Freitas *et al*. 2011; Corsini and Moura 2014; Coelho *et al*. 2020), habitat and population viability (Gouveia *et al*. 2016; Barreto *et al*. 2022), and conservation strategies (IBAMA, 2006; ICMBio, 2012, 2018).

Like all platyrrhines, *C. barbarabrownae* is strictly arboreal, inhabiting remnants of dry and evergreen forest, often in disturbed habitats (Printes *et al*. 2011; Alonso *et al*. 2022). As a typical callicebine, it feeds primarily on fruit and leaves, and forms small, monogamous family groups – a reproductive pair and its offspring – with strict territorial behavior, defending home ranges of 30–50 ha with conspicuous duet vocalizations (Alonso *et al*. 2022). The species is sexually monomorphic, with adults of both sexes measuring 80–90 cm (31–42 cm head and body, 42–56 cm tail) and weighing approximately 1.0–1.5 kg (Hershkovitz 1990).

All *Callicebus* species are threatened with extinction at some level, with *C. barbarabrownae* being classified as Critically Endangered in both the IUCN Red List (Printes *et al*. 2021) and the Brazilian assessment (MMA 2022). Its principal threats are habitat loss and fragmentation, given that deforestation is widespread throughout its range, due to cattle-ranching and agriculture, urban expansion, and rapid infrastructure development, all facilitated by a growing network of highways and power lines (Printes *et al*. 2018, 2021). Hunting requires further investigation, although it is likely moderate, due to the small size of the species, and few individuals have been observed being kept as pets (Printes *et al*. 2013, 2018, 2021; Alves *et al*. 2016). There are no *ex situ* populations, and the few opportunities to maintain and reproduce individuals in captivity have not been successful.

The small and isolated remnant populations are declining and exposed to synergistic genetic and demographic risks. The first survey (Printes *et al*. 2011) recorded the species in 37 areas, estimating an extent of occurrence of 291,438 km², an area of occupancy of 2,636 km², and a minimum of 260 individuals. Additional records have been obtained from five localities in Bahia (Estrela *et al*. 2011) and seven in Sergipe (Marques *et al*. 2013). A more recent reassessment (Alonso *et al*. 2022), based on playback surveys, found 194 groups in 92 areas, including 28 sites previously unrecorded, and estimated the minimum number of adults to be 404. This increased estimate is probably the result of the greater sampling effort and the effectiveness of the playbacks, rather than a recovery of the populations.



Recent localized extinctions probably occurred in six areas where burning, selective logging, deforestation, and mining were recorded during surveys (Alonso *et al*. 2022). The species is underrepresented in protected areas. It is known to occur in only three — the Orobó Area of Relevant Ecological Interest, Marimbus-Iraquara Environmental Protection Area, and the Chapada Diamantina National Park. The latter is the most important because it is the only strictly protected area, although only a small population has been identified there (Alonso *et al*. 2022). Freitas *et al*. (2011) and Corsini and Moura (2014) surveyed populations using line transects, and the few records confirmed that the species is relatively rare at most sites. However, Coelho *et al*. (2020) estimated a population of 273 individuals in an area of 221 km² by playback point counts, which indicates that population density may be higher than previously thought and highlights the importance of more effective detection methods.

Land cover change in the species' geographic range is of major concern, with less than half of it (47.8%) still being potential titi habitat (forest or savanna), only 4.5% of forest cover remaining, and only 1% is protected (Alonso *et al*. 2022). In 10 years (2005–2016), potential habitat decreased by 3.5%, including known areas of occurrence, with forest alone decreasing by 11%, and a concomitant increase of 67% in urban development, which probably increased hunting pressure and the exploitation of natural resources (Alonso *et al*. 2022). Worse still, 94% of the Brazilian Northeast has a moderate to high risk of desertification (Vieira *et al*. 2015), and the Caatinga is poorly protected (Teixeira *et al*. 2021).

Gouveia *et al*. (2016) found that projected changes in climate and land use will affect the distribution of all *Callicebus* species, leading to a worrisome scenario if environmental degradation continues at present rates. Barreto *et al*. (2022) combined species distribution modeling with population viability analysis under different climate change scenarios and simulated forest loss, and predicted a reduction of one-third in the suitable area available for *C. barbarabrownae*. In this analysis, viable populations in large forest remnants represent only a quarter of all known populations, and a decline in climatic suitability

will impact most of the smaller populations, despite efforts to recuperate forests.

Conservation strategies for *C. barbarabrownae* were established as public policy through the *National Action Plan for the Conservation of the Northeastern Primates* (ICMBio 2012, 2018). Areas appropriate for the maintenance of viable populations were identified, and a connectivity program was designed to establish corridors and recover degraded areas (ICMBio, CPB 2021, 2023). The creation of strictly protected areas at federal and state levels is of utmost urgency, in addition to private reserves, in particular those that have the potential to maintain viable populations over the long term (Barreto *et al*. 2022; ICMBio, CPB 2021). It will also be crucial to promote forest restoration to increase the quality, size, and connectivity of habitats to increase population viability (ICMBio, CPB 2023).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NEOTROPICS

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PIED TAMARIN

***Saguinus bicolor* (Spix, 1823)**

Brazil
(Previously included on this list in 2018)

Marcelo Gordo, Diogo Lagroteria, Renata Bocorny de Azevedo and Leandro Jerusalinsky

The distinctive Pied Tamarin, family Callitrichidae, has a black, hairless face, ears and crown, contrasting with white fur on the back of the head, the mantle, the chest and arms. The back, flanks, abdomen and legs have pale (sometimes quite dark) grayish-brown fur, while the tail and outer surface of the thighs are variably a more reddish-brown or have reddish tinges (Hershkovitz 1977; Egler 1986; Jerusalinsky *et al.* 2017). It weighs between 450 and 550 g, with a body length of 28–32 cm, and a long, thin tail measuring 38–42 cm, with no sexual dimorphism (Jerusalinsky *et al.* 2017). With its slim body and claw-like nails, the Pied Tamarin can move with great agility through thick vegetation, and even climb broad vertical trunks.

Like other tamarins, *S. bicolor* gives birth to twins once a year, rarely twice (Gordo 2012). Gestation ranges from 180 to 219 days (Hershkovitz 1977; Egler 1992; Baker *et al.* 2009). All group members carry the infants until they become independent. They reach sexual maturity at about two years old. Group sizes range from 2 to 13 (Gordo 2012). *Saguinus bicolor* is diurnal, and groups are extremely territorial. It inhabits dense primary forest, secondary forest and *campinarana* (forest on white sand). Its diet includes ripe fruits, small animals—invertebrates and small vertebrates—eggs, tree exudates (gums) and nectar (Egler 1992; Jerusalinsky *et al.* 2017).

Endemic to the Brazilian Amazon, its geographic distribution is approximately 8,000 km². A portion of this range encompasses the city of Manaus, the capital of the state of Amazonas, and its metropolitan region; there, there are strong anthropogenic impacts on the species due to urban expansion, roads, colonization, agriculture and cattle ranching (Röhe 2006, Gordo *et al.* 2013; Coelho *et al.* 2018; Faria 2022). Population densities of the Pied Tamarin are low throughout its range. Gordo (2012) has documented densities of 1 group/km² in extensive tracts of mature forest, and slightly higher numbers, about 2 groups/km², in isolated forest patches in and near the city of Manaus. These fragmented areas, despite having higher densities, can only support small populations that are inviable in the medium to long term (Gordo 2012; Jerusalinsky *et al.* 2017). In urban areas, Pied Tamarins are run over, electrocuted when using power lines, attacked by dogs, and sometimes captured as pets (Gordo 2012; Gordo *et al.* 2013).

In rural areas, the Pied Tamarin is threatened by deforestation, habitat degradation and fragmentation, and an insidious displacement by encroaching Red-handed, or Midas Tamarins, *Saguinus midas*, which occurs over a large part of the Guiana Shield, in Brazil, French Guiana, Suriname and Guyana (Hershkovitz 1977; Röhe 2006; Gordo *et al.* 2017; Faria 2022). Interspecific interactions and potential competition between *S. bicolor* and *S. midas* were discussed by Ayres *et al.* (1982) and Egler (1983), with subsequent studies undertaken by other researchers (reviews in Sobroza *et al.* 2021; Lagroteria 2022). The gradual shrinking of the Pied Tamarin's small range and its occupation by Red-handed Tamarins, has contributed to its classification as Critically Endangered on the Brazilian List of Threatened Species (Vidal *et al.* 2018) and the IUCN Red List of Threatened Species (Gordo *et al.* 2021).

The demographic expansion of *S. midas* at the expense of *S. bicolor* is very worrying.

Nonetheless, genetic studies have demonstrated that, in addition to the genetic bottlenecks observed in urban fragments, *S. bicolor* has been experiencing population declines for approximately 10,000 years (Farias *et al.* 2015). Hybrids, displaying predominantly the *S. midas* phenotype, have been recorded in the contact zone between the two species (M. Gordo unpubl. data). Unfortunately, the southernmost part of *S. bicolor*'s range, which could in principle serve as a natural refuge for the species, is precisely the area which encompasses Manaus and its expanding urban zone.

Other threats that have been neglected are diseases, as they are infrequently investigated. There is limited understanding of the effects of parasites and pathogens on both free-living and captive animals, something that has been of major concern for both *in situ* and *ex situ* conservation measures (Baker *et al.* 2009; Jerusalinsky *et al.* 2017). This concern has stimulated some research, although yet incipient (review in Dias 2022).

A key initiative for the conservation of the species was the development of the *National Action Plan for the Conservation of the Pied Tamarin* in 2011, coordinated by the National Center for Research and Conservation of Brazilian Primates/ICMBio (Jerusalinsky *et al.* 2017). An environmental education program associated with the action plan was successfully implemented through which information about the species' threatened status was disseminated, promoting the adoption of the species as the symbol of Manaus, and cultivating new allies for conservation and research (Jerusalinsky *et al.* 2017). The *ex situ* management program receives strong support from European zoos and a few North American zoos, with an increasing participation of Brazilian institutions (Baker *et al.* 2009; Jerusalinsky *et al.* 2017). The financial support provided by the European and US zoos for *in situ* and *ex situ* conservation projects has been extremely important for the conservation efforts on behalf of the Pied Tamarin, including the reforestation of degraded areas and the establishment of forest corridors.

Considering that there were only two strictly protected areas for the species, one municipal and one state-owned, both located in urban areas

and each smaller than 50 ha, it became evident that the establishment of a reserve capable of sustaining a large, viable population is essential. The 1,050 ha, urban Environmental Protection Area Sauim-de-Manaus was established in June 2018, representing an important strategy to improve the connectivity of some forest fragments in the city of Manaus. Following the strategies traced and studies promoted by the national action plan, and after several years of negotiations, finally, in June 5th 2024, the Pied Tamarin Wildlife Refuge was created in the municipality of Itacoatiara, with 15,300 ha. This is the first federal strictly protected area for the species, with a category and size presumably enough to support a viable population in the long term.

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NEOTROPICS

CENTRAL AMERICAN SQUIRREL MONKEY

***Saimiri oerstedii* (Reinhardt, 1872)**

Costa Rica, Panama
(Never previously included on this list)

Melissa E. Rodríguez, Daniela Solano-Rojas, Karol M. Gutiérrez-Pineda, Luz I. Loría, Pedro Méndez-Carvajal, Ariel Rodríguez-Vargas, Grace Wong and Liliana Cortés-Ortiz

The Central American Squirrel Monkey (*Saimiri oerstedii*) is a small arboreal primate endemic to Costa Rica and Panama. Two subspecies are recognized: *Saimiri o. oerstedii* (Reinhardt, 1872)[1] and *Saimiri o. citrinellus* Thomas, 1904[2]. *Saimiri o. oerstedii* has been reported from sea level to 1,145 m a.s.l. (Hershkovitz 1984; Rodríguez 1999; Ceballos *et al.* 2019; Solano-Rojas 2021). In contrast, *S. o. citrinellus* is usually observed at elevations of no more than 500 m a.s.l. (Sierra *et al.* 2003; Solano-Rojas 2021), although small groups were recently found at ~1,700 m a.s.l. (G. Wong pers. obs.). The Extent of Occurrence of *S. oerstedii* has been estimated at about 5,500 km² in Costa Rica (Ceballos *et al.* 2019) and 2,613 km² in Panama (Rodríguez 1999). However, populations are highly fragmented across their distribution (Boinski *et al.* 1998; Rodríguez 1999; Rodríguez-Vargas 2018). Ceballos *et al.* (2019) reported a 60% decrease in the Extent of Occurrence of *Saimiri* in Costa Rica.

The optimal habitat for *S. oerstedii* is tropical forest with a mix of successional stages (Boinski 1987a). Squirrel monkeys in Costa Rica live in a mix of secondary and primary forests, and use gardens, crops, wetlands, and occasionally, palm oil and gray teak plantations as corridors (Wong 1990; Solano-Rojas 2021). The habitat of *S. oerstedii* in Panama is limited to the tropical rainforest at Punta Burica, the tropical premontane rainforest in Puerto Armuelles, and the mangroves of the Gulf of Chiriquí (Miranda-Jiménez and Méndez-Carvajal 2012). Most of these areas are surrounded by a matrix of secondary forest, cattle ranching, palm oil plantations, and crops (L.I. Loría pers. comm.). The diet of *S. oerstedii* includes animal prey (mainly insects, bird eggs and nestlings, lizards, frogs, and bats), nectar, fruits, young leaves, and petioles (Boinski and Timm 1985, Solano-Rojas 2020, Chaves *et al.* 2023). A total of 180 plant species are included in their diet (reviewed in Chaves *et al.* 2023).

Groups of *S. oerstedii* have up to 70 individuals (Baldwin and Baldwin 1981; Solano-Rojas 2020). Behavioral studies indicate that males are philopatric and females disperse from their natal groups when reaching sexual maturity (e.g., Boinski 1999). However, a molecular analysis of *S. o. citrinellus* suggests no sex bias in dispersal (Blair and Melnick 2012). Males are sexually mature at 2.5 to 3.5 years old (Boinski 1987b), while females reach sexual maturity at ~2.5 years of age (Baldwin and Baldwin 1981). There is a marked mating season in which males exhibit seasonal sexual dimorphism (increasing their weight up to 20%, as well as in testicular volume and spermatogenic activity) (Bionski 1987b).

[1] Limited to the north by the left bank of the Río Grande de Terraba in Costa Rica (Rylands *et al.* 2006) and to the south by the Río Chiriquí "Nuevo" (Cuenca N° 108), SW of Chiriquí in Panama (Rodríguez-Vargas 2018).

[2] Found only on Costa Rica's central Pacific coast from Herradura Hills and Dota (von Frantzius, 1923) and the left bank of the Río Tulín, to the right bank of the Río Grande de Térraba (Rylands *et al.* 2006).

Mating occurs during the wet season and the gestation period is about 152–168 days, with females giving birth to only one young in the dry season (Baldwin and Baldwin 1991; Boinski 1987b). The interbirth interval is approximately one year (Boinski 1999).

Saimiri oerstedii is listed as Endangered on the IUCN Red List of Threatened Species (Solano-Rojas 2021), with the main threat being habitat loss due to deforestation caused by several anthropogenic activities (Solano-Rojas 2021). In Costa Rica, *S. o. citrinellus* is highly impacted by tourism and real estate development, which causes habitat loss and fragmentation, roadkill, and electrocutions (Boinski *et al.* 1998; G. Wong pers. obs.). An increased expansion of palm oil, pineapple, teak, and banana plantations, and urbanization is also affecting the well-being of the species. Capture for the pet trade and hunting to reduce crop damage also threatens local populations (Boinski *et al.* 1998; Miranda-Jiménez and Méndez-Carvajal 2012; G. Wong pers. obs.).

The Central American Squirrel Monkey is included on this year's list of the 25 most endangered primates due to its restricted range, which makes it highly vulnerable to the threats described above. There are very few protected areas in the species' range in Costa Rica (Ceballos *et al.* 2019), and there are no protected areas within their range in Panama. The current Area of Occupancy of this species in Costa Rica has been estimated as 1,280–1,387 km², a mere 57–62% of the present Extent of Occurrence (2,250 km², Ceballos *et al.* 2019). No similar estimate exists for Panama but using the historical Extent of Occurrence (2,613 km², Rodríguez 1999) and extrapolating the trends observed in Costa Rica, the current Area of Occupancy in Panama might be around 894–972 km². A qualitative analysis of the changes in available habitat of the range of *Saimiri* in Panama identified several locations where populations that existed are likely declining or locally extinct due to the reduction of their habitat (Rodríguez-Vargas 2018).

Several organizations in Costa Rica have implemented strategies to conserve squirrel monkeys. In the past, conservation initiatives focused mainly on *S. o. citrinellus* (e.g., Manuel

Antonio National Park, Titi Conservation Alliance, the National University). Since 2010, the Saimiri Foundation has established a program to protect *S. o. oerstedii* on the Osa Peninsula (Solano 2020), which includes monitoring populations, habitat regeneration, environmental education, promotion of alternative livelihoods for the local communities, and designing a professional training course on primate conservation and monkey watching. There are also several rescue centers near the Osa Peninsula and Manuel Antonio National Park that receive squirrel monkeys from the pet trade and those that have been injured, for example from electrocution. These centers have had an important role in establishing programs to build aerial bridges to lower the number of electrocutions for the Manuel Antonio National Park Area. In Panama, the Fundación Pro-Conservación de los Primates Panameños (FCPP) has implemented environmental education programs for schools and local communities (e.g., Miranda and Méndez-Carvajal 2012; Loría *et al*. 2024; Méndez-Carvajal 2019), as well as monitoring populations in areas such as the Majagua Civil, near Puerto Armuelles (L. I. Loría pers. obs.).

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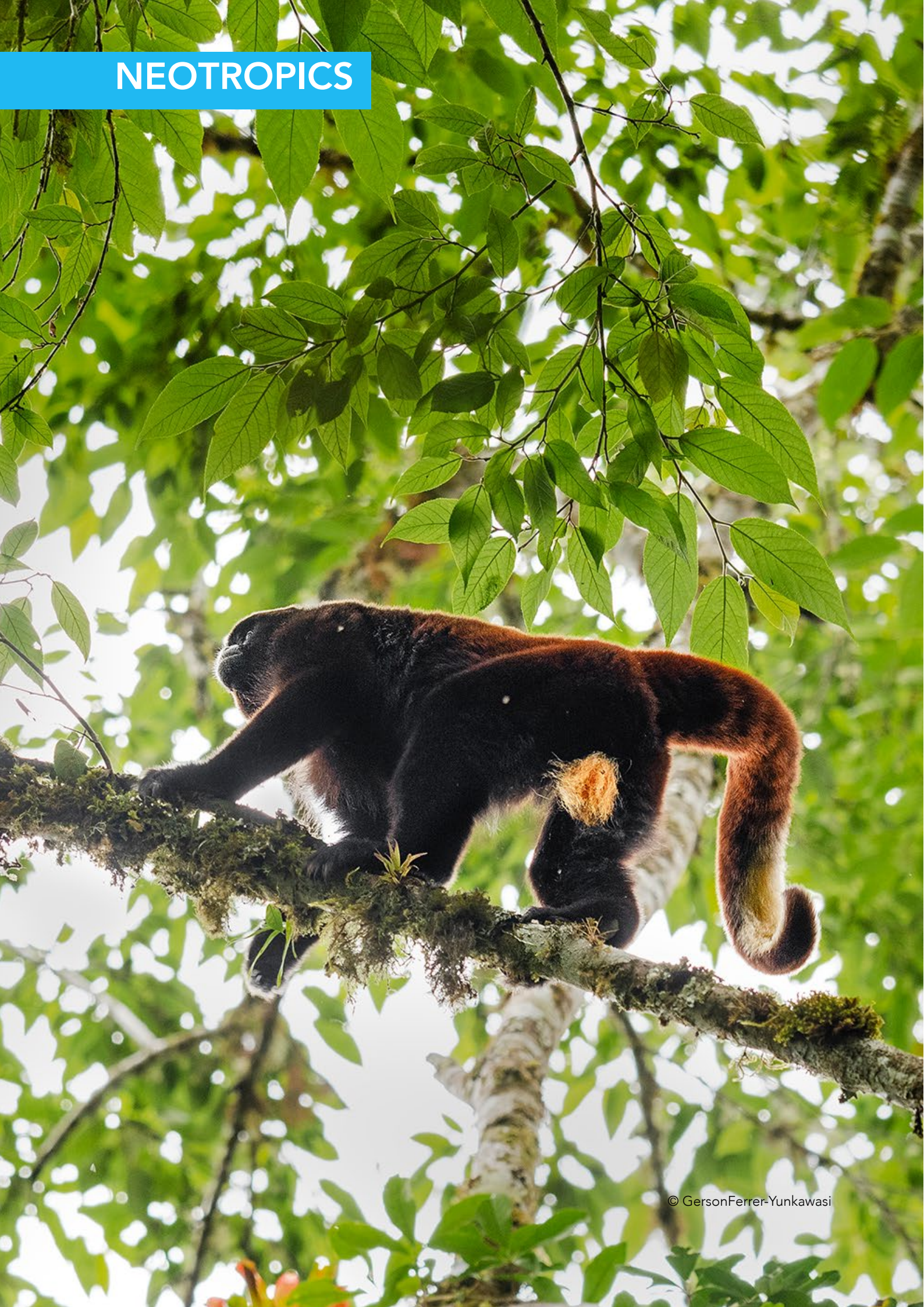
NEOTROPICS



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PERUVIAN YELLOW-TAILED WOOLLY MONKEY

***Lagothrix flavicauda* (Humboldt, 1812)**

Peru
(This species previously appeared on the list in 2000, 2006, 2008 and 2010)

Sam Shanee, Fanny Maria Cornejo, Mariella Leo Luna and Russell A. Mittermeier

Lost to western science and for many years thought to be extinct, 2024 marked the 50th anniversary of the scientific rediscovery of the Peruvian Yellow-tailed Woolly Monkey (*Lagothrix flavicauda*) (Mittermeier *et al*. 1975). The species was first discovered by the German explorer-naturalist Alexander von Humboldt in 1802 but described by him only in 1812. The species then remained largely unknown, with only a single specimen collected by a French naturalist in 1900, placed in the Museum National d'histoire Naturelle in Paris but not recognized until 2019, and a total of five specimens obtained by professional collectors in 1925 and 1926 and deposited in the British Museum of Natural History, London, and the American Museum of Natural History, New York. Neither Humboldt nor the collectors ever saw live individuals of the species, relying instead on skins obtained by local hunters, or, in the case of Humboldt, skins being used as saddle covers by local muleteers. After that, nothing was heard of the species until an expedition by Russell Mittermeier, Hernando de Macedo-Ruiz and Anthony Luscombe confirmed its existence in May 1974 and brought back the first live individual ever seen by the outside world (Mittermeier *et al*. 1975, 1977).

This rediscovery stimulated much national and international interest in the species and led to a series of field studies over the next decades, the first by Mariella Leo Luna beginning in 1978 and others by the Anglo-Peruvian NGO Neotropical Primate Conservation and Fanny Cornejo and the Peruvian NGO Yunkawasi beginning in 2007. The species is of particular importance to Peru in that it is the largest vertebrate endemic to the country and is found in the extremely biodiversity-rich northern Peruvian Andes, part of the Tropical Andes Biodiversity Hotspot. As such, it is a flagship species of national and global importance, comparable to the Giant Panda for China, the Mountain Gorilla of Central Africa, the Indri and Aye-aye of Madagascar, and the Muriqui and Golden Lion Tamarin of Brazil.

While placed in the genus *Lagothrix* by Fooden (1963), Groves (2001) argued that it belonged to the monotypic genus *Oreonax* Thomas, 1927. This was contested by Matthews and Rosenberger (2008) and Rosenberger and Matthews (2008), and recent molecular phylogenetic and morphological analyses confirmed its inclusion in the genus *Lagothrix* (Ruiz-García *et al*. 2014; Serrano-Villavicencio 2014; Di Fiore *et al*. 2015). *Lagothrix flavicauda* is one of the largest primates in the New World. The adult male has a head–body length of 56 cm with a tail length of 58 cm, and it can weigh up to 12 kg (Leo Luna 1982, 1989). Adult females are slightly smaller (Leo Luna 1980). *Lagothrix flavicauda* has thick, soft, deep mahogany fur. Its name derives from the yellow pelage on the underside of the tail. It also has a yellow genital tuft – larger in adult males – and a distinctive white patch around the mouth (Fooden 1963).

Until recently, *L. flavicauda* had been the subject of few field studies and little was known about its natural history. This was due to its rarity and the difficulties of working in remote cloud forest in

a part of Peru that has historically been subject to socio-political instability (N. Shanee and S. Shanee 2014). Beginning in the mid-1970's, and completed in the 90s, the construction and subsequent paving of a trans-Andean highway connecting the Peruvian coast with the northern Amazonian lowlands has facilitated access for research, but also opened up the species' habitat to deforestation (S. Shanee 2011). Several studies were carried out on its distribution, basic ecology, and conservation status after its rediscovery (Leo Luna 1980, 1982, 1984, 1987, 1989). Other early reports were limited to sightings and conservation recommendations (Graves and O'Neill 1980; Parker and Barkley 1981; Rios and Ponce del Prado 1983). In the last 17 years, the species has been the subject of renewed interest and we now know much more about its natural history. *Lagothrix flavicauda* lives in multi-male multi-female groups with a dominant male (Leo Luna 1980; DeLuycker 2007). Group sizes

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vary from four to 24 individuals (Leo Luna 1980; S. Shanee 2014; Aquino *et al.* 2015; Almeyda Zambrano *et al.* 2019; Fack *et al.* 2020) but larger groups of ~30 individuals have been reported (DeLuycker 2007). Solitary individuals have also been observed (S. Shanee and N. Shanee 2015). Groups are composed of two to four adult males, two to eight adult females, one to seven juveniles, and up to four infants (S. Shanee and N. Shanee 2011a, 2015; Shanee 2014; Almeyda Zambrano *et al.* 2019; Fernández-Hidalgo 2019; Fack *et al.* 2020). Population densities range from nine to 21 individuals/km² and 0.52 to 5 groups/km² (Leo Luna 1984; S. Shanee and N. Shanee 2011b, 2015; Aquino *et al.* 2015, 2017).The species is active throughout the day and divides its time between feeding (29.8%), resting (26.3%), traveling (29.0%), social interactions (2.3%) and other activities (12.8%) (S. Shanee and N. Shanee 2011a). It feeds on fruits, supplementing its diet with leaves, flowers, lichens, bromeliad leaf bases, roots, bulbs of epiphytic plants, tender arboreal fern fronds, *Cecropia* leaf petioles and insects (Leo Luna 1982; Cornejo 2008; S. Shanee 2014). Its diet varies according to the availability of food resources, consuming more leaves and insects when fruits are scarce (S. Shanee *et al.* 2021). Fruit consumption is higher than leaf consumption in less disturbed habitat (34% and 31% respectively), while the opposite occurs in disturbed sites (18–21% fruits and 34–42% leaves) (Pain and Cornejo 2022). Little is known about the species' reproductive rates, although Leo Luna (1980) estimated one birth per year for every six adults, and Aquino *et al*. (2015) reported between one and four infants per group. Females of the closely related Common Woolly Monkey (*L. lagothricha*) typically have an age at first reproduction of nine years, with males reaching sexual maturity at about six years old, with an interbirth interval of three years (Di Fiore *et al.* 2011) resulting in slow rates of natural increase.

Lagothrix flavicauda is endemic to Peru, predominantly in the highlands between the Marañón and Huallaga rivers in the northern departments of Amazonas and San Martín, but also in small areas of the neighboring departments of Huánuco, La Libertad and Loreto (Mittermeier *et al*. 1975; Mittermeier *et al.* 1977; Parker and Barkley 1981; Shanee 2011; Patterson and López Wong 2014; Aquino *et al*. 2016a, 2016b; Zarate *et al.* 2023). A population was discovered recently in Junín department, about 200 km south of the species' previously known distribution (McHugh *et al.* 2019). Subsequent surveys found the species to be absent in the intervening area between the northern and southern distributions, where it is replaced by *L. l. tschudii* (see Zarate *et al.* 2023). It is found mostly at elevations of between about 1,400 and 2,800 m but has also been recorded at around 1,000 m at two sites (Allgas *et al.* 2014; Patterson and López Wong 2014). *Lagothrix flavicauda* is primarily found in remaining areas of primary forest where human disturbance (e.g., timber extraction, subsistence hunting, and road construction) is low and where more extensive habitat is available. It is often locally extirpated or rare in disturbed forests, and where it does persist, this may be only temporary (S. Shanee 2011; Aquino *et al.* 2015). Groups have large home ranges of between 147 and 236 ha (S. Shanee 2014; Almeyda Zambrano *et al*. 2019), within which activities are concentrated in smaller core areas with occasional use of more peripheral areas, with space use determined by forest composition and the dominance of mature food trees in their home ranges (Almeyda Zambrano *et al*. 2019).

The Yellow-tailed Woolly Monkey has been confirmed in five national government protected areas in Amazonas (Santuario Nacional Cordillera Colán, Reserva Comunal Chayu-Nain, and the Zona Reservada Río Nieva) and San Martín departments (Parque Nacional Río Abiseo and Bosque de Protección Alto Mayo), as well as in one regional government protected area in Amazonas (Área de Conservación Regional Vista Alegre-Omia), and two in San Martín (Área de Conservación Regional Bosques de Shunté y Mishollo and the Área de Conservación Regional Cordillera Escalera) (DeLuycker 2007; S. Shanee 2011; Patterson and López Wong 2014). The prevalence and area coverage of private and communal protected areas in Peru has increased considerably in recent years, and many of them protect important habitat for *L. flavicauda* (see S. Shanee *et al.* 2020). These include Private Conservation Areas: Hierba Buena – Allpayacu, Copallin, Bosque de Berlin, and Abra Patricia – Alto Nieva in Amazonas, and Los Chilchos in San Martín; and Conservation Concessions: Abra Patricia – Alto Nieva and Cerro El Adobe

in Amazonas, and Alto Huayallabamba, Bosques del Sinaí, Martin Sagrado, and El Breo in San Martín, and more continue to be created through the efforts of NGOs such as Neotropical Primate Conservation, and Amazónicos por la Amazonia, which are currently developing the creation of two community run Conservation Concessions in San Martín, covering an area of about 15,000 ha. So far, the only protected area in the species' distribution in Junín is the Inchatoshi Kametsha Conservation Concession (McHugh *et al.* 2019). The NGO Yunkawasi and the regional government of Junín are currently promoting the creation of the proposed Área de Conservación Regional San Cristóbal de Pucutá, which will protect approximately 34,000 ha of habitat. No protected area exists for *L. flavicauda* in the departments of Huánuco and La Libertad (Zarate *et al.* 2023). However, Nature and Culture International and the Regional Government of Huánuco are working on the establishment of the San Pedro de Chonta Regional Conservation Area. Notwithstanding the growth in protected areas in its range, analysis of the current protected area network suggests that as much as 75% of remaining suitable habitat for *L. flavicauda* is still unprotected (Zarate *et al.* 2023).

The species is listed as Critically Endangered on the IUCN Red List of Threatened Species (Shanee *et al.* 2021) and on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2020) and is also categorized as Critically Endangered under Peruvian law (D.S. N°004-2014-MINAGRI). The most recent studies across the species' range have found massive habitat loss and fragmentation throughout almost all of its geographic distribution, which has been increasing in recent decades and leaving many populations isolated (S. Shanee 2016; S. Shanee *et al.* 2023). The most comprehensive surveys and modelling to date, suggest that only 11.5% of the species' original habitat remains, and that only 2% is rated as high-quality habitat (Zarate *et al.* 2023). Modeling of the future effects of climate change predicts a further 7% reduction in habitat availability for *L. flavicauda* over the next decades (Shanee 2016).

There are no precise estimates of the total remaining population size, but all assessments agree that their numbers are declining rapidly (Leo Luna 1987; N. Shanee and Shanee 2014; S. Shanee 2016). Based on an evaluation of habitat loss and population densities from multiple sites, there has been an estimated population reduction of up to 93% since the 1980s (N. Shanee and S. Shanee 2014). The main threats facing *L. flavicauda* are from habitat loss and fragmentation, hunting, and logging (Leo Luna 1980, 1987; Rios and Ponce del Prado 1983; N. Shanee *et al.* 2007; S. Shanee *et al.* 2007, 2011b, 2016; N. Shanee and S. Shanee 2014; Aquino *et al.* 2015, 2016b). These threats are being driven by increasing human populations and socioeconomic instability in the rural Peruvian highlands (Leo Luna 1987; N. Shanee and S. Shanee 2016). The majority of land conversion in *L. flavicauda*'s range is for cattle ranching, and cash and subsistence crops (Schjellerup 2000; N. Shanee and S. Shanee 2014; Aquino *et al.* 2015, 2016b; N. Shanee *et al.* 2015). The growing of coca for cocaine production is a threat in some areas, as are the control measures employed to counter the illicit trade (Young 1996; Zarate *et al.* 2023). Mining has also become a threat in several areas (N. Shanee and S. Shanee 2014). Hunting is a major threat facing the species and occurs in both indigenous and mestizo communities. One of the first assessments of the species estimated the removal of about 600 individuals from the wild and causing the extirpation of some populations (Leo Luna 1987). Recent assessments show that hunting is still occurring, with some hunters preferentially targeting females with infants, as they provide both meat and animals for the pet trade, thus impacting the populations' abilities to recover (N. Shanee 2012; N. Shanee *et al.* 2017). The species is also hunted for adornments and traditional practices (DeLuycker 2007; N. Shanee 2012; N. Shanee *et al.* 2017).

Although the species continues to face enormous pressures, many advances have been made towards its conservation. This includes the creation of new state protected areas, and the rapid growth of the private and communal protected area systems (S. Shanee *et al.* 2017, 2018, 2020). Around 1 million ha of its habitat is now under legal protection through different conservation mechanisms (S. Shanee 2016; Zarate *et al.* 2023). The NGOs Neotropical Primate Conservation, Amazónicos por la Amazonia, Asociación Peruana

para la Conservación de la Naturaleza, Asociación de Ecosistemas Andinas, Proyecto Mono Tocon, Equipo Primatologico del Peru, Yunkawasi and others, universities and governmental institutions are helping in the creation and management of protected areas and promoting complementary conservation activities, such as education campaigns, reforestation, development of alternative income streams, and the development of corridors that benefit the species, its habitat and local human populations in thousands of villages and towns within the distribution of the species. In 2019, the Peruvian Wildlife and Forestry Service approved the *Plan Nacional de Conservación de los Primates Amenazados del Perú 2019-2029* (SERFOR, 2020) and, based on this document, the Regional Government of Amazonas and Yunkawasi led the participatory development of the *Regional Action Plan for the Conservation of the Yellow-tailed Woolly Monkey and Andean Night Monkey 2020–2025*, approved with regional ordinance N° 005-2020 GRA/CR. The principal measures proposed have been implemented with funding from the Critical Ecosystems Partnership Fund (CEPF).

Critical action is also being taken by landowners at the community level. In 2023, Yunkawasi and the Asociación de Conservación Oso Dorado of the community of Corosha, a community recognized by the Andean Parliament through Resolución 07-2022 for its conservation commitment over the last two decades, promoted the creation of four community-led monitoring committees for the Yellow-tailed Woolly Monkey. These committees, operating in four community-managed protected areas, are now obtaining information on the species' population status based on a protocol developed with the Red Voluntaria de Conservación de Amazonas (Yunkawasi, 2023). Sernanp, Conservation International and Yunkawasi are currently developing the first protocol for government-managed protected areas. In 2024, law N° 32100 was approved to promote protection and conservation of the species and its habitat – an important milestone for endangered species conservation in the country. This law, promoted by Yunkawasi and supported by communities and local authorities country-wide, proposes strategic planning to prevent the extinction of this emblematic primate, promotes investment in conservation actions by regional governments, and declares the first week of May as the week for the conservation of the Yellow-tailed Woolly Monkey, to commemorate the anniversary of its rediscovery, and to position this species as an emblematic and recognized animal among Peruvians.

Since 2023, the NGO Yunkawasi, the IUCN SSC Primate Specialist Group, the Ministry of the Environment, the National Service of Natural Protected Areas, the National Wildlife and Forestry Service and various municipalities ran the 'Stand-up for the Yellow-tailed Woolly Monkey' campaign (*Achórate por el mono choro de cola amarilla*). Events were held during May 2024 in Lima and key towns in the range of the species (Huancayo-Junín, Bagua-Amazonas, Chachapoyas-Amazonas, Moyobamba-San Martín) to celebrate the 50th anniversary of its rediscovery. Activities included lectures and panel discussions, festivals, and the unveiling of statues of the Peruvian Yellow-tailed Woolly Monkey in three locations (Lima, Bagua, and Moyobamba), with the participation of one of the original rediscoverers, Russell Mittermeier. Over 100 thousand people were reached by this campaign, including 15 thousand people that participated in the in-person events. A film on the species is now under production.

With the legal tools in place and increased awareness of the need to protect the species, it is expected that threats will continue to decrease. Needed, however, is further research on the behavior and ecology of *L. flavicauda*, regular population surveys, and continued and concerted efforts for land protection and further development of community-based conservation with sustainable activities. Due to the relatively high human population density in most of the species' range, particular emphasis should be put on environmental education to promote sustainable practices and reduce hunting. The development of new conservation areas in the southern range of the species is also a priority. A comprehensive species account was recently published covering the current state of knowledge of *L. flavicauda* (Serrano-Villavicencio *et al.* 2021).

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NEOTROPICS

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VARIEGATED SPIDER MONKEY

***Ateles hybridus* I. Geoffroy Saint-Hilaire, 1829**

Colombia, Venezuela
(Previously included on this list in 2004*, 2006, 2008, 2010, 2012 and 2014)
* Subspecies *A.h. brunneus* was listed in 2004

Andrés Link, A. Gabriela de Luna, Anthony Di Fiore, Diana Liz Duque, Néstor Roncancio-Duque, Pablo Stevenson and Bernardo Urbani

Variegated Spider Monkeys (*Ateles hybridus*) are endemic to the lowland forests of Colombia and Venezuela. In Colombia, they are present in the middle Magdalena River basin in north-eastern Colombia, in the southern and eastern slopes of the Sierra Nevada de Santa Marta, and along the western slopes of the Serranía del Perijá and the eastern slopes of the eastern Andean Cordillera in Catatumbo (Link *et al.* 2020). In western Venezuela, they are present in lowland forests south of the Maracaibo Lake, on the northern-most part of the eastern Andean Cordillera, and in the western llanos (Urbani 2015). Isolated populations also occur in north-central Venezuela (Cordero-Rodríguez and Biord 2001; Urbani 2015). Less than 15% of the forests within its historical distribution remain, and most of them are heavily fragmented and face high rates of deforestation (De Luna and Link 2018). The species is included in CITES Appendix II and categorized as Critically Endangered on the IUCN Red List of Threatened Species (Link *et al.* 2020).

Until two decades ago, Brown Spider Monkeys were considered a subspecies of the White-bellied Spider Monkey (*A. belzebuth*) due to their nearby distribution and morphological similarities. However, both morphological and genetic data support its taxonomic classification as a distinct species of *Ateles* (Collins and Dubach 2000; Morales-Jimenez *et al.* 2015). There is still debate as to whether the species should be divided into two putative subspecies (*A. h. hybridus* and *A. h. brunneus*) separated by the Magdalena River, and more studies on intraspecific phylogeography are needed (Link *et al.* 2015).

Brown Spider Monkeys are large, arboreal primates that can weigh up to 10 kg. They prefer extensive and continuous mature forests with minimal human intervention, but some populations persist in heavily fragmented landscapes (De Luna and Link 2018; Cordero *et al.* 2019; Duque *et al.* 2019). Like other atelins, Brown Spider Monkeys have slow life histories; females reach adulthood at approximately 7 to 8 years of age and have long interbirth intervals (*ca.* 3 years). As a result, the species is particularly vulnerable to population declines (Urbani 2015). They are most often found in the forest canopy and rarely descend to the forest floor, occasionally eating soil at mineral licks (Link *et al.* 2011). They live in multi-male–multi-female groups that generally range between 15 and 40 individuals, and social associations in the group are very flexible, showing a high degree of fission-fusion dynamics (Aureli *et al.* 2008). Home ranges are presumably large (*ca.* 400 ha), but some groups have been reported to persist even in small forest fragments (>50 ha). Population densities are relatively low in undisturbed forests (approx. 8 ind/km²) but may reach up to 58 ind/km² in forest fragments or in areas adjacent to deforestation borders (Roncancio 2021). However, in fragmented landscapes, Brown Spider Monkeys may go locally extinct in otherwise ecologically suitable forest remnants or persist only at low population densities (1–5 ind/km²) (Roncancio *et al.* 2010, 2013). Brown Spider Monkeys are primarily frugivorous (Link *et al.* 2012), although they can also rely on young leaves and other plant items during dry periods or in degraded habitats (De Luna *et al.* 2017). Like other species of spider monkeys, they play

a key ecological role in tropical forest dynamics by dispersing the seeds of hundreds of canopy trees and lianas (Link and Di Fiore 2006; Urbina-Bermudez 2010).

In Colombia and Venezuela, *A. hybridus* is subject to pervasive habitat loss and to hunting for the pet trade and medicinal use, posing an imminent threat to their persistence in the near future. They have become locally extinct in many areas of their range and are extremely sensitive to habitat loss and hunting (Urbani 2015; De Luna and Link 2018). Indeed, in some areas, the local extinction probability has been estimated to be approximately 65% despite the presence of mature forests (Roncancio 2021). Large tracts of continuous mature forest in the species' range remain only in Colombia in the Serranía de San Lucas, Serranía del Perijá, Catatumbo, and Serranía de Las Quinchas, and even in these areas, habitat loss continues due to legal and illegal mining, oil palm agribusiness and illegal plantations. The declaration of a protected area in the Serranía de San Lucas could protect the largest tract of continuous forest in their range. However, the political instability of this region makes it inaccessible for researchers, conservationists and government officials.

Unfortunately, information about the existence, current population status, and viability of Brown Spider Monkey populations in Colombia's and Venezuela's national parks is sorely lacking. Although Brown Spider Monkeys are reported to be present in Catatumbo-Bari, Selva de Florencia (see Elizalde *et al.* 2021), and Guatopo national parks and are presumed to be present as well in Tamá National Natural Park, and El Cocuy and Sierra Nevada de Santa Marta national parks, it is uncertain if viable populations are present in any of these protected areas. Brown Spider Monkeys also occur in Caparo Forest Reserve in western Venezuela (Duque *et al.* 2019).

In Venezuela, habitat alteration appears to be the most important threat to wild populations of *A. hybridus*. The lowland forests of the state of Zulia and the piedmont of the Perijá Mountains are being destroyed by expanding cattle ranching, land clearance, and hunting (B. Urbani unpubl. data). Similarly, Guatopo National Park and its buffer areas are being pervasively transformed

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(Isasi-Catalá *et al.* 2019), as is the case for most forests of the Venezuelan western llanos (Cordero *et al.* 2019; Duque *et al.* 2019). *Ateles hybridus* is at risk in north-central Venezuela, where most of the human population of Venezuela is settled (Rivas-Rojas *et al.* 2019).

A handful of conservation initiatives have recently focused on the protection of Brown Spider Monkeys. In Colombia, Fundación Proyecto Primates has led an ambitious science-based conservation program since 2007, including the creation of private reserves, improvement of forest connectivity, and the creation and execution of an environmental education program. In recent years, Proyecto Vida Silvestre led by WCS-Colombia has expanded these conservation actions. Other Colombian NGO´s have established private reserves in Boyacá (Fundación ProAves) and in Antioquia (Fundación Biodiversa Colombia). The National Action Plan for the Conservation of Brown Spider Monkeys in Colombia has highlighted conservation priorities for the coming years. In Venezuela, the Spider Monkey Project has worked towards the conservation of the population of Brown Spider Monkeys at the Caparo Forest Reserve, but more support is needed to protect its remaining wild populations.

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OTHER SPECIES CONSIDERED

ASIA – SIBERUT MACAQUE
***Macaca siberu* Fuentes and Olson, 1995**
Indonesia (Mentawai Islands)
Not previously included on the list of 25 most endangered primates.

Andie Ang and Rizaldi

Macaca siberu is one of seven endemic primate taxa on the Mentawai Islands (West Sumatra, Indonesia), and is found on the northernmost island named Siberut. This species is Endangered due to a past and continued population decline, estimated at more than 75% over the past 40 years (approximately three generations) due to hunting and loss of habitat (Traeholt *et al.* 2020). Whittaker (2006) suggested the following conservation actions: 1) increased protection for Siberut National Park, which currently lacks enforcement; 2) formal protection of the Peleonan Forest in North Siberut; 3) conservation education, especially regarding hunting; and 4) the development of alternative economic models for the local people to reduce the likelihood of selling off their lands to logging companies. Quinten *et al.* (2014) further suggested 1) lobbying the local government to ban the use and possession of air rifles throughout the archipelago, and confiscate such weapons, 2) an island-wide campaign to emphasize cultural tradition in order to increase the hunters' inclination to follow traditional practices and taboos, including ceremonial rather than opportunistic hunting, 3) improving agricultural practices to decrease dependence on primates for animal protein, and 4) active inclusion of locals into conservation projects and environmental tourism ventures on Siberut as guides and field assistants who can act as multipliers for a positive conservation message in their communities.

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ASIA – SOUTHERN MENTAWAI MACAQUE
***Macaca pagensis* G.S. Miller, 1903**
Indonesia (Mentawai Islands)
Not previously included on the list of 25 most endangered primates.

Andie Ang and Rizaldi

Macaca pagensis is one of seven endemic primate taxa on the Mentawai Islands (West Sumatra, Indonesia), and is found on Sipora, North Pagai and South Pagai islands. This species is Critically Endangered due to past population declines, estimated at more than 80% over the past 39 years (three generations) and continuing decline due to hunting and loss of habitat. Due to the ongoing nature of the threats, it is predicted to decline by the same rate over at least the next 13 years; it is suspected that the species will undergo a reduction of >80% over the three-generation period 2001–2040 (Setiawan *et al.* 2020). Overall, it is crucial to develop an up-to-date action plan for all primates of the Mentawai Islands. Some of the recommended next steps include (1) a stakeholder engagement with relevant government agencies and the local community, (2) a large-scale conservation education campaign to raise awareness about the rich biodiversity and endemism of not only the primates, but also other taxonomic groups, (3) the development of conservation tourism, following the model of the flourishing diving industry on the islands, (4) the exploration of carbon/biodiversity credit projects

on the islands, and (5) the protection of at least one priority, representative site for primates on each of Sipora, North Pagai, South Pagai, and Siberut islands.

Setiawan, A., Mittermeier, R.A. and Whittaker, D. 2020. *Macaca pagensis*. The IUCN Red List of Threatened Species 2020: e.T39794A17949995.

ASIA – SOUTHERN MENTAWAI LANGUR
Presbytis potenziani (Bonaparte, 1856)

Indonesia (Mentawai Islands)
Not previously included on the list of 25 most endangered primates.

Andie Ang and Rizaldi

Presbytis potenziani is one of seven endemic primate taxa on the Mentawai Islands (West Sumatra, Indonesia). Specifically, it is distributed on Sipora, North Pagai and South Pagai islands. Hunting pressure has increased in recent years as a result of improved access to remote areas due to logging roads, as well as the replacement of bows and arrows with air rifles. Furthermore, local rituals and taboos that previously regulated hunting have been progressively eroded due to missionary and state influences (Mitchell and Tilson 1986). There is also a rise in sport hunting of wildlife by young people who have plenty of leisure time after school. Given the hunting pressure on *P. potenziani* and that deforestation continues, there is a pressing need for field surveys to identify priority sites for the protection of *P. potenziani* populations. These sites need to be evaluated alongside existing logging locations, with the objective of working with the government, private landowners and local communities to develop a sustainable land use plan. Also considered could be an economic model for managing the forests that can provide higher returns to the local stakeholders in the long term rather than the short-term benefits of land conversion; there may be potential to develop carbon/biodiversity credit projects, agroforestry of spices, and conservation tourism on these islands.

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ASIA – SIBERUT LANGUR
Presbytis siberu (Chasen and Kloss, 1928)

Indonesia (Mentawai Islands)
Not previously included on the list of 25 most endangered primates.

Andie Ang and Rizaldi

Presbytis siberu is one of seven endemic primate taxa on the Mentawai Islands (West Sumatra, Indonesia), and is found on Siberut Island. Siberut has a national park that covers 47% of the island. At present, however, the national park lacks proper management and enforcement against illegal activities, and habitat loss is a serious threat, especially outside the national park. Increased protection of Siberut National Park is needed, and it is imperative to work with local communities to manage their forests outside the national park. The Kalaweit organization is also collaborating with the government outside the national park, so there may be an opportunity to explore working together. The Peleonan Forest in North Siberut also requires formal protection. Additionally, work is already underway to build the Trans-Mentawai highway, a two-lane paved road running north-south along the eastern half of Siberut Island (Harbinson 2019). Understanding the distribution of *P. siberu* in this area and identifying priority sites for its conservation is crucial.

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ASIA – KLOSS'S GIBBON
***Hylobates klossii* (G.S. Miller, 1903)**
Indonesia (Mentawai Islands)
Not previously included on the list of 25 most endangered primates.

Andie Ang and Rizaldi

Hylobates klossii is one of seven endemic primate taxa on the Mentawai Islands (West Sumatra, Indonesia), and is found on Siberut, Sipora, North Pagai and South Pagai islands. *Hylobates klossii* is Endangered due to a past and continued population reduction, estimated at more than 50% over a period of 45 years, including two past generations (1986–2015) and the current generation (2016–2030) (Liswanto *et al*. 2020). The population decline is due to widespread local hunting for cultural reasons and loss of habitat, particularly in North Pagai, South Pagai and Sipora Islands. To foster economic resilience and environmental sustainability on Siberut Island, there is a need to diversify income streams through agroforestry of different forest commodities and to improve agricultural yield. Involving local communities (in longhouse *uma malingai*) in conservation tourism and wildlife monitoring projects is essential, empowering them as advocates. Education campaigns in schools and religious communities to raise awareness on *H. klossii* and all the Mentawaian primates is needed. Co-designing curricula and materials with teachers to include Mentawaian biodiversity and to mainstream nature education will help improve knowledge and appreciation of wildlife and the environment. As a whole, we recommend a collective effort to support young people to remain in schools and pursue higher education.

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ASIA – POPA LANGUR
***Trachypithecus popa* Roos *et al.* 2020**
Myanmar
Not included on the list of 25 most endangered primates.

Naw May Lay Thant, Ngwe Lwin, Christian Matauschek, Frank Momberg and Christian Roos

The Popa Langur, described in 2020, is a colobine monkey endemic to central Myanmar (Roos *et al*. 2020). The species occurs in primary and secondary evergreen, semi-evergreen, mixed moist deciduous and dry deciduous forests, but it is also found in bamboo-dominated areas, light woodlands, and plantations (Matauschek *et al*. 2022). The species has been listed as Critically Endangered on the IUCN Red List of Threatened Species and occurs only in four isolated populations with a total of 135–176 mature individuals (Matauschek *et al*. 2022). The best protected population at Mount Popa experienced a decline of 43% over the past 14 years, suggesting a decline of at least 90% over the last three generations (with a generation time of 11 years) (Matauschek *et al*. 2022). The species is threatened by hunting, habitat loss, degradation, and fragmentation caused by agricultural encroachment, illegal/unsustainable timber extraction, and disturbances caused by the collection of non-timber products and free cattle-grazing (Matauschek *et a*l. 2022). Improved protected area management and law enforcement, particularly in Popa Mountain Park and Panlaung-Pyadalin Cave Wildlife Sanctuary, is essential to stabilize the two largest known populations (Matauschek *et al*. 2022). The population at Mount Yathae Pyan could be protected through the designation of a community-protected area (Matauschek *et al*. 2022). The forests in Bago Yoma are severely degraded and fragmented, but could still provide the largest, contiguous habitat if deforestation and forest degradation are reversed through improved forest protection and restoration. The status of most populations is poorly understood, and additional surveys are urgently needed (Matauschek *et al*. 2022).

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ASIA – PHAYRE'S LANGUR

Trachypithecus phayrei (Blyth, 1847)

Bangladesh, India, Myanmar

Not previously included on the list of 25 most endangered primates.

Tanvir Ahmed and Christian Roos

Phayre's Langur is one of the least-studied Asian colobines and its distribution was recently restricted to eastern Bangladesh, northeastern India, and western Myanmar (Roos *et al.* 2020). This predominantly arboreal species occupies primary and secondary evergreen, semi-evergreen, mixed moist deciduous forests, plantations, and bamboo-dominated hill forests (Mittermeier *et al.* 2013). The species has been listed as Endangered for two decades on the IUCN Red List of Threatened Species (Chetry and Ahmed 2021). No recent population estimates are available but populations are suspected to have declined by 50% to 80% over the last three generations (Chetry and Ahmed 2021). Several isolated small populations have already extirpated in India and Bangladesh due to hunting and habitat loss (Bleisch *et al.* 2020; Hasan *et al.* 2023). Furthermore, many of the remaining habitats are small, fragmented, and isolated (Mittermeier *et al.* 2013). Mixed-species groups and putative hybrids between Phayre's and capped langurs (*T. pileatus*) have been recently detected (T. Ahmed pers. obs.) and may represent another threat. Also alarming is the direct loss of individuals because of illegal trading of live animals, electrocution, and roadkill (Ahmed *et al.* 2020). An assessment of current population size, genetic structure, and viability of small populations is needed to develop a proper conservation action plan. Mitigation of hunting, trading, habitat loss, and fragmentation is urgent by implementing laws, engaging local communities, environmental education, and building capacity at national scales. Habitat connectivity should be increased through restoration, corridors, and transboundary conservation measures. Translocation of small, isolated populations and rewilding of confiscated individuals is recommended.

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ASIA – TONKIN SNUB-NOSED MONKEY

Rhinopothecus avunculus Dollman, 1912

Vietnam

(Previously included on the list of 25 most endangered primates in 2000, 2002, 2004, 2006, 2008, 20010, 2012, 2014, 2016 and 2018)

Tilo Nadler

The Tonkin Snub-nosed Monkey, *Rhinopithecus avunculus*, is a Critically Endangered species endemic to Vietnam (Quyet *et al.* 2020). It is now confined to only two areas of the far northwest (Nadler *et al.* 2003; Nadler and Brockman 2014). Its distribution has been drastically reduced in recent decades due to massive deforestation and intensive hunting. As a result, the population has become severely fragmented. The species was thought to be extinct until its rediscovery near the town of Na Hang, Tuyen Quang Province in 1989. Conservation activities there were unsuccessful, and it is most likely now extirpated. A population of 20 to 40 individuals was estimated for the Cham Chu Nature Reserve, Tuyen Quang Province in 1992, but subsequent surveys provided no sightings, and the population is also most likely extirpated. In 2001, a population was discovered in Khau Ca, close to Du Gia Nature Reserve, Ha Giang Province. A census in 2015 confirmed 125–130 individuals. The area was subsequently declared as the Tonkin Snub-nosed Monkey Species/Habitat Conservation Area. Based on recent surveys the population is estimated to comprise about 160 individuals. During a survey in March 2022, two groups were observed, one group with 84 and another with 11 individuals. It is the only population that is not immediately threatened. In 2007, a population of about 20 Tonkin Snub-nosed Monkeys was discovered in Tung Vai, Ha Giang Province, close to the border with China (Le Khac Quyet and Covert 2010). This population is threatened by hunting and habitat loss and intensive cardamom cultivation, besides other human activities. The total population of the Tonkin Snub-nosed Monkey is currently believed to be fewer than 200 individuals.

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ASIA – WESTERN HOOLOCK GIBBON

***Hoolock hoolock* (Harlan, 1834)**

Bangladesh, India, Myanmar

Previously included on the list of 25 most endangered primates in 2008.

Dilip Chetry, M Tarik Kabir, Ngwe Lwin and Susan M. Cheyne

The Western Hoolock Gibbon (*Hoolock hoolock*) is one of 20 species of gibbons and is listed as Endangered on the IUCN Red List of Threatened Species (Brockelman *et al.* 2019). It is found in Eastern Bangladesh (Feeroz *et al.* 2015), northeastern India (Chetry *et al.* 2007), and in the west of the Ayeyarwaddy and Chindwin Rivers in Myanmar (Geissmann *et al.* 2013). Continuous loss of habitat resulting from encroachment, uncontrolled harvesting of natural resources, infrastructure development, the establishment of tea gardens, *jhum* or shifting cultivation, habitat fragmentation, and hunting for food and medicine, and capture for the illegal wildlife trade (Islam and Feeroz 1992; Molur *et al.* 2005; Das *et al.* 2005; Chetry *et al.* 2021) are the primary threats. Localized extinctions were observed in isolated fragments in northeast India (Chetry *et al.* 2021; Molur *et al.* 2005) and Bangladesh (Islam *et al.* 2006). The population trend is declining in India and Bangladesh. While the Myanmar population could be considered stable owing to having the largest continuous suitable habitat remaining, the threats are still found in some areas (Lwin *et al.* 2022). To safeguard the future of this species, all possible efforts must be made to prevent further loss of habitat. Restoration of degraded habitats and the creation of ecological corridors are vital for the conservation of isolated populations. Further research, training of forest rangers, education and awareness programs among relevant stakeholders and community-based conservation initiatives in its range, and making the western hoolock gibbon as flagship species, is required. Above all, successful conservation of the species demands intensive intervention from the government.

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NEOTROPICS – NORTHERN MURIQUI

Brachyteles hypoxanthus (Wied, 1820)

Brazil (Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro)
Previously included on the list of 25 most endangered primates in 2000, 2002 and 2004.

Fabiano R. de Melo, Leandro Jerusalinsky and Karen B. Strier

The Northern Muriqui (*Brachyteles hypoxanthus*) is the largest neotropical primate and endemic to the Atlantic forest in the states of Minas Gerais, Espírito Santo, Rio de Janeiro and Bahia (Melo and Jerusalinsky 2024). The species is threatened by habitat loss and fragmentation and by hunting, which combined caused a population reduction of at least 80% over the past 60 years and, consequently, it is categorized as Critically Endangered on the IUCN Red List of Threatened Species (Melo *et al.* 2021). Yellow fever and climate change are emerging threats to the species (Strier 2019; Strier *et al.* 2021). The current population is ~1,000 individuals, distributed in 12 isolated sites, mainly in national, state and private protected areas that total less than 200,000 ha (Strier *et al.* 2017; Melo and Jerusalinsky 2024). The five largest populations — RPPN Feliciano Miguel Abdala, Serra do Brigadeiro State Park, Rio Doce State Park, Caparaó National Park and Santa Maria do Jetibá — represent the best potential for the persistence of the species in the long term (Strier *et al.* 2017; Melo *et al.* 2021; Melo and Jerusalinsky 2024). Strategies for the conservation of the Northern Muriqui have been defined by national action plans, which promote measures such as the creation of protected areas, definition of methods and priority areas for demographic monitoring, and the establishment of standard protocols for research and management (Strier *et al.* 2017, 2021; Valença-Montenegro *et al.* 2021). In addition to assuring the protection of populations and habitats outside protected areas, of utmost priority are the development of a population management program and the establishment of forest corridors to connect the remnant populations. The conservation of the northernmost populations, specifically in the Mata Escura Biological Reserve, is a priority because of the genetic variability and distinctiveness it is likely to sustain.

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NEOTROPICS – BROWN-HEADED SPIDER MONKEY

Ateles fusciceps Gray, 1866

Colombia, Ecuador, Panamá

Previously included on the list of 25 most endangered primates in 2006, 2012, 2014, 2016, 2022.

Nathalia Fuentes, Felipe Alfonso-Cortes, Alma Hernández-Jaramillo, Andrés Link and Stella de la Torre

The Brown-headed Spider Monkey is native to Colombia, Ecuador, and Panama. They mainly inhabit large, continuous primary or secondary forests, although there are some populations in fragmented landscapes in Ecuador and Colombia (Cervera and Griffith 2016; Hernández-Jaramillo *et al*. 2024). There are two subspecies *Ateles fusciceps rufiventris* (Panama and Colombia), and *Ateles fusciceps fusciceps* (Ecuador and Colombia) (Morales-Jiménez *et al*. 2015). The main threats facing the species are habitat loss and hunting, and it has been categorized as Endangered on the IUCN Red List of Threatened Species due to the continuing declining of its populations and habitat quality and area (Moscoso *et al*. 2021). *Ateles f. fusciceps* – the subspecies found in Ecuador – is classified as Critically Endangered due to the loss of more than 60% of its suitable habitat, and by 2050 could reach 73% (Gallo-Viracocha *et al*. 2022, Tirira *et al*. 2022). Meanwhile, *A. f. rufiventris* was recently reassessed as Vulnerable (Link *et al*. 2021); it is estimated that a 60% reduction of forest within the potential habitat for the species has occurred, the most frequent threats to the species are illegal crops, mining, and hunting for subsistence and trade, including pets. (Hernández-Jaramillo *et al*. in press). It remains as Critically Endangered in Panama (the Panamanian List of Endangered Species. Méndez-Carvajal 2019). In Ecuador during the last decade, different actors have focused their efforts on the creation and extension of private and state conservation areas. In addition, genetic research and community conservation strategies have been developed for the species (Tirira *et al*. 2022, Abondano *et al*. 2022). All these actions contribute to the implementation of the Action Plan for the Conservation of Ecuadorian Primates. In Colombia, efforts have concentrated on developing and implementing the species' conservation action plan (in press), distribution studies and threat characterization (Hernández-Jaramillo *et al*. in press).

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NEOTROPICS – AZUERO SPIDER MONKEY

Ateles geoffroyi azuerensis (Bole, 1937)

Panama (Azuero peninsula)

Ateles geoffroyi, including this subspecies, was previously included on the list of 25 most endangered primates in 2016, 2018 and 2022.

Pedro G. Méndez-Carvajal and Karol M. Gutiérrez-Pineda

This subspecies was initially described as *Ateles azuerensis* Bole, 1937 and was studied for the first time in Chiriquí province, at its type locality, Altos Negritos, Montijo, near río Negro and Mariato, Veraguas province, Azuero peninsula, Panama (Méndez-Carvajal 2023). It was re-classified as *Ateles geoffroyi azuerensis* following Kellogg and Goldman (1944). *Ateles g. azuerensis* has been extirpated in Chiriqui province, western and northern Veraguas and in northern Herrera province. The subspecies only appears to be present in south-western Veraguas in southern Herrera and Los Santos in the southern areas near the Canajaguas Nature Reserve in Herrera province, Cerro Hoya National Park, and in the fragmented landscape between Punta Duarte, La Barra, Guanico, Quema, La Tronosa Forest Reserve, La Miel, and Aguas Buenas, Venao, la Zahina from Pedasi in Los Santos and southeast Veraguas province. Only 11 subgroups and five complete groups have been detected, with a mean of 3.8 individuals/subgroup, SE ±0.6 (range 2–7) and a mean of 12.5 individuals/group, SE ±3.7 (range 10–22), with densities of 1.4 individuals/km² (for fragmented habitats), and an approximate total population of <150 individuals (Méndez-Carvajal 2019). Scientific study and conservation measures led by the Fundación Pro-Conservación de los Primates Panameños (FCPP) involve community volunteer vigilantes from Azuero, reforestation with native species, environmental education and the creation of an educational Azuero primates guide, as well as monitoring biodiversity and surveying primate groups on the Azuero peninsula (Méndez-Carvajal *et al.* 2013; Méndez-Carvajal 2023). The species' range is under threat due to tourism-related development and modern infrastructure, which is resulting in deforestation and electrocutions. An additional threat is the consumption of this species by indigenous people from Ngabe Buglé groups that have been established near the gallery forest.

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NEOTROPICS – WHITE-CHEEKED SPIDER MONKEY

Ateles marginatus É. Geoffroy Saint-Hilaire, 1809

Brazil (Mato Grosso, Pará)

Not previously included on the list of 25 most endangered primates.

Gustavo R. Canale, André L. Ravetta, Gerson Buss and Leandro Jerusalinsky

The White-cheeked Spider Monkey (*Ateles marginatus*) endemic to the eastern Brazilian Amazon, inhabits forests from the right banks of the rios Tapajós and Teles Pires to the left bank of the Rio Xingu (Ravetta *et al.* 2021; Lima-Silva *et al.* 2022). Most of its Extent of Occurrence lies in the Amazonian 'arc of deforestation', with the highest deforestation rates of the tropics (Lazari *et al.* 2020). The species

is Endangered on the IUCN Red List of Threatened Species (Ravetta *et al.* 2021) due to a suspected population decline upwards of 50% over the last 45 years (three generations), related to habitat loss and illegal pouching (Ravetta *et al.* 2021). Late maturation (4–5 years of age) and long inter-birth intervals (up to 30 months) hinder population recovery. Its range is crossed by major highways – the Transamazônica and Cuiabá-Santarém – and a new railway (Ferrogrão) is projected for the region. This infrastructure tends to increase deforestation by the consequential expansion of commodity plantations (soy, corn and ccotton) and the cattle industry, and the increase of human populations living in Amazonian cities. The Tapajós Hydroelectric Complex might lead to forest fragmentation and isolation of primate populations inhabiting riparian forests (Buss *et al.* 2017). Recently, the degazettement of the Parque Estadual do Cristalino II, one of the few protected areas in the southern distribution of the species, is being discussed by the Government of Mato Grosso, public defenders and environmentalist organizations. An updated second version of the *National Action Plan for the Conservation of the Amazonian Primates* is under elaboration, after a prolific first round (Brazil, ICMBio 2017). The climate crisis is already impacting populations in the south, with long droughts and forest fires.

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NEOTROPICS – MANTLED HOWLER MONKEY
Alouatta palliata mexicana (Merriam, 1902)

Guatemala, Mexico

Not previously included on the list of 25 most endangered primates.

Pedro A.D. Dias, Gilberto Pozo Montuy, Ariadna Rangel Negrín, Juan Carlos Serio Silva, Brenda Sólorzano García and Bertha Valenzuela Córdova

The Mexican Mantled Howler Monkey (*Alouatta palliata mexicana*) is categorized as Endangered on the IUCN Red List of Threatened Species, primarily due to severe habitat loss and fragmentation (Cuarón *et al.* 2020). These threats are largely driven by deforestation for agriculture and urban development. The constrained distribution of the Mexican Mantled Howler Monkey in forest remnants in southeastern Mexico and Guatemala further aggravates its vulnerability. Isolation into small forest patches disrupts population dynamics and social structure and increases susceptibility to diseases and hunting (Arroyo-Rodríguez and Dias 2010; Galán *et al.* 2021). Isolation reduces gene flow, increasing the risk of inbreeding and decreasing genetic diversity, compromising population fitness and long-term survival (Solórzano-García *et al.* 2021). Emerging threats for this taxon include climate change, wildfires, mining, and pollutants (heavy metals, pesticides, and microplastics; Dias and Rangel-Negrín 2022; Alvarez-Velazquez *et al.* 2024). In 2024, the synergistic effects of habitat degradation and extreme hot weather caused the death of many hundreds of individuals in Mexico, exacerbating conservation concerns for this taxon. Conservation efforts should prioritize this subspecies because of its critical ecological role in forest regeneration and its evolutionary significance. The loss of these primates could lead to significant ecological consequences, including reduced biodiversity and altered forest composition. Key conservation actions should include: 1) protecting existing forests and restoring degraded areas to expand habitat, which implies working under a coexistence framework that incorporates environmental education, agroecological systems and regenerative agriculture, and reinforcement of environmental policies; 2) creating free-range sanctuaries with

reforestation and regeneration components to ensure sustainable habitat; 3) establishing corridors to connect isolated patches and protect individuals from linear infrastructure, facilitating gene flow and reducing fragmentation impacts; 4) creating protocols and infrastructure that allow for the safe capture, rehabilitation, translocation, and reintroduction of individuals; and 5) developing research to monitor population health, genetic diversity, and the impacts of conservation strategies.

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NEOTROPICS – KA'APOR CAPUCHIN

Cebus kaapori Queiroz, 1992

Brazil (Maranhão, Pará)

Brazil (western Maranhão, eastern Pará)

Previously included on the list of 25 most endangered primates in 2012, 2014, 2016 and 2022.

Tatiane S. Cardoso, Gerson Buss, Eloísa N. Mendonça, Renata B. Azevedo and Leandro Jerusalinsky

The Ka'apor Capuchin (*Cebus kaapori*) is endemic to the eastern edge of the Brazilian Amazon, occurring in northeastern Pará and northwestern Maranhão (Queiroz 1992). Preliminary data collected at the Gurupi Biological Reserve (REBIO Gurupi) indicate that the species lives in small groups ($\leq$12 individuals), which occupy large home ranges (~300 ha, Cardoso 2021). The low abundance recorded for *C. kaapori* (Lopes 1993; Buss *et al*. 2017), indicates its probable natural rarity. The species inhabits the so-called Arc of Deforestation, the region in the Brazilian Amazon with the highest level of deforestation and habitat degradation, and also the most densely populated by people (Carvalho *et al*. 1999). From 1985 to 2020, habitat loss in the species range (206,081 km^2) was estimated at 32.8% (Butti *et al*. 2022). According to a species distribution model, *C. kaapori* could lose 100% of its habitat as result of climate change and deforestation in the next 30 years, considering the loss of climatic suitability added to the loss of vegetation cover in a business-as-usual scenario (da Silva *et al*. 2022). Due to severe habitat loss, fragmentation and degradation, in addition to hunting, *C. kaapori* suffered a drastic population reduction in the last decades. Consequently, the species is categorized as Critically Endangered, being among the most threatened Amazonian mammals and already listed as one of the 25 most Endangered primates. The species occurs in only two protected areas, the Lago de Tucuruí Environmental Protection Area (5,687 km^2) and REBIO Gurupi (2,712 km^2). Conservation strategies for the species have been defined within the Brazilian *National Action Plan for the Conservation of the Amazonian Primates*. Creating more protected areas, to compose a mosaic including the REBIO Gurupi and four indigenous territories close to it (Alto Turiaçu, Awá, Caru, and Arariboia), is of utmost priority to protect some of the species' largest remaining habitats.

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NEOTROPICS – ECUADORIAN WHITE-FRONTED CAPUCHIN
Cebus aequatorialis J. A. Allen, 1914

Ecuador, Peru

Previously included on the list of 25 most endangered primates in 2018 and 2022.

Stella de la Torre, Fanny Cornejo, Felipe Alfonso-Cortes and Nathalia Fuentes

The Ecuadorian White-fronted Capuchin (*Cebus aequatorialis*) is a Critically Endangered primate found in western Ecuador and northwestern Peru from 0 to 2420 m.a.s.l. (Tirira 2017; Brito *et al.* 2018; Moscoso *et al.* 2021). The main threats to this species are forest loss and fragmentation, which have been particularly severe in western Ecuador, reducing its habitat. An assessment by Tirira (2021) estimated that the remaining area of native forests for the species in Ecuador is 10,701 km^2, representing an 83% reduction of its historical area of occurrence (distribution obtained according to the IUCN criteria) and a 75% reduction of its suitable habitat within the area of occurrence. Isolated forest fragments do not allow individuals to migrate from their groups, probably resulting in loss of genetic variability. Other threats include live capture for illegal pet trafficking and hunting, both for food and in retaliation, since it is considered a pest in plantations, mainly of corn (Cervera *et al.* 2018; Moscoso *et al.* 2021). In some mangrove areas, this species is persecuted by local people, who perceive this species to be a competitor in crab hunting (Cervera *et al.* 2018). In Peru, it is only found in a mosaic of protected areas that are under heavy pressure due to projects to build dams and expand agricultural land. Given the degree of fragmentation across the species' range, improving forest connectivity through biological corridors and restoration projects is imperative. It is also important to understand the relationships with capuchins and humans in different landscapes and identify the factors that may enhance coexistence over time. Conservation education and a close collaboration between Ecuadorian and Peruvian authorities, stakeholders, and scientists are key for the successful management and conservation of the species, emphasizing population monitoring and policies for its conservation.

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NEOTROPICS – GROVES' TITI

***Plecturocebus grovesi* Boubli *et al.* 2018**

Brazil (Mato Grosso)

Previously included on the list of 25 most endangered primates in 2022.

Jean Philippe Boubli, Christine Steiner S. Bernardo, Gustavo Rodrigues Canale, Thiago Borges Fernandes Semedo and Leandro Jerusalinsky

Groves' Titi Monkey (or zogue-zogue-de-Mato-Grosso), *Plecturocebus grovesi*, was recently described (Boubli *et al*. 2019) as an endemic species to the southern Brazilian Amazonia (in the Arinos and Juruena interfluvium) and possibly including the ecotonal zone with the Brazilian Cerrado in the state of Mato Grosso. Extensive monocultures (soya, maize, cotton), large-scale livestock farming, illegal mining, anthropogenic fires and large dams are widespread across the species' distribution, which overlaps with the Amazon's Arc of Deforestation, the Brazilian agribusiness frontier (Ferreira *et al*. 2014). Boubli *et al*. (2019) estimated a loss of 42% of forested habitat, excluding patches in the savannas, and 39% of the species' total range (forest and savannas). In addition, they forecast further habitat loss over the next 24 years, which will amount to 86% under a business-as-usual scenario. Therefore, Grove's Titi Monkey was classified as Critically Endangered in the IUCN Red List of Threatened Species (Boubli *et al*. 2020), due to a potential future population reduction over the next 24 years. Forest loss must be mitigated or avoided by using the species as a flagship for primate watching tourism and as a tool for biodiversity conservation, by the creation of private and governmental reserves, the enforcement of the law to protect forest set-asides ('legal reserves'), and the replacement of large areas of chemical-dependent monocultures of commodity crops by more sustainable models of land use, such as agroforests and agroecological food production. Forest degradation must also be avoided by preventing fires and logging by land-grabbers incited by the lack of enforcement. The few protected areas and Indigenous lands are located in the northern portion of the species' geographic distribution, and the central and southern portions are partially protected by fragile legislation like legal reserves, which are constantly attacked by the agribusiness lobby (Fernandes *et al*. 2017).

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NEOTROPICS – BUFFY-HEADED MARMOSET

***Callithrix flaviceps* (Thomas, 1903)**

Brazil (southern Espírito Santo, eastern Minas Gerais and extreme north of Rio de Janeiro)

Previously included on the list of 25 most endangered primates in 2022.

Fabiano R. de Melo, Rodrigo Salles de Carvalho, Mônica M. Valença-Montenegro and Leandro Jerusalinsky

The Buffy-headed Marmoset (*Callithrix flaviceps*) is a small primate endemic to the montane regions of the Atlantic forest in southeastern Brazil, and has the most restricted geographical distribution among all Neotropical primates. The species is threatened by habitat loss and severe fragmentation – mainly due to extensive cattle ranching and agriculture, expanding urbanization and tree plantations (*Eucalyptus* spp.), mining and dam construction – besides poaching for local pet trade (Melo *et al.* 2021, 2022). However, the most challenging threat facing the species – as it is for the other mountain marmoset, *C. aurita* – is the competition and hybridization with the currently abundant congeneric invasive species brought from other regions of Brazil and released in the species range (Melo *et al.* 2021, 2022). In addition, *C. flaviceps* suffered the impacts of a recent yellow fever epidemic, from

which at least one of the largest subpopulations was reduced by 90% (Possamai *et al*. 2022). These combined threats led to a drastic population reduction over the recent decades, and the total remnant population is estimated at less than 5,000 individuals, with no subpopulation having more than 250 mature individuals. Thus, *Callithrix flaviceps* is currently categorized as Critically Endangered on the IUCN Red List of Threatened Species (Melo *et al*. 2021). The National Action Plan for the Conservation of the Atlantic Forest Primates and the Maned Sloth (Brazil 2018) defined strategies for the species, counting with the support from the Mountain Marmoset Conservation Program, an interinstitutional initiative, to promote its effective implementation. One of the most urgent actions is the development of an integrated *in situ* and *ex situ* population management program, including the establishment of an insurance *ex situ* population with pure individuals, and future translocations. Priority conservation sites were identified, and the creation of protected areas in some of these is also crucial to maintain viable populations (Bataillard *et al.* 2024).

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APPENDIX 1

Tables for each major region showing the species on the lists of the World's 25 Most Endangered Species from 2000 to 2024

Table 1. The 22 Species from Madagascar included in the 12 editions of the World's 25 Most Endangered Primates since 2000 –2024.

	2000	02	04	06	08	10	12	14	16	18	22	2024	# eds.
Cheirogaleidae													
Microcebus berthae							■				■	■	3
Microcebus gerpi									■				1
Microcebus manitatra										■			1
Mirza coquereli												■	1
Cheirogaleus lavasoensis								■					1
Lepilemuridae													
Lepilemur jamesorum									■	■			2
Lepilemur septentrionalis					■	■	■	■			■	■	6
Lepilemur sahamalazensis				■									1
Lemuridae													
Hapalemur alaotrensis[1]	■							■	■	■			4
Hapalemur aureus	■												1
Prolemur simus[2]		■	■	■	■	■							5
Lemur catta									■				1
Eulemur cinereiceps[3]			■	■	■								3
Eulemur flavifrons					■	■	■				■		4
Varecia variegata						■							1
Varecia rubra							■	■				■	3
Indriidae													
Propithecus coquereli											■		1
Propithecus tattersalli	■												1
Propithecus candidus	■	■	■	■	■	■	■						7
Propithecus perrieri	■	■	■					■	■				5
Indri indri							■			■			2
Daubentoniidae													
Daubentonia madagascariensis									■	■			2
Species per edition	5	3	4	4	5	5	6	5	6	5	4	4	**56**

[1] Included as *Hapalemur griseus alaotrensis* in 2000.
[2] Included as *Hapalemur simus* in 2002.
[3] Included as *Eulemur albocollaris* in 2004 and 2006.

Table 2. The 23 species from continental Africa included in the 12 editions of the World's 25 Most Endangered Primates since 2000.

	2000	02	04	06	08	10	12	14	16	18	22	2024	# eds.
Galagidae													
Paragalago orinus[1]			■						■				2
Paragalago rondoensis[2]				■		■	■	■		■	■	■	8
Cercopithecidae													
Cercocebus galeritus[3]		■											1
Cercocebus chrysogaster											■	■	2
Cercocebus sanjei[4]	■	■	■										3
Cercocebus lunulatus[5]	■	■	■										3
Mandrillus leucophaeus	■												1
Rungwecebus kipunji				■	■					■			3
Erythrocebus baumstarki											■	■	2
Cercopithecus roloway[6]		■		■	■	■	■	■	■	■	■		9
Cercopithecus erythrogaster												■	1
Cercopithecus sclateri	■												1
Colobus vellerosus									■	■			2
Piliocolobus waldroni[7]	■	■		■									3
Piliocolobus pennantii[8]			■	■		■	■						4
Piliocolobus epieni[9]					■	■			■	■	■	■	6
Piliocolobus preussi								■					1
Piliocolobus rufomitratus[10]		■	■	■	■		■	■		■			7
Hominidae													
Gorilla gorilla diehli	■	■	■	■	■							■	6
Gorilla beringei beringei[11]	■	■	■										3
Gorilla beringei graueri						■	■	■	■				4
Pan troglodytes ellioti											■		1
Pan troglodytes verus										■			1
Species per edition	7	8	7	7	6	5	5	5	5	7	6	6	74

[1] Included as "Galagoides sp. (Mt. Rungwe galago)" in 2004, as the population recorded at Mount Rungwe had yet to be described as a new species.
[2] Included as *Galagoides rondoensis* form 2006 to 2014, as the species was grouped in this genus before the validation of the genus *Paragalago*.
[3] Included as *Cercocebus galeritus galeritus*, as it was previously considered a subspecies of *C. galeritus*.
[4] Included as *Cercocebus galeritus sanjei* in 2000 and 2002, as it was previously considered a subspecies of *C. galeritus*.
[5] Included as *Cercocebus atys lunulatus*, as it was previously considered a subspecies of *C. atys*.
[6] Included as *Cercopithecus diana roloway* in 2002, 2006, 2008, 2010, 2014 and 2016.
[7] Included as *Procolobus badius waldroni* in early editions.
[8] Included as *Procolobus pennantii pennantii* in 2006 and 2008, and as *Piliocolobus pennantii pennantii* in 2010 and 2012.
[9] Included as *Procolobus epieni* in 2008.
[10] Included as *Procolobus rufomitratus* in 2002, 2004 and 2006, and as *Procolobus rufomitratus rufomitratus* in 2008.
[11] Included as *Gorilla gorilla beringei* in 2000.

Table 3. The 33 species from Asia included in the 12 editions of the World's 25 Most Endangered primates since 2000.

	2000	02	04	06	08	10	12	14	16	18	22	2024	# eds.
Lorisidae													
Loris tardigradus nycticeboides			■	■									2
Nycticebus javanicus					■	■	■	■	■	■	■		7
Xanthonycticebus intermedius												■	1
Tarsiidae													
Carlito syrichta								■					1
Tarsius tumpara				■	■	■							3
Tarsius pumilus							■						1
Tarsius sangirensis											■	■	2
Cercopithecidae													
Macaca silenus						■							1
Macaca nigra									■				1
Presbytis femoralis											■	■	2
Presbytis chrysomelas												■	1
Presbytis canicrus[1]			■										1
Presbytis natunae		■											1
Pygathrix cinerea[2]	■	■	■	■	■	■	■						7
Rhinopithecus avunculus	■	■	■	■	■	■	■	■	■				9
Rhinopithecus bieti		■											1
Rhinopithecus brelichi		■									■		2
Rhinopithecus strykeri												■	1
Simias concolor		■	■	■	■	■	■	■	■	■		■	10
Semnopithecus ajax								■					1
Semnopithecus vetulus[3]			■	■	■	■	■	■	■	■	■		9
Trachypithecus geei									■	■			2
Trachypithecus poliocephalus[4]	■	■	■	■	■	■	■	■	■	■	■	■	12
Trachypithecus leucocephalus		■											1
Trachypithecus delacouri	■	■	■	■	■	■	■	■					8
Hylobatidae													
Hoolock hoolock				■	■								2
Hoolock tianxing										■	■		2
Hylobates moloch	■												1
Nomascus nasutus		■			■	■	■					■	5
Nomascus hainanus[5]	■		■	■				■	■				5
Hominidae													
Pongo pygmaeus[6]						■			■				2
Pongo abelii	■	■	■	■	■			■					6

Table 3. *Cont'd.*

	2000	02	04	06	08	10	12	14	16	18	22	2024	# eds.
Pongo tapanuliensis													3
Species per edition	7	11	10	11	11	11	9	10	9	7	8	9	**113**

[1] Included as *Presbytis hosei canicrus*.
[2] Included as *Pygathrix nemaeus cinerea* from 2000 to 2008.
[3] From 2004 to 2014, only the subspecies *Semnopithecus vetulus* nestor was included.
[4] Included as *Trachypithecus poliocephalus poliocephalus* in 2010, 2014 and 2016.
[5] Included as *Hylobates concolor hainanus* in 2000.
[6] In 2010, only the subspecies *Pongo pygmaeus pygmaeu*s was included.

Table 4. The 23 Species from the Neotropics included in the 12 editions of the World's 25 Most Endangered primates since 2000.

	2000	02	04	06	08	10	12	14	16	18	22	2024	# eds.
Callitrichidae													
Callithrix aurita										■			1
Callithrix flaviceps											■		1
Saguinus bicolor										■		■	2
Oedipomidas oedipus[1]					■								1
Leontopithecus rosalia	■												1
Leontopithecus chrysopygus	■												1
Leontopithecus caissara	■	■	■										3
Cebidae													
Saimiri oerstedii[2]												■	1
Sapajus xanthosternos[3]	■	■	■										3
Sapajus flavius[3]						■							1
Cebus kaapori							■	■	■		■		4
Cebus aequatorialis										■	■		2
Pitheciidae													
Plecturocebus olallae										■		■	2
Plecturocebus oenanthe[4]							■	■					2
Plecturocebus caquetensis									■				1
Plecturocebus grovesi											■		1
Callicebus barbarabrownae						■						■	2
Atelidae													
Alouatta guariba[5]							■	■	■	■	■		5
Ateles geoffroyi[6]									■	■	■		3
Ateles fusciceps[7]				■			■	■	■		■		5
Ateles hybridus[8]			■	■	■	■	■	■				■	7
Lagothrix flavicauda[9]	■			■	■	■						■	5
Brachyteles hypoxanthus	■	■	■										3
Species per edition	6	3	4	3	3	4	5	5	5	6	7	6	**57**

[1] Included as *Saguinus oedipus*, since it was before the genus *Oedipomidas* was revalidated.
[2] Included as species *S. oerstedii*, with its two subspecies: *S. o. oerstedii* and *S. o. citrinellus*.
[3] Included as *Cebus flavius* and *Cebus xanthosternos*, since it was before the revalidation of the genus *Sapajus* for the robust capuchin monkeys.
[4] Included as *Callicebus oenanthe* in 2012 and 2014, since it was before the description of the genus *Plecturocebus*.
[5] From 2012 to 2016 only the subspecies *Alouatta guariba guariba* was included, but in 2018 and 2022 the species *A. guariba*, with the two then recognized subspecies *A. g. guariba* and *A. g. clamitans*, was included.
[6] Included as species *A. geoffroyi*, with its six subspecies: *A. g. geoffroyi*, *A. g. azuerensis*, *A. g. ornatus*, *A. g. frontatus*, *A. g. vellerosus*, *A. g. grisescens*.
[7] In 2012 and 2014 only the subspecies *Ateles fusciceps fusciceps* was included, but in 2006, 2016 and 2022, the species *A. fusciceps*, with the two then recognized subspecies *A. f. fusciceps* and *A. f. rufiventris*, was included.
[8] In 2004, the subspecies *Ateles hybridus bruneus* was included.
[9] Included as *Oreonax flavicauda* in 2006 and 2008, since *Oreonax* was then considered a valid and monotypic genus.

APPENDIX 2

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