

BUFFY SAKI

Pithecia albicans (Gray, 1860)**Synonymy**

- 1860 *Pithecia albicans* Gray, J. E. *Proc. Zool. Soc. Lond.*, p.231, pl.81.
 1863 *Pithecia albicans* Bates, H. W. *The Naturalist on the River Amazons*, vol. 1, Figs. p. 306, 314.
 1987 *Pithecia albicans* Hershkovitz, *P. Am. J. Primatol.* 12: 431, for further synonymy.

Holotype. British Museum of Natural History, No. 60.4.16.3, adult male, collected by H. W. Bates, 1862.

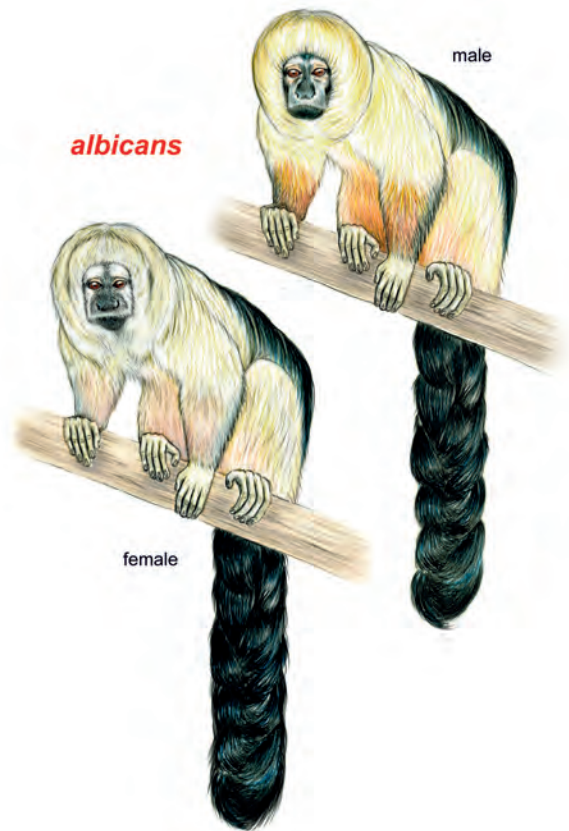
Paratypes. Hershkovitz (1987) reports “syntypes” of skins and skulls at BMNH of a male, a female, and “young”, but it is unclear which numbers are assigned as none are designated as such currently. Specimens available: Nos. 27.8.11.17 (M), 34.6.16.10 (F), 26.5.5.6 (F), 26.5.5.5 (F), 26.5.5.3 (M), 26.5.5.4 (F), 26.5.5.2 (M), 27.8.11.18 (M), 26.5.5.1 (M), collected by W. Erhardt between 1925 and 1927. All are undisputed representatives of the species, and can be accepted as types per this taxonomy. Additional specimens from Erhardt’s expedition are in the Museum für Naturkunde, Berlin (Nos. 35768, 35769, 35770, 35308, 35767, 46146).

Type localities. Holotype: Rio Tefé, Tefé Lake, south bank of the Rio Solimões, Amazonas, Brazil. Syntypes: Amazonas, Rio Solimões, Rio Purus, Ayapúa.

Specimens examined. Forty-two museum specimens, skins and skulls; wild photo references from A.D. Johns, and photos of captive sakis by R.A. Mittermeier; and observation of a captive specimen by L.K. Marsh (São Paulo Zoo, São Paulo).

Description. These sakis are the most distinct in the genus due to the obvious coloration and larger size. Males and females are very similar, with predominantly orange to blonde pelage, which in adults is lighter dorsally and darker ventrally on the heads, arms, legs. Ventral chest/belly hairs are sparse. The back is black extending from the nape of the neck to the tip of the tail. The tail is entirely black. The wrists often have black short hairs, the hands are off-white, and the feet off-white. Adult males and females have large throat scent-gland patches ringed in a light orange ruff that is more pronounced in males.

Males. The facial skin is mostly black, with small “bare” pinkish skin patches above the eyes, distinct white to cream eyebrows, and stiff white to cream upper lip hairs. The muzzle has dispersed whitish hairs, not in a distinct line. Ventrally, adult males have testicles that are light cream to buffy, often with black speckles, and on their kneecaps,



what appear to be calluses (obvious on intact specimens both living and stuffed, Fig. 70).

Females. The facial skin is black, also with white to cream eyebrows but with white malar stripes that often extend out in short white to cream hairs to the cheeks. Older females have more white covering the face than juveniles or sub-adults, and may include a short ring of white to off-white hairs around the outside of the face, making the face in some cases appear to be nearly entirely covered in white hairs.

Diagnosis. *Pithecia albicans* is the “most derived” (*sensu* Hershkovitz [1987], p.431) of all saki species in that they are the most distinct in pelage. They share some of the buffy characteristics of *P. vanzolinii*, but as Hershkovitz (1987) notes, “the differences in coloration [...] are wide, and the gap between the incompletely known geographic ranges of the two taxa are also wide” (p. 431).

Measurements. See Tables 20 and 21.

Distribution. Map 11. *Pithecia albicans* occurs only in Brazil. Hershkovitz (1987) places it between the lower Rio Purus and Rio Tefé, south bank tributaries of the upper Rio Solimões-Amazonas, Amazonas, Brazil. Per the specimen localities studied for this revision, this distribution is accepted specifically noting collections near Lago Tefé, Lago Ayapuá, Lago de Boia, and Jaburú on the left bank of the Rio Purus. Johns (1985, 1986) observed *P. albicans* in terra firma forest on both sides of the Rio Tefé, and principally at the Ponta da Castanha (3°32'S, 64°58'W) on the eastern side of the lake. They also occur along the Rio Bauana, a

tributary entering the lake on its eastern shore (A.B. Rylands, pers. comm. in Johns 1986). Peres (1997) observed *P. albicans* west of the Rio Tefé, at a locality called Vai Quem Quer, in terra firma on the right bank of the lower Rio Juruá, 3°19'S, 66°01'W.

Specific locations. Appendix I. BRAZIL. Amazonas: Rio Purus – Lago Ayapuá, Ayapuá town, Jaburú; Rio Tefé; Tefé town; Lago de Boia; Lago Tefé – Ponta da Castanha.

Table 20. General measurements for syntypes (BMNH, London) and other specimens of *Pithecia albicans* from NHRM, Stockholm. All measurements in mm.

Specimen	Location	Age/sex	Total	Tail	Hind
BMNH 27.8.11.17	Lago Ayapuá	M	920	430	–
BMNH 34.6.16.10	Lago Ayapuá	F	880	–	–
BMNH 26.5.5.6	Lago Ayapuá	F	980	460	–
BMNH 26.5.5.5	Lago Ayapuá	F	1050	530	–
BMNH 26.5.5.3	Lago Ayapuá	M	1030	460	–
BMNH 26.5.5.4	Lago Ayapuá	F	1030	490	–
BMNH 26.5.5.2	Lago Ayapuá	M	930	420	–
BMNH 27.8.11.18	Lago Ayapuá	M	860	400	–
BMNH 26.5.5.1	Lago Ayapuá	M	1070	510	–
NHRM A62-0158	Lago Ayapuá	F	460	420	103
NHRM A62-0178	Lago Ayapuá	M	510	500	132
NHRM A62-0293	Lago Ayapuá	F	990	490	–
NHRM A63-0169	Lago Ayapuá	M	890	–	–
NHRM A62-1202	Jaburú	Juvenile F	795	405	120
NHRM A63-1205	Jaburú	Subadult M	820	416	120
NHRM A62-1207	Jaburú	Subadult F	810	440	115
NHRM A62-1213	Jaburú	Subadult F	820	415	120
NHRM A62-1215	Jaburú	Juvenile F	805	440	100
NHRM A62-1236	Jaburú	M	850	455	125
NHRM A62-1240	Jaburú	Juvenile F	820	455	125
NHRM A63-1212	Jaburú	F	800	415	110

* All locations are: Brazil, Amazonas, west of the Rio Purus, south of the Rio Solimões.

Table 21. Skull measurements of example specimens of *Pithecia albicans* from NHRM, Stockholm.

Skull Measurements (mm)	Male NHRM A62-0178	Male NHRM A62-1236	Subadult female NHRM A62-1240
Total length	84.3	81.1	80.9
Breadth of braincase	43.9	42.6	42.8
Zygomatic breadth	56.6	53.9	53.7
Orbital breadth	45.0	43.9	43.0
Nasal breadth mid-orbit	0.71	0.58	0.75
L-orbit inner width	17.0	17.4	18.2
L-orbit inner height	16.4	17.7	18.4
Breadth of rostrum at canines	24.8	24.3	23.4
L-mandible length	53.0	51.7	48.3
L-mandible height	44.1	38.0	36.6

Discussion. Hershkovitz (1987) and others use the term “buffy” to mean white, off-white, cream, and tan. The definition used here and throughout this text for buffy is based on the original tanned hide definition of “yellow brown” or blonde. Thus, the buffy saki is one which is principally blonde in color, a yellowish brown, not white nor cream *per se*.

It will be interesting to study the relationship with *P. irrorata* in the northern reaches of its range in Brazil (west of the Rio Purus and west of the Rio Juruá), *P. albicans* throughout its range, and *Cacajao calvus calvus* as a possible evolutionary explanation for why *P. albicans* is so derived. Strictly from an armchair observation, it seems as though *C. c. calvus* at some point in time may have bred with the *Pithecia* in the area. Likewise for *P. vanzolinii* further south, it will be interesting to study whether the “in between” resemblance of *P. irrorata* and *P. albicans* has anything to do with a long ago cross-breeding event or if this extremely different color variation was just a fluke of genetics.

In 2008, *Pithecia albicans* was classified as Vulnerable (VU) on the *IUCN Red List of Threatened Species* (Viega *et al.*, 2008). In 1993, Peres reported the population of *P. albicans* in the upper Rio Urucú to be 8.8 individuals/km². In 2005, Haugaasen and Peres reported an average of 2.2 individuals/km² in the lower Purus watershed at Lago Uauaçú with slightly higher results for terra firma (3.3 individuals/km²) and igapó (4.6 individuals/km²), but lower for várzea (0.8 individuals/km²). By all accounts, the population is low if not drastically declining. Research is needed for all areas where *P. albicans* occurs.



Figure 64. Original plate LXXXI of *Pithecia albicans* from Gray (1860).



Map 11. Geographic distribution of *Pithecia albicans*.

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|--------------------------------|---------------------------|--|
| 1. Lago Tefé | 4. Lago de Boia (approx.) | 7. Lago Uauaçú (approx. location of Coari) |
| 2. Ponta da Castanha (approx.) | 5. Rio Uruçú | 8. Lago Ayapuá |
| 3. Rio Tefé | 6. Jaburú (approx.) | |



Figure 65. *Pithecia albicans*. Holotype skin, adult male, BMNH 60.4.16.3. Photos by L.K. Marsh.



Figure 66. *Pithecia albicans*. Holotype BMNH 60.4.16.3 skull. Photos by L.K. Marsh.



Figure 67. *Pithecia albicans*. Adult female syntype BMNH 26.5.5.4. Photos by L.K. Marsh.



Figure 68. Captive adult male *Pithecia albicans*. Photo by R.A. Mittermeier.

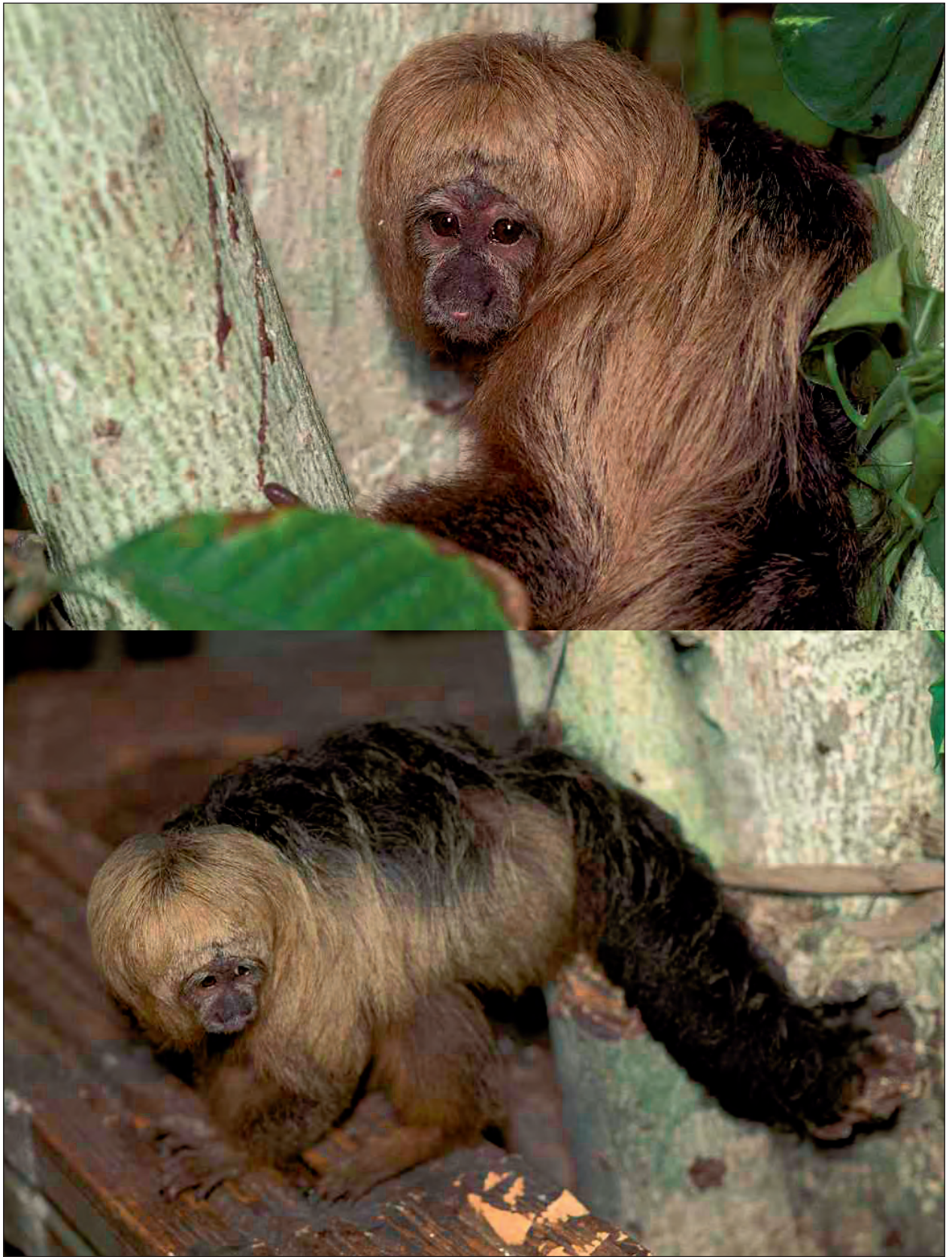


Figure 69. *Pithecia albicans* juvenile female pet in the town of Tefé, Amazonas State, Brazil. Photo by L.C. Marigo.



Figure 70. *Pithecia albicans*, adult male underside, showing “calloused knee caps,” BMNH No. 26.5.5.1. Photo by L.K. Marsh.

GRAY'S BALD FACED SAKI

Pithecia irrorata (Gray, 1842)**Synonymy**

- 1842 *Pithecia irrorata*. Gray, J. E. *Ann. Mag. Nat. Hist., 1st series*, 10: 256.
- 1844 Gray, J. E. "The Yarke." *List of the Specimens of Mammalia in the Collection of the British Museum*, p.14, pl. 3.
- 1976 *Pithecia irrorata*. Napier, P. H., *Catalogue of Primates in the British Museum (Natural History), Part 1: Families Callitrichidae and Cebidae*. British Museum (Natural History), London. Holotype No. 101a; p.69.
- 1987 *Pithecia irrorata*. Hershkovitz, P. *Am. J. Primatol.* 12: 425–426, for further synonymy.
- 2013 *Pithecia hirsuta*. Van Roosmalen, M. G. M. and Van Roosmalen, T, 2013. *On the Origin of Allopatric Primate Species and the Principle of Metachromic Bleaching*. E-book, printed privately, p.63.

Holotype. Hershkovitz (1987) used Gray's (1843) description from vol. 1, color plate 3. No precise specimen was identified, but according to Napier (1976), the type is BMNH No. 101a: adult male, skin and skull.

Type locality. "Tropical America" also said to be "Brazil" (Gray, 1843, p.13), but based on evidence from the actual voyage accounts, it is most likely that the type was procured in Peru (see "Discussion" below).

Key specimens. FMNH No. 98040, adult male, skin and skull, collected by C. Kalinowski, 23 August 1961 and FMNH No. 93534 adult male, skin and skull, collected by C. Kalinowski, 20 October 1960; both from Peru, Madre de Dios, Río Manu, Altamira, 350–400 m. NNMN No. 409 mount, Catalog Nos. 2 & 6, without collector information and date (on specimen) from "Perou Septentr" (implying northern Peru, but without more details on the collector it is difficult to estimate location, even though truly north in Peru is unlikely). MZSP No. 19683 adult male skin collected by J. Hidasi, 24 May 1968, from Brazil, Rio Branco, Acre, the latter at "Fazenda Campo Lindo." MNRJ No. 3317, adult female, skin and skull, collected by C. Lako, June 1931 from Brazil, Lago do Mapiocu, west of the Rio Purus, assigned by gazetteer as Rio Mapixi (Paynter and Traylor 1991). NHRM No. 1153, large juvenile female, skin and skull, collected by A. Olalla, 20 October 1935 from Brazil, Rio Purus, Arumá.

Specimens examined. Forty-seven skins and skulls, and photographs of living animals in Peru by T. Gregory and tourist photos, and in Brazil by J.C. Bicca-Marques and F. Cardoso.



Description. Transitional juveniles are not as divergent as they are in some species.

Males. Overall, the pelage is black as in most sakis, with longer bands of white grizzling throughout ("irrorata" means "sprinkled") that vary in density with the age of the animal and location. For instance, the *P. irrorata* in Brazil, particularly older males in Acre, appear to be very grizzled with white. A distinct white crown "headband" or "bangs" is present—white tips of the nape whorl—but it is not dense as in *Pithecia rylandsi* sp. nov. In subadults, this line seems to trace down the sides toward the shoulders. The forearms can be brownish to white depending on the region they are from. *Pithecia irrorata* in Peru, particularly those distant from the Brazilian border, appear to be much browner on the forearms than those north of the Río Tahuamanu. The hands and feet are white. The faces are "pink" or unpigmented with a dark muzzle outlined by noticeable, but fine, short-haired, white malar stripes. Otherwise the hair on the face is lacking or sparse overall. In Peru, animals collected in the early 1960s near the Río Manu/Río Madre

de Dios confluence (at Altamira, which no longer exists as that name) were most similar to the type in their faces, even though they were more grizzled white than the type. The sakis further west as far as the Río Urubamba seem to have darker faces as adults, but resemble the juvenile form. *Pithecia irrorata* from Acre, near Xapuri and Rio Branco, are more similar to the type in that they have pink faces with black muzzles, but are more grizzled in their pelage. In general, males can have darker facial skin as they age, but it never approaches the blackness seen in *P. rylandsi* sp. nov., nor does their pelage become as white as in *P. rylandsi* sp. nov. All *P. irrorata* males have a pronounced ruff ranging from bright orange to dull orange/light tan. Juvenile males can be browner, with grizzling throughout the dorsal pelage. Their facial skin is “pink-black,” where they appear dark, but not black, with lighter pink highlighting around the eyes that is not nearly as contrasting as it is in *P. mittermeieri* sp. nov. or *P. rylandsi* sp. nov. juveniles (of either males or females). There is some light white hair on the face above the eyes, and a light “headband” or bang-line that is so distinct in adults is just forming in juveniles.

Females. Overall, the pelage is similar to that of males, where the forearms are very brownish, but not extensively buffy as in *P. vanzolinii*. They are browner across the front of the shoulders and chest, but do not have a defined light ruff. Young females have very black facial hair around the face with some white in the center of the forehead and a small amount above the eyes. In older adults in Peru, the faces can become grayer. Females in Acre can have an

overall body grizzling that is much whiter, approaching more of a *P. rylandsi* sp. nov. look, with faces retaining the very black facial hair (see “Discussion”). The skin of the face on young *P. irrorata* can be pinkish-black, but becomes blacker with age.

Measurements. See Table 22. Additional information: Adult male collected by R. Aquino, (AQ 21.4.88) on 21 April 1988 at San Lorenzo, Peru, weighed 2.5 kg and had an upper right canine tooth length of 10.1 mm.

Diagnosis. *Pithecia irrorata* differs significantly from the other bare-faced sakis in the region: *P. vanzolinii* and *P. rylandsi* sp. nov. *Pithecia irrorata* lacks the obvious buffy forearms and hindlimbs of *P. vanzolinii* and the very black faces, extreme extent of white pelage grizzling, and size of *P. rylandsi* sp. nov. *P. irrorata* have obvious orange ruffs, something *P. rylandsi* sp. nov. lacks, but *P. vanzolinii* loosely shares this feature in that it has a buffy-orange ruff to go with its buffy forearms. And while *P. irrorata* males in the wild may appear to have dark faces, they are mostly unpigmented except for their black muzzle. *Pithecia irrorata* females differ from either aforementioned species in that up through the subadult class they have black hair surrounding their faces similar to *P. vanzolinii* females, but as they age this ring can become grizzled with white, something that does not appear to happen in *vanzolinii* females. *Pithecia rylandsi* sp. nov. adult females have nearly naked, black faces with scant black hairs along the sides of the face, and can have white distinct eyebrows and pinkish to grey eyespots.

Table 22. Measurements for male *Pithecia irrorata* paratypes FMNH 98040, FMNH 93534 and female paratypes MNRJ No. 3317 and NHRM A62-1153.

Measurement	FMNH 98040 Male	FMNH 93534* Male	MNRJ 3317‡ Female	NHRM A62-1153 Female
Skull (mm)				
Length of brain case	85.14	79.99	83.3	77.1
Width of brain case	45.97	48.51	42.5	44.3
Zygomatic arch width	56.88	61.63	54.3	51.8
Orbits-outer	45.90	44.75	45.9	39.2 (est.)
Nose bridge	6.88	7.95	8.5 (est.)	0.78
L-orbit inner width	18.51	16.00	16.7	18.4
L-orbit inner height	18.71	17.84	17.0	18.2
Muzzle width	24.38	27.97	25.7	23.2
L-mandible length	59.80	63.19	45.8	48.8
L-mandible height	39.49	41.63	31.3	32.8
Canine length	11.44	13.87	–	–
Post-crania (mm)				
Head-body	419	440	490	440
Tail	496	455	480	407
Hind foot	131	127	130	101
Ear	32	37	18	–

*Top of braincase missing.

‡Occiput and bottom missing, nose broken on right side.

^ Right orbit broken.

Distribution. Map 12. In Brazil, *P. irrorata* follows the west side of the Rio Purus, south to Acre. Specifically there are specimens from Lago Mapiocu (likely Lago Mapixi) and Arumá in the northern reaches, and Rio Branco and Xapuri in the south. While it is tempting to say they are in the entire region between the rios Juruá and Purus, there are not enough specimens to support this, especially as the southern reaches of upper Juruá are where *P. vanzolinii* is found, and the north-west pocket between these rivers is where *P. albicans* can be found around Tefé and, as of 1935, at Jaburú on the Rio Purus. It is unknown where the boundaries lie with *P. vanzolinii* in the upper Rio Juruá watershed or *P. albicans* in the lower Rio Purus. It is also unknown if *P. irrorata* is found currently further east of the upper Rio Madeira in the southern-most reaches of Rondônia (see “Discussion”).

In Peru, they are primarily in the Manu region, west of the Río Manu and south of the upper Río Madre de Dios, west of the Manu confluence. They extend to the lower Río Urubamba and are likely to occur in all areas north-east of the ríos Urubamba/alto Madre de Dios/Manu to the Brazil border where, theoretically (as there are no specimens of either in the area) they would meet with *P. vanzolinii*. More data is needed on sakis in this region. Likewise, it is unclear how far east in Peru they extend, as *P. rylandsi* sp. nov. appears to be in the Los Amigos/Madre de Dios Conservation Concessions. Of note is an adult male *P. irrorata* collected by R. Aquino in San Lorenzo, Peru, near the Bolivian border that is very similar to the type. It is unclear where exactly it was collected and on which side of the Río Tahuamanu, but it is clear that somewhere near there is a population of *P. irrorata*, even though *P. rylandsi* sp. nov. is just over the border in the Pando (cf. *P. rylandsi* sp. nov.).

Their full distribution is unknown, but Cocha Cashu in their 2008 mammal census list *P. irrorata* (and I believe the sakis in this region are mostly likely *P. irrorata*) as “rare”: http://www.duke.edu/~manu/Home/list_of_species/mammals.htm.

Specific locations. Appendix I. PERU. *Ucayali*: Río Urubamba. *Madre de Dios* – Altamira; Río Tahuamanu – San Lorenzo. BRAZIL. *Amazonas*: Rio Purus – Lago do Arumá, Lago do Mapiocu/Mapixí. *Acre*: Xapuri; Rio Branco – Fazenda Campo Lindo.

Discussion. Hershkovitz (1987) describes the history of the type specimen thus:

“The formal description of *P. irrorata* appeared in Gray’s 1843 report on the mammals collected between 1836 and 1842 during the globe-encircling voyage of H.M.S. Sulphur. Precisely where, when, how or by whom the bare-faced saki was acquired is unknown. In any event, Gray’s 1842 reference to *P. irrorata* was evidently in anticipation of his 1843 report [Gray, 1843b].” (p.409). In the species account he reported that the holotype was “acquired,

probably in early 1836, on the voyage of H.M.S. Sulphur.” and restricted it “to west (left) bank Rio Tapajós, Parque Nacional da Amazônia, Pará, Brazil.” (p.426).

However, animals in this area do not resemble the type as closely as the sakis further south. Hershkovitz found no reference to the holotype during the accounts of the voyage of H.M.S. Sulphur, neither did C. P. Groves nor A.B. Rylands (pers. comm.). Hershkovitz reported that the Sulphur stopped in Rio de Janeiro, but I could not find any explorations by Belcher or the Sulphur into South America other than Colonial Peru where it is likely the saki specimen is from. However, I do agree with Hershkovitz that likely the holotype of *P. irrorata* was purchased live in a market by one of the crew and was brought on board as a pet, if it ever really was on board the ship at all. It is equally probable that “Brazils” was synonymous to “South America” at the time, and does not necessarily put the type in the actual country of Brazil (C.P. Groves, pers. comm.).

In Hershkovitz’s 1987 paper, *Pithecia irrorata* was not clearly defined (except by implication in his dichotomous key, p. 416), and he went straight to the level of subspecies denotation since he added *P. i. vanzolinii* to the species, as he did in cases where he recognized polytypic species. Much like *P. monachus*, any bald-faced saki was placed under *irrorata* in a “catch all” manner. It is interesting to speculate at this point on the features in the *irrorata* of Peru, particularly those that have browner forearms and darker faces in the males and the black hairs around the face of females, as these features are reminiscent of *P. vanzolinii*. It is possible that the animals in this region are color morphs, subspecies, or different species as they deviate from type.

There is much work to be done on *P. irrorata* throughout its range. The animals in the state of Acre appear to have more grizzling in their overall pelage than those in Peru, especially one female: MPEG No. 8926, skin only, collected by Flavio Pimenta, 29 January 1971. It is unknown if *P. irrorata* gets whiter with age as does *P. rylandsi* sp. nov., but it does seem clear it never approaches the extreme pelage change that is shown by *P. rylandsi* sp. nov.

Comissão Rondon sakis. Adding to the mystery of *irrorata* in Brazil, particularly in Rondônia and Mato Grosso, are collections from the Comissão Rondon (1909–1914), collected largely throughout the Rio Aripuanã/Rio Roosevelt–Rio Jamari region that are poorly preserved, but are worthy of further scrutiny. For now they are provisionally added into *P. irrorata* (for general appearance and skull features). It is entirely possible that these animals are a legacy population from 100 years ago that are no longer there—except perhaps as contributing to a new species in the UHE Samuel region as possible hybrids (cf. Rio Jamari sakis, Appendix II), or are poorly preserved *P. mittermeieri* sp. nov. as their location suggests (cf. *P. mittermeieri* sp. nov.).

Furthermore, it is interesting to note that there are some legacy specimens collected as part of the Comissão Rondon (in 1912) that are at present rolled into *P. irrorata*. These are a juvenile female, skin and skull (MNRJ 3322) and adult male, skin and skull (MNRJ 3339) both from São Manuel/Rio Teles Pires. Although not immediately easy to determine based on their skulls, as both are broken, by their skins they could easily be similar to the more recently collected animals along the Jacaréacanga highway. It is entirely possible that all of these specimens belong in *P. mittermeieri* sp. nov. based on location, and are artifacts of the preservation process. Certainly, more research needs to be done both on the legacy material and the present day populations in the region.

Sakis from Jacaréacanga. Sakis collected in the early 1970s immediately after the construction of the BR 230 Trans-Amazonica highway between Itaituba and Jacaréacanga on the Río Tapajós have some interesting variations—which could be due to them being a different species, color morphs, or subspecies, or they may be merely remnant populations of *P. irrorata*. Specimens at the Smithsonian collected by F.D. Pinheiro on 17 July 1972 at km 19 appear to be most similar to *P. mittermeieri* sp. nov. based on a hairy-faced female in the group (SMITH Nos. 461705, 461706), but animals collected on 19 July 1972 presumably from the same location or nearby (km 19), likely by Pinheiro as well, are quite different. MPEG No. 8150 is a large female with an incomplete skull, but it appears to be adult. She looks similar to *P. irrorata* females or subadult *P. mittermeieri* sp. nov. with very black fur around the face, white bangs, and not very much grizzling throughout the pelage. MPEG No.

21536 is an adult male, which in pelage looks intermediate between *P. mittermeieri* sp. nov. and *P. irrorata*, where there is a moderate amount of white grizzling, the forearms are slightly more densely covered, there is a prominent orange ruff—and it has a completely pink face! On km 212, collections on 29 November 1973, by an unknown collector are nearly identical to the km-19 animals—MPEG 8149 another adult male—this one showing some fine hairs on the face in a pattern somewhat similar to *P. mittermeieri* sp. nov. and another adult female, MPEG 21537 nearly identical to MPEG 8150. There are two small juvenile females also from km 212 in the Smithsonian Collection, likely collected by whomever collected the others in 1973 (or perhaps 1972)—SMITH Nos. 461918, 461919—both juvenile females, both appear to have furry faces, but could be either young of these “other” sakis or of *P. mittermeieri* sp. nov.

East of the Rio Tapajós. While it is entirely possible that sakis east of the Rio Tapajós are not related at all to *P. irrorata* or *P. mittermeieri* sp. nov., one of the two specimens is similar to the Tapajós females: MZSP No. 3632, subadult female, skin and skull, from Fazenda Marau, Santarém (according to E. Garbe in 1920 this was about four hours away from Santarém, in the foothills). And the other: MPEG No. 8152, a juvenile female, skin only, resembles a juvenile form of the pink-faced *irrorata*-like indeterminate sakis from the Jacaréacanga region.

A great deal more research is needed to determine not only where the legacy animals properly align, but if there are any remaining “true” *irrorata* left in the southern regions of Brazilian Amazon.



Figure 71. *Pithecia irrorata*. J. E. Gray's presumed type, from *The Zoology of the Voyage of the HMS Sulphur During the Years 1836–42, Mammalia*, Plate III, by R.B. Hinds (1843), and as referenced by Hershkovitz (1987) as the nominal holotype.



Map 12. Geographic distribution of *Pithecia irrorata*.

- | | | |
|---|---|---|
| Peru | 5. Altamira, Rlo Manu (location by gazetteer, Stevens & Traylor 1983) | Brazil |
| 1. Rio Urubamba | 6. Rio Manu | 8. Xapuri - Acre |
| 2. lower Rio Urubamba (T. Gregory Field Site) | 7. San Lorenzo | 9. Rio Branco - Acre |
| 3. Parque Nacional Manu | | 10. Rio Purus, Lago Mapixi |
| 4. Cocha Cashu | | 11. Reserva de Desenvolvimento Sustentável Piagaçu-Purus |
| | | 12. Rio Purus – Aruma (location by gazetteer, Paynter & Traylor 1991) |



Figure 72. *Pithecia irrorata*. BMNH London type No. 101a, skin.



Figure 73. *Pithecia irrorata*. BMNH London type No. 101a, skull.

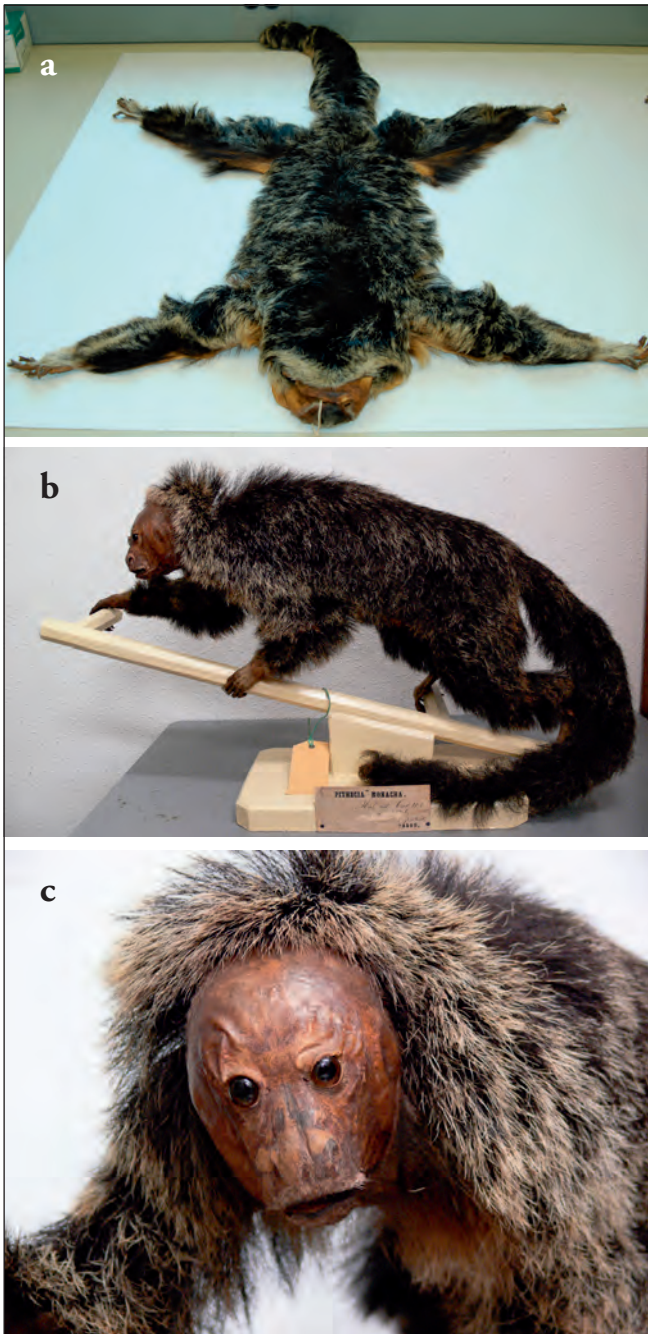


Figure 74. *Pithecia irrorata*. (a) Adult male, FMNH No. 98040, skin, Altamira, Rio Manu, Peru, and (b-c) subadult male/large juvenile, NNMN Leiden No. 409 mount and detail, Peru.



Figure 75. *Pithecia irrorata*. (a) Captive (pet) adult male, Rio Branco, Acre, Brazil, photo by J.C. Bicca-Marques, and (b) Juvenile male *Pithecia irrorata* pet in Iquitos, photo by Science Photo Library (<http://www.sciencephoto.com/media/384772/view>).



Figure 76. *Pithecia irrorata*. Adult female MNRJ No. 3317, skin and skull.

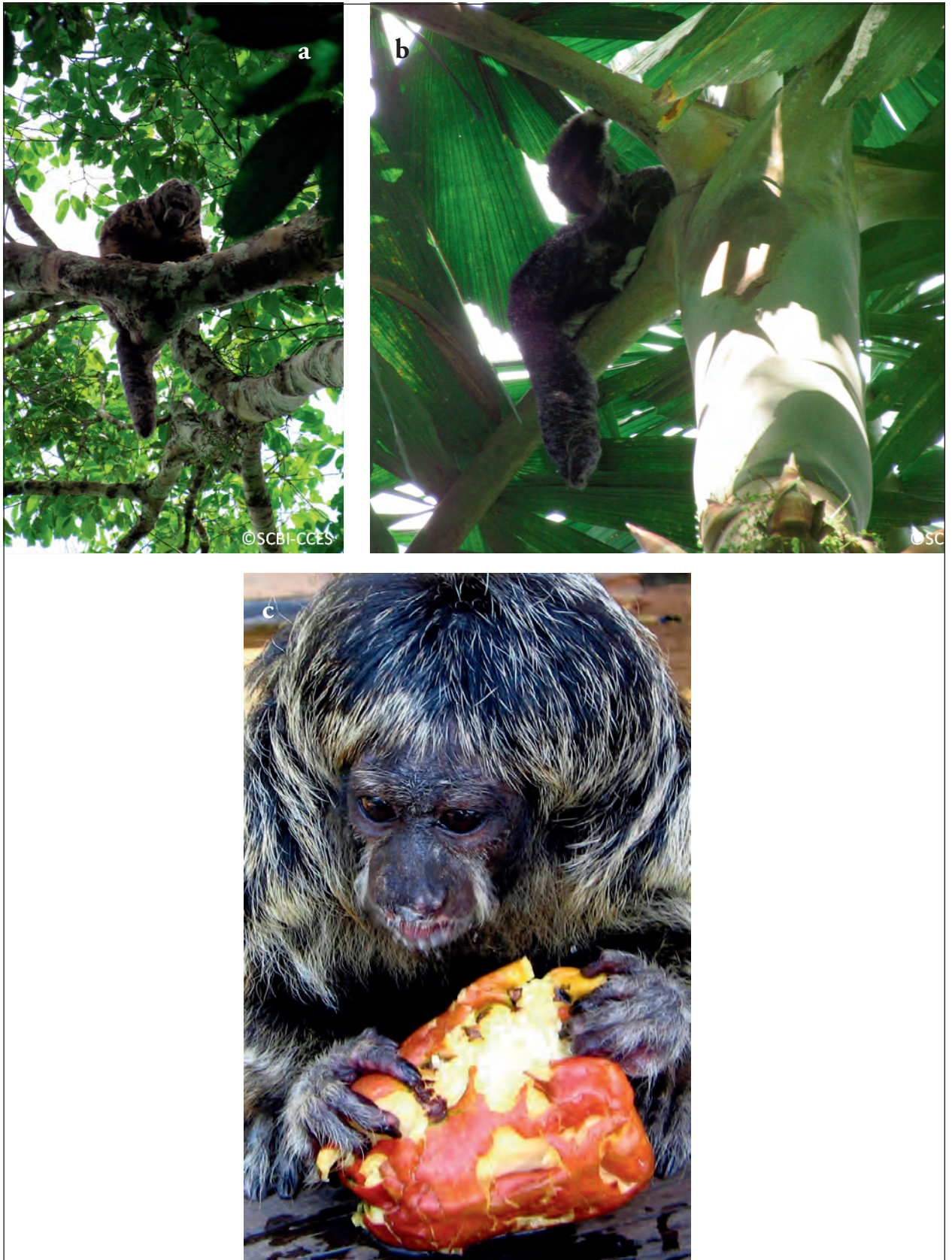


Figure 77. *Pithecia irrorata*. Females: (a) adult from Río Urubamba, Peru, photo by T. Gregory and SCBI-CCES, (b) large juvenile-subadult from Río Urubamba, Peru, photo by T. Gregory and SCBI-CCES, and (c) a small juvenile captive, eating a cashew fruit, in the Reserva de Desenvolvimento Sustentável Piagaçu-Purus, Rio Purus, Amazonas, Brazil, photo by Felipe Rossoni Cardoso.

VANZOLINI'S BALD-FACED SAKI

Pithecia vanzolinii (Hershkovitz, 1987)**Synonymy**

1987 *Pithecia irrorata vanzolinii* Hershkovitz, *P. Am. J. Primatol.* 12: 426–427; in part.

Holotype. Universidade de São Paulo, Museu de Zoologia (MZUSP), No. 5491, adult male, collected by A.M. Ollala, 29 October 1936, skin and skull.

Paratype. At MZUSP, there are 22 specimens designated by Hershkovitz as paratypes. I would recommend as an example an adult female No. 5495, skin and skull.

Type locality. Brazil, Santa Cruz, Rio Eirú, a southern tributary of the Rio Juruá, Amazonas, for both the holotype and all paratypes.

Description. Species determination is based on 36 specimens. Males and females are similar in pelage with black dorsal fur stippled in light white to cream grizzle, with contrasting pale yellowish-buffy arms and legs. A buffy ruff matches the limbs on both males and females, but the male's ruff is more distinct. A detailed description is given in Hershkovitz (1987). The descriptions by Hershkovitz and this paper are based solely on museum specimens.

Males. The face of the males is bare with black skin and they have white to cream malar stripes.

Females. Black skin on the face is fringed in soft black hair with a star or snip of white on the forehead generally present, and white to cream malar stripes that appear generally wider than in males. Juvenile females appear to have a much shaggier appearance in the face. Female body hair in general is not as thick or wavy as in males.

Diagnosis. Originally placed by Hershkovitz (1987) as a subspecies of *P. irrorata*, it is here elevated to species—there are no other sakis that closely resemble it.

Measurements. See Table 23.

Distribution. Map 13. Only in Brazil. Hershkovitz (1987) places them in south-western Brazil, between the south bank of the Rio Juruá and the south bank of the Rio Tarauacá in the south-west of the states of Amazonas and Acre. There are, however, very few documented locations for these animals, which are principally along the south-eastern side of the Rio Juruá, including: Amazonas – Rio Eiru, Santa Cruz, Santo Antônio, Lago Grande; Acre – Seringal Oriente “prox. Tassmatinga” (likely Taumaturgo), and Cruzeiro do Sul (which like Sarayacu in Peru or Manaus in Brazil is a site for multiple species collections).



Table 23. Measurements for *P. vanzolinii* holotype and a female paratype.

Measurement	Male MZUSP 5491	Female MZUSP 5495
Skull (mm)		
Length of brain case	84.6	83.9
Width of brain case	42.1	42.3
Zygomatic arch width	57.2	57.2
Orbits – outer	44.1	43.0
Nose bridge	6.8	6.3
L-orbit inner width	16.8	16.0
L-orbit inner height	17.1	16.8
Muzzle width	25.0	26.6
L-mandible length	54.3	58.8
L-mandible height	40.0	35.4
Post-crania (mm)		
Total length	935	740
Tail	420	465
Hind foot	120	120

Specific locations. Appendix I. BRAZIL. *Amazonas*: Rio Juruá - Lago Grande; Rio Eiru - Santa Antônia, Santa Cruz. *Acre*: Rio Juruá – Seringal Oriente, Tassmatinga, Cruzeiro do Sul

Discussion. As of this writing, I have not seen a living specimen of *P. vanzolinii* in captivity, in the wild, or as a photograph. It is possible this species is quite restricted in range or occurs in regions far from human populations or tourism. Every effort should be made to gather as much information as possible to determine its range and conservation status.



Map 13. Geographic distribution of *Pithecia vanzolinii*.

Brazil

1. Seringal Oriente

2. Cruzeiro do Sul

3. Rio Eirú, Santa Cruz (approx.)

4. Rio Eirú, Santo Antônio (approx.)

5. Rio Eirú, Lago Grande (approx.)

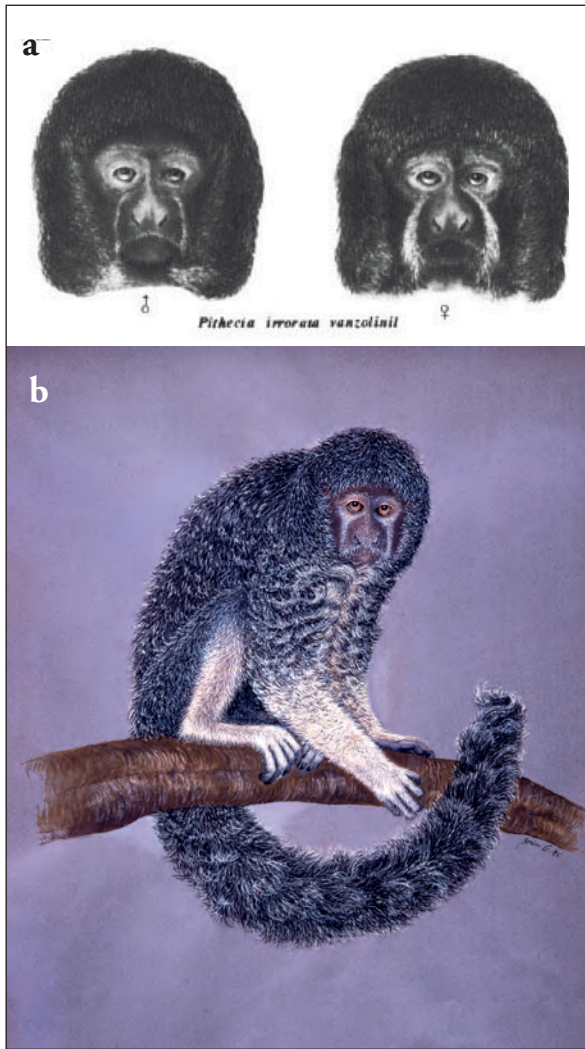


Figure 78. *Pithecia vanzolinii* from Hershkovitz (1987): (a) From Figure 19 male and female face, and (b) Figure 27, original color painting by Zorica Dabich and Philip Hershkovitz, through the courtesy of Field Museum of Natural History.



Figure 79. *Pithecia vanzolinii*. Holotype, adult male MZUSP 5491. Photos by L.K. Marsh.



Figure 80. *Pithecia vanzolinii*. Skull of holotype MZUSP 5491. Photos by L.K. Marsh.



Figure 81. *Pithecia vanzolinii*. Adult female paratype, MZUSP 5495.

MITTERMEIER'S TAPAJÓS SAKI

Pithecia mittermeieri sp. nov.**Synonymy**

1987 *P. i. irrorata*. Hershkovitz, P. *Am. J. Primatol.* 12: 425–426, in part.

2013 *P. irrorata*. Van Roosmalen, M. G. M. and Van Roosmalen, T., *On the Origin of Allopatric Primate Species and the Principle of Metachromic Bleaching*. E-book, printed privately, p.63.

Etymology. Named for Russell A. Mittermeier, President of Conservation International and long-time Chairman of the IUCN/SSC Primate Specialist Group. Dr. Mittermeier, who has been studying primates since 1970, has now seen more primate species in the wild than anyone, and is particularly fond of the Pitheciidae. His dissertation research was carried out in Suriname from 1975–1977 and included some of the first field work on sakis. He has been particularly influential in Brazil, where he has been working since 1971 and where his efforts on behalf of Brazil's amazing biodiversity have earned him the Order of the Southern Cross from the Brazilian government and the João Pedro Cardoso Award from the state of São Paulo. Given his long-term devotion to Brazil, it is especially appropriate that this Brazilian endemic be named after him. He has also been a long-time friend and supporter of my work, so I am also personally very pleased to name this new saki species in his honor.

Holotype. BMNH No. 27.8.5.9.1, adult male, skin and skull, collected by W. Hoffmanns, 14 September 1906.

Paratypes. MZSP No. 5549, adult male, skin and skull, collected by A.M. Olalla, 8 May 1936. BMNH No. 20.7.14.6, subadult male, skin and skull and MNRJ No. 3315, adult female, skin and skull, both collected by F. Lima, 22 July 1917. INPA No. 5707, subadult (lactating) female, skin and skull, collected by P.S. Pinheiro, 23 April 2005.

Type localities. All in Brazil: BMNH No. 28.8.5.9.1 from “Humaytha River,” Rio Madeira, by Gazetteer considered Humaitá (Paynter and Traylor, 1991). *Paratypes:* Brazil, Pará, Arua, Rio Arapiuns—south of the Rio Amazonas and just west of the Rio Tapajós. BMNH No. 20.7.14.6 and MNRJ No. 3315 Rio Tapajós, Vila Braga (south of Itaituba, left bank). INPA No. 5707 from the “Município de Novo Aripuanã, margem direita do Rio Aripuanã, Lago do Cipotuba.”

Specimens examined. Thirty skins and skulls, additional photographs from captive and living animals throughout the area.



Description. One of the most variable of all saki species, especially in the “transitional” juvenile males. Males and females both have tan to orange fur between the legs around their respective genitalia, similar to *P. pissinattii* sp. nov.

Males. Adult male dorsal pelage has long white bands of grizzling throughout the black, and the forearms are densely covered in shorter white hairs. Wrist cuffs are white underneath and grizzled white on top. The hind legs are black on the front half, similar to *P. pissinattii* sp. nov. males, but become very black and obvious as the males age. The hands and feet are white. The ruff is bright orange, but varies in density and extent among individuals. The hair extending toward the face is white and can become a wide white band in adult animals. And as in *P. rylandsi* sp. nov. the “bangs” are short over the front of the face, while the nape hairs—varying in intensity of whiteness depending on the age—form a “hole” over the ears making it appear as though there are black streaks coming from the sides of the head. It is more prominent in older individuals whose hair has become increasingly white. Adult males, depending on age, have varying degrees of scattered white hairs

along the sides of the face and the eyebrows, and as light malar lines and lips. The extent of the light white facial hair decreases as the animals get older. The skin of the face in older animals is black, in younger animals it is black, but the overall look of the face varies with age. Juvenile males of this species are some of the most striking and transitional of all sakis. Very young males have black face skin with prominent pink eyespots that can extend under the eyes as well. As they age, fine white hairs form over the eyes extending back to a horseshoe of fine white fringe around the face. In some photos of living *P. mittermeieri* subadult males appear “gray” faced, where the white can seem obvious and extensive (but short and light) and the eyespots not as intensely pink. Depending on the angle of the photo or the way the specimen was prepared and depending on the age, juveniles can appear greyish, coppery-brownish, very black with a white fringe, or colorful with both white hairs and very pink eyespots.

Females. Overall, the pelage is similar to that of males, but generally much less grizzled, especially when younger. As the females age, they become more grizzled overall, but never approach the whiteness seen in *P. rylandsi* sp. nov. females. Adult females have a darker ruff than males in general, but it sometimes can be a lighter tan tending toward orangish in some individuals. Very young females resemble young males with pink eyespots over the eyes and black faces, but they always have thick, shaggy malar lines, and a fringe of black hair around the back edge of the face, and hairs forming over the brow. As they age they have extensive facial hair that is white, similar to *P. pissinattii* sp. nov. females. Some subadult individuals have very black fur around the face, and very little pelage stippling. As they age, this hair can go from dark, to loosely white, to more

closely pressed to the face as blackish with white in it. The facial skin is black, with scattered hairs over the muzzle.

Diagnosis. Distinct from all other sakis in that the males are almost “clownish” with bright orange ruffs, grayish lightly haired faces as subadults, with traces of hair over the black faces in older adult males, and contrasting very white and black pelage with dense buffy to white forearms. Much older adults can be quite white in overall pelage, but unlike *P. rylandsi* sp. nov. males, retain their bright orange ruffs. Females in the upper sections of the range south of the Amazon and between the rios Madeira and Tapajós have very hairy faces as compared to the females of *P. rylandsi* sp. nov.

Measurements. See Table 24.

Distribution. Map 14. *Pithecia mittermeieri* is found only in Brazil, south of the Rio Amazonas between the rios Madeira and Tapajós, including the Rio Aripuaná drainage. Current populations appear to be concentrated primarily north of Aripuaná in Mato Grosso, although there is some evidence that historically they may have extended at least along the Madeira as far as the Mamoré and even Rio Guaporé (as per Natterer 1829 in Destacamento do Ribeirão and Rio Pacáas Novos, but cf. *P. rylandsi* sp. nov.). The collection of a male, juvenile male, and infant in “Nova Brasília, Polonoroeste,” presumed to be Ji-Paraná as per the gazetteers of Paynter and Traylor (1991), in 1985, demonstrates some populations north of the Rio Jamarí as well. Two photos of wild males taken in southern Rondônia suggest they are still in the region. One was a tourist photo in 2010 at Cacoal Selva Park, 470 km from Porto Velho, and the other in Chupinguaia in 2012 (Figure 85). Along

Table 24. *Pithecia mittermeieri* adult male holotype and male and female paratypes.

Measurement	BMNH 27.8.5.9.1 Male	MZSP 5549 Male	INPA 5707 Female	MNRJ 3315 [‡] Female
Skull (mm)				
Length of brain case	85.8	84.8	76.6	82.9
Width of brain case	43.4	44.9	42.1	47.0
Zygomatic arch width	58.4	55.7	50.0	–
Orbits – outer	46.7	43.6	41.0	43.3
Nose bridge	8.0	7.3	6.1	8.3
L-orbit inner width	17.5	15.6	15.5	14.6
L-orbit inner height	17.0	19.0	17.4	14.4
Muzzle width	27.0	26.1	20.2	24.5
L-mandible length	57.9	56.4	50.5	51.0
L-mandible height	27.0	37.3	34.1	–
Post-crania (mm)				
Head-body	460	450	370	350
Tail	450	450	410	490
Hind foot	85	135	105	115
Ear	35	–	30	30

[‡] Skull articulated and not fully cleaned.

the Tapajós, they extend possibly as far as Jacaréacanga and perhaps further south, depending on the presence of other species (see Discussion below).

Specific location. Appendix I. BRAZIL. *Para*: Rio Madeira - Borba, Humaitá; Parintins - Villa Bella Imperatriz, Lago Andina; Itaituba; Rio Arapiuns - Arua; Rio Humaitá; Rio Aripuanã; Rio Tapajós; Lago do Cipotuba; Villa Braga; Igarapé Auara; Igarapé Brabo; Igarapé Amorin; Limoal; Limontuba; Santarém - Fazenda Mararu. *Mato Grosso*: Aripuanã. *Rondônia*: Nova Brasília.

Discussion. The colloquial name for these sakis has generally been “the Tapajós saki,” and it will likely continue to be so even though the species name has been given as *P. mittermeieri*. The region between the rios Madeira and Tapajós has changed extensively over the last two hundred years. Railways and telegraph lines were introduced at the turn of the 19th century (instigated by Marechal Rondon). Because of highways such as the BR 364 in Rondônia completed in 1961, the Trans-Amazônica BR 230 inaugurated in 1972, and the devastating colonization and development program Polonoroeste (Northeastern Brazil Integration Development Program) in the 1980s, the forests have gone from complete coverage in Rondônia and Mato Grosso in the 1950s to approximately half or less today (per satellite images). Previous collection sites are now roads and towns leaving little doubt that the primate populations have been severely disrupted and have potentially led to hybrid zones (cf. Jamari sakis, Appendix II).

Likewise, as discussed for *P. irrorata*, it is not known if historic populations of *P. irrorata* were somewhere within the collecting routes of the Comissão Rondon, or how far north of the Rio Guaporé *P. rylandsi* sp. nov. extended originally, but today’s distribution is likely very different for all of these species. So while it is possible that *P. mittermeieri* extended throughout the region between the rios Madeira and Tapajós to the Guaporé, its exact distribution today is unknown.

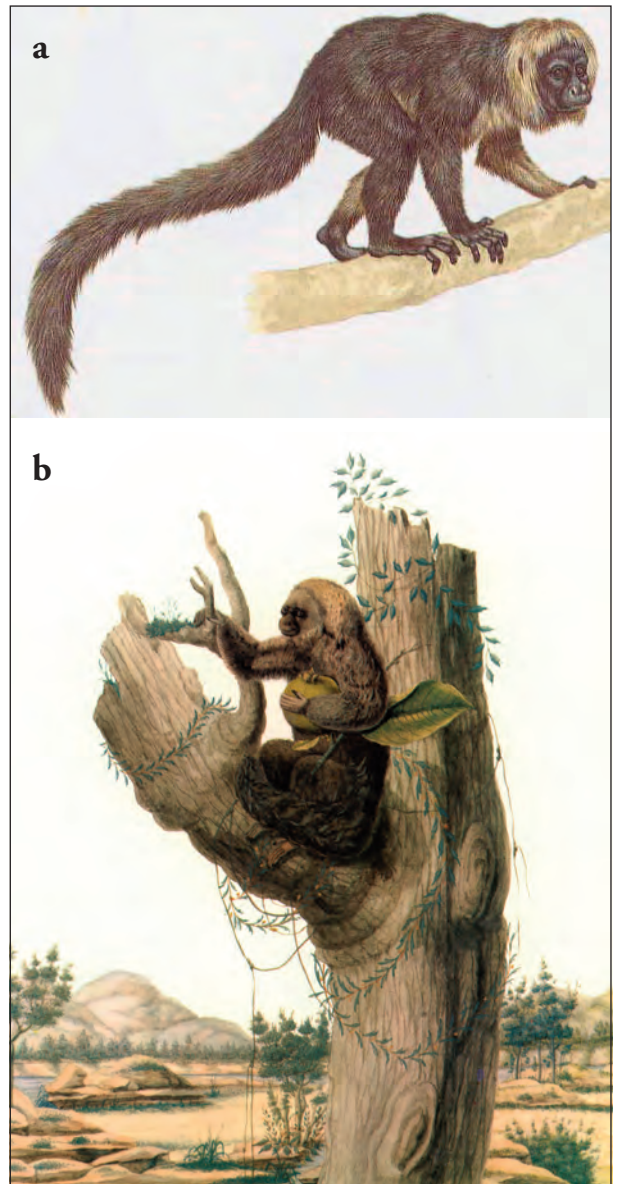


Figure 82. (a) Illustration of a juvenile male *Pithecia mittermeieri* by Graham Allen for P. Whitfield & R. Walker, and (b) Illustration of a subadult or adult male *P. mittermeieri* by Alexandre Rodrigues Ferreira (1783–1792).



Map 14. Geographic distribution of *Pithecia mittermeieri*.

Brazil

- | | | |
|---|--|--|
| 1. Amorin, Brabo, Limoatuba (Olalla collection, by gazetteer, Paynter Jr. & Traylor Jr. 1991) | 4. Parintins | 12. Humaitá |
| 2. Rio Arapiuns, Aruá (Olalla collection, by gazetteer, Paynter Jr. & Traylor Jr. 1991) | 5. Rio Andira | 13. Destacamento do Ribeirão (Natterer 1883) |
| 3. Limoal near Boim (Olalla collection, by gazetteer, Paynter Jr. & Traylor Jr. 1991) | 6. Lago Andira | 14. Rio Pacáas Novos (Natterer 1829) |
| | 7. Itaituba, Villa Braga | 15. Nova Brasília (Polonoreste 1985) |
| | 8. Igarapé Auara (Olalla collection, by gazetteer, Paynter Jr. & Traylor Jr. 1991) | 16. Cacoal State Park |
| | 9. Borba | 17. Chupinguala |
| | 10. Rio Aripuanã | 18. Retiro do Veado Branco, Serra do Norte (Comissão Rondon) |
| | 11. Lago do Cipotuba | 19. Km 16 on BR 230 (approx.) |



Figure 83. *Pithecia mittermeieri*. Holotype BMNH No. 27.8.5.9.1, adult male, skin.

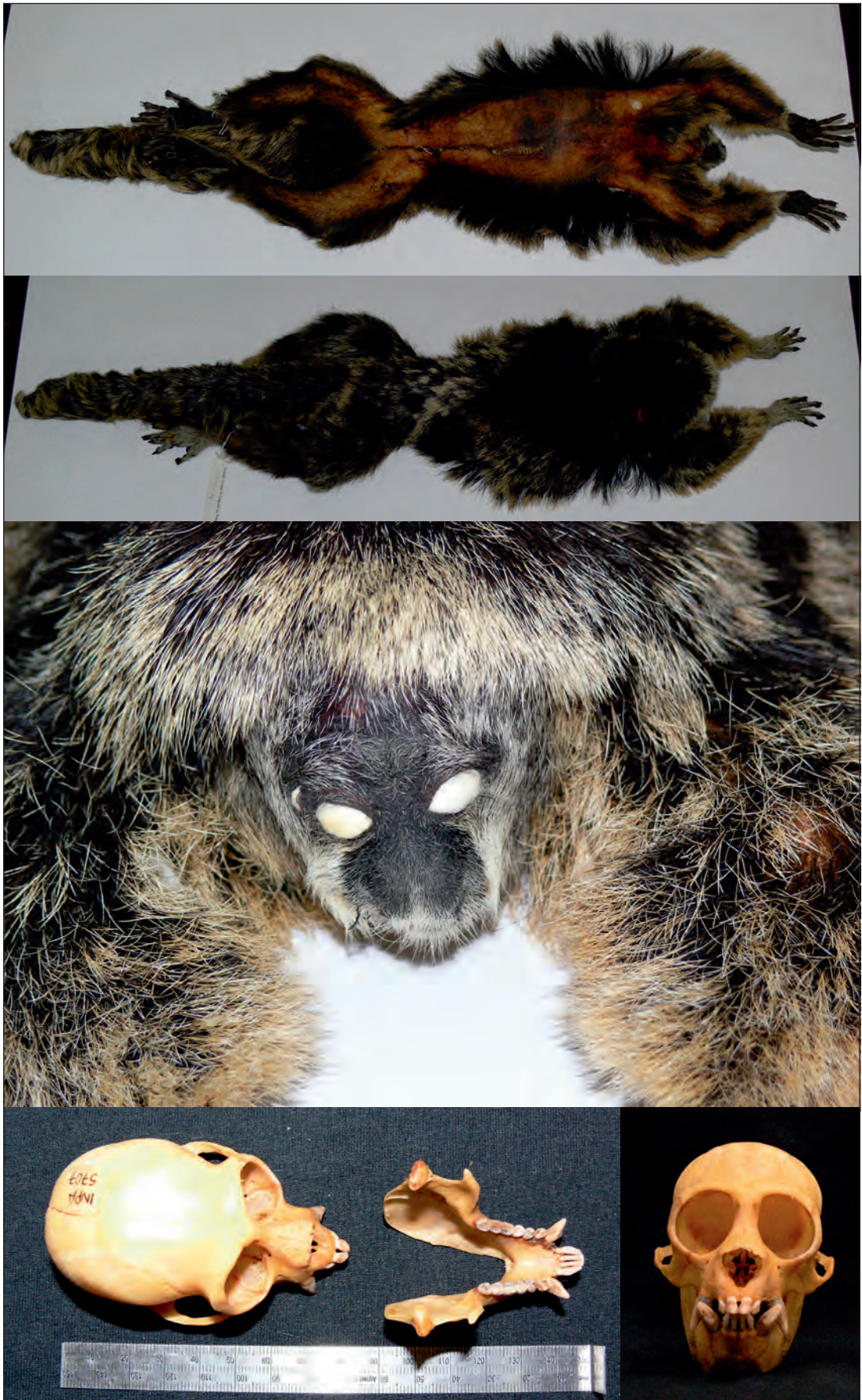


Figure 84. *Pithecia mittermeieri*. Paratype INPA No. 5707, lactating subadult female, skin and skull.

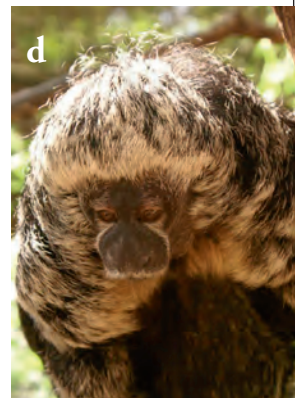


Figure 85. *Pithecia mittermeieri*. Males: (a) captive juvenile male, photo by L.C. Marigo, (b) captive juvenile male, photo L.C. Marigo, (c) captive sub-adult male, photo by N. Rowe, (d) captive adult male, photo by Matheus Fortunato, and captive adult male (older), photo by ZooChat.com, and (f) wild adult male in Chupinguaia, Rondônia, Brazil, by Kurazo Matheus Okada Aguilar.



Figure 86. *Pithecia mittermeieri*. Females: (a) adult captive female, photo by L.C. Marigo, and (b) subadult female with older adult male, photo by L.C. Marigo.

RYLANDS' BALD-FACED SAKI

Pithecia rylandsi sp. nov.**Synonymy**

- 1842 *Pithecia irrorata*. Gray, J. E. *Ann. Mag. Nat. Hist., 1st series* 10: 256. In part.
- 1976 *Pithecia monachus*. Heltne P., Freese, C. and Whitesides, G. *A Field Survey of Nonhuman Primates in Bolivia*, Report, PAHO, Washington, DC. 40pp.
- 1981 *Pithecia hirsuta*. Izawa, K. and Bejarano, G. *Kyoto Univ. Overseas Res. Rep. New World Monkeys* (2): 3, 5, 10.
- 1981 *Pithecia hirsuta*. Izawa, K. and Yoneda, M. *Kyoto University Overseas Res. Rep. New World Monkeys* (2): 16.
- 1987 *Pithecia irrorata*. Hershkovitz, P. *Am. J. Primatol.* 12: 425–426; in part.
- 2013 *Pithecia hirsuta*. Van Roosmalen, M. G. M. and Van Roosmalen, T. *On the Origin of Allopatric Primate Species and the Principle of Metachromic Bleaching*. E-book, printed privately, p.63.

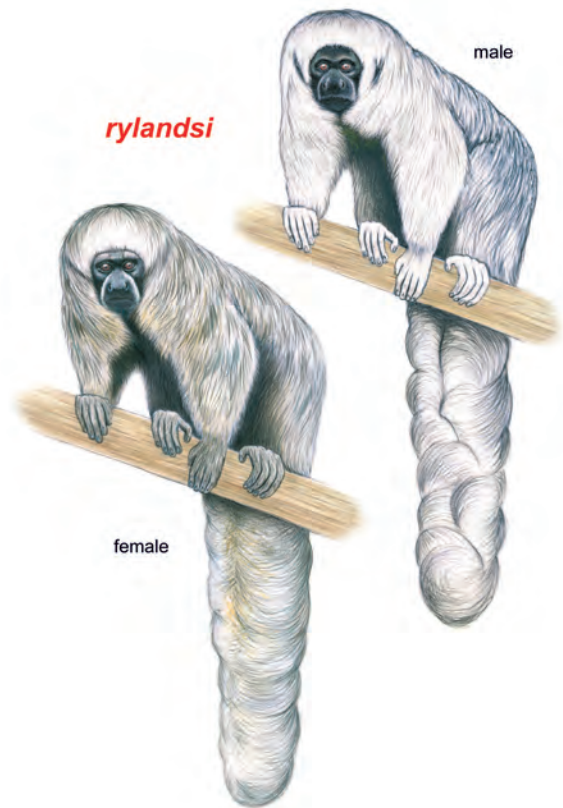
Etymology. Anthony Rylands is a Senior Research Scientist at Conservation International, Deputy Chair of the IUCN/SSC Primate Specialist Group, a member of the Brazilian Academy of Sciences, former professor of Vertebrate Zoology at the Federal University of Minas Gerais, and founding editor for the journal *Neotropical Primates*. He has mentored hundreds of young primatologists, and as coordinator for Conservation International's Primate Action Fund, has directly impacted primate research and conservation the world over. Dr. Rylands is a tireless academic and a dear friend. For all of these reasons and more, I name this species after him.

Holotype. AMNH No. 247669, subadult male, skin only, collected by K. Izawa, 5 December 1980 (listed as female on the label, but face appears male). As type skin does not have a corresponding skull, I include AMNH No. 248723, subadult male, skull only, collected by S. Anderson, 26 May 1982.

Paratypes. FMNH No. 123967, skin only, subadult female. As paratype skin does not have a corresponding skull, I submit KUPRI No. 5973, skull only, collected by M. Kimursa, 8 November 1978.

Key Specimens. KUPRI Nos. 5974 and 5975, both skulls only, collected by M. Kimursa in Bolivia with No. 5975 collected in Mucden, Bolivia on 5 August 1979.

Type localities. Bolivia, Pando Department: Holotype skin AMNH No. 247669 from the Río Tahuamanu, Mucden; holotype skull AMNH No. 248723 from the Río Nareuda.



Paratypes: FMNH No. 123967 from Bolivia, Pando Department, Porvenir, Río Nareuda. KUPRI No. 5973 from Bolivia.

Specimens examined. Eleven skins, 14 skulls, and 40 photos of living specimens (captive, rescued, wild) from numerous sources.

Information about this species comes in part from living photographs of wild and captive animals in Bolivia, Peru, and Brazil. No museum specimens are available from Peru. Specimens from Brazil are provisional pending further investigation. According to R. B. Wallace (pers. comm.), there are no *Pithecia* specimens in any of the Bolivian natural history museums.

Description. One of the largest of the sakis. Males and females have bare faces with black pigmentation.

Males. Overall pelage is transitional, as it is in most of the genus. When young, the males are black and moderately to heavily grizzled with white throughout. As they age, they become almost entirely white. Their dorsal coloration can be so intense with white that they take on a “skunky”

appearance. Males in Peru appear to have almost no black showing through the heavy white hair tips. The forelimbs can be buffy to white, and the hind limbs can have black on the inner leg, but it may not get as black as *P. mittermeieri* or the Jamari sakis (cf. Appendix II). The hands and feet are white to off-white. The crown bangs are also white in all ages, and can be quite thick compared to other species, and are shorter than the hair coming from the shoulders, making a “hole” where the ears are. This makes for the appearance of black stripes on the sides of the older males’ heads. This kind of pattern also appears in very old *P. mittermeieri* and sometimes in *P. irrorata*. Males tend to lack or have only very light malar lines, but do have white hair on the lips. They lack an obvious orange or bright ruff as in *P. irrorata*; instead they have a black or dark brownish ruff. Males retain light to pinkish eyespots over the eyes. Juvenile males are dark “pink-black,” where the facial skin is not as dark as adults and appears reddish-black, but tend toward black even from very young. Otherwise males have plain, extremely lightly furred or non-furred faces.

Females. Adult female pelage can be as intensely white as males and the hair on the forehead, creating “bangs,” can look like a white shield. Their forearms can be more buffy than those of the males, and this blonde-tan can extend across their chests. They do not have distinct ruff coloration, as it is sometimes a light buff or grayish. The black of their faces is deep with reddish undertones, and lacks hair. Younger females can have obvious white eyebrow hair. Very young females can look cartoonish with pink circles around the eyes, a very black face with some black hairs along the sides, and white forming as eyebrows. All ages of females have distinct, white, shaggy muzzle stripes. Young females have grayish faces, sometimes with a ring of light black hairs peripherally around the face with light grey eyebrow spots and light skin around eyes. Adult females retain the light colored eyebrow spots, and, depending on age, may retain some of the light black fringe, but in most cases, the faces are very bare save the bright muzzle lines.

Diagnosis. Easily distinguishable from all other bald-faced sakis by their large size, very black faces, and extreme white grizzling. *P. irrorata* males have far less white throughout, bright orange ruffs and light faces with dark muzzles. *P. irrorata* females have black-fringed faces as juveniles becoming greyer faced overall.

Measurements. See Table 25.

Distribution. Map 15. Found in north-western Bolivia, south-eastern Peru, and possibly in the south of the state of Rondônia and the west of the state of Mato Grosso in Brazil.

Bolivia. Found in the western Pando Department, but with some evidence that they may be in northeastern Beni and northern La Paz, particularly north/northwest of the Río Madre de Dios in those areas. Specific locations with

verification include: Mucden; north of the Río Tahuamanu, but east of the Peru border; and Municipio de Bolpebra, Provincia Nicolas Suarez. Additional locations reported for Bolivia by various authors without specimens or photos, summarized by R. B. Wallace (unpubl. data) by municipality include: Bolpebra – Buena Vista, Piaou, Rutina, Los Campos, El Refugio, Estación Tahuamanu, and San Sebastian (reported ‘not common’); Filadelfia – Pingo de Oro (‘rare’) and north of Río Tahuamanu, vicinity of Río Muyumanu; Bella Flor – Santa Rosa near Río Abunã, Bella Flor, Río Manuripi, and between the ríos Acre and Tahuamanu; Cobija – Cobija, Belo Horizonte, Tres Corazones, Puerto Rico, Tres Estrellas, Fortaleza; Porvenir – Porvenir along the Río Nareuda and Cocamita; Nuevo Esperanza – Federico Roman (Compartamentos Caiman, Manoa, and Río Negro); and Ingavi – Centro Dieciocho, north of Baraca San Juan de Nuevo Mundo.

Peru. Mainly north of the Río Madre de Dios, likely throughout the Reserva Territorial Madre de Dios, specifically in the Los Amigos Conservation Concession including Río Los Amigos, the Manu Wildlife Center, and Los Amigos Research Center. It is possible, as sakis are reported for Tambopata, that they are also south of the Río Madre de Dios, but this is unconfirmed. Their border with *P. irrorata* north of the Madre de Dios to the Brazilian border and further west toward the Parque Nacional Alto Purus is unknown.

Table 25. Skull measurements for *Pithecia rylandsi* holotype male AMNH 248723, and paratype female KUPRI 5973.

Measurements	AMNH 248723 Male	KUPRI 5973 Female
Skull (mm)		
Length of brain case	63.6	77.9
Width of brain case	42.6	n/a
Zygomatic arch width	54.8	51.4
Orbits-outer	42.6	40.4
Nose bridge	–	4.4
L-orbit inner width	–	15.5
L-orbit inner height	–	19.1
Muzzle width	–	21.8
L-mandible length	62.2	49.5
L-mandible height	47.9	36.4
Symphysis angle	37.0	–
M1-M1 mandible	21.3	–
M3-M3 maxillary	22.6	–
I-M3 maxillary	34.1	–
Nasal length	19.2	–
Nasal width	17.1	–
Condylbasal length	74.6	–
Postorbital constriction	34.1	–
Canine (L/R)	–	9.4/9.2

Brazil. While it is likely that these animals occur east and north of the Rio Guaporé into the states of Rondônia and Mato Grosso, and possibly as far north as the Rio Anari or west to the Rio Jamari (see Discussion, below), to be conservative in this account, their distribution will be restricted to the south (west) of the Rio Guaporé or just north (east) along its Brazilian shores where passable by arboreal primates.

Specific locations. Appendix I. **BOLIVIA.** *Pando:* Nicolas Suarez - Bolpebra; Tahuamanu; Mucden; Río Nareuda. **BRAZIL.** *Rondônia:* Cacoal Selva Park; Rio Guaporé; Destacamento do Ribeiro; Rio Anari; Pedra Branca; Ritiro do Veado Branco - Serra do Norte; Guajará-Mirim. **PERU.** Madre de Dios: Río Madre de Dios - Manu Wildlife Center; Río Los Amigos Conservation Concession.

More data are needed to determine the borders and range of these monkeys in relation to those of *P. irrorata* in Peru and Acre, Brazil, and *P. mittermeieri* north of this area.

Discussion. These sakis are distinct and unmistakable. More data are needed to determine the boundaries with *P. irrorata* in Peru and *P. mittermeieri* in the southern

Brazilian Amazon. This is one of the few cases in this taxonomy where there is more information on living animals than reference material.

Material collected by J. Natterer in 1829 from Guajará-Mirim, Rio Pacaás Novos (old name, now very near Guajará-Mirim), and Rio Guaporé are juveniles and difficult to place firmly in *P. rylandsi*; therefore, as they are thought to have been collected on the north bank of the Rio Guaporé, they will be provisionally placed in *P. mittermeieri* (cf. *P. mittermeieri*). A female (MZSP No. 22895) collected in Rondônia, Rio Anari, Pedra Branca by D. F. Stotz that appears to be closer to *P. rylandsi* than to *P. mittermeieri*, extends the possibility that they were further north into Brazil at least in 1988. More study is needed for the *P. rylandsi* population in Brazil.

Except for south-eastern Peru and perhaps parts of Pando in Bolivia, it is likely the population is declining throughout the range. While I do not advocate more collections of these sakis, I do suggest we get as much detailed information from photos or from capture-release animals as possible to determine their relationship to *P. irrorata* and *P. mittermeieri*.



Map 15. Geographic distribution of *Pithecia rylandsi*.

Peru

1. Manu Wildlife Center
2. Concesión para Conservación, Los Amigos
3. Los Amigos Research Center

Bolivia

4. L. Porter Field Site
5. Mukden
6. Río Nareuda

Brazil

7. Rio Guaporé (approx. collection area both sides of river, Natterer 1829)
8. Mato Grosso do Sul (approx. collection area, Natterer 1826)



Figure 87. Illustration of what appears to be *Pithecia rylandi* drawn in 1790 by Alexandre Rodrigues Ferreira as part of his explorations into the southern Brazilian Amazon.



Figure 88. *Pithecia rylandi*. Holotype male, skin AMNH No. 247669 and skull AMNH No. 248723.

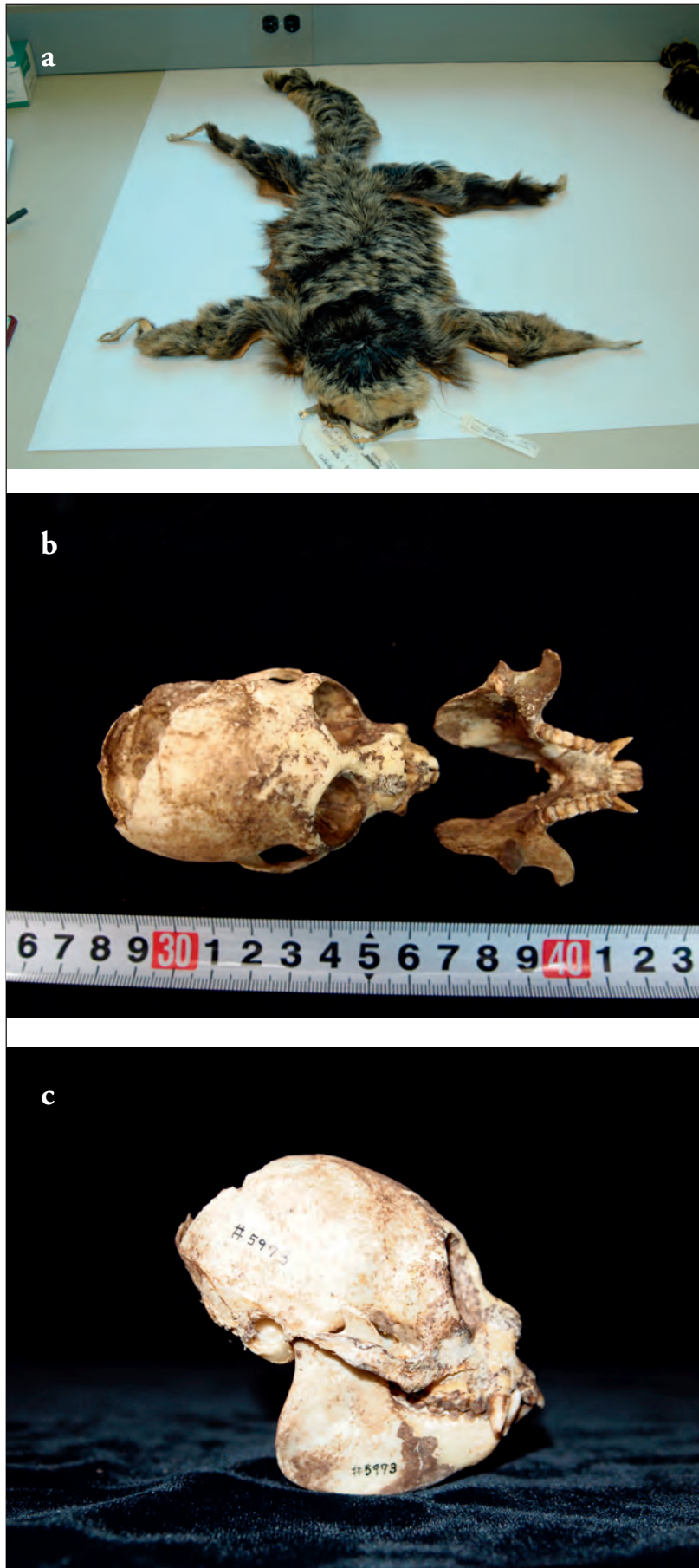


Figure 89. *Pithecia rylandi*. (a) Paratype subadult female FMNH No. 123967, skin, and (b-c) paratype skull KUPRI No. 5973.



Figure 90. *Pithecia rylandsi*. Adult males (a) Pando, Bolivia, photo by Leila Porter; (b) Los Amigos, Peru, photo by Bretstickypartsblog, and (c) near Manu Wildlife Center, Peru, photo by Fred Yost.



Figure 91. *Pithecia rylandsi*. Adult females (a) wild, Pando, Bolivia. Photo by Leila Porter. (b–c) captive at CENP, Belém, Pará. Photos by Luiz Claudio Marigo.



Figure 92. *Pithecia rylandsi*, subadult female (a) captive/rehabilitation at Inti Wara Yassi, Bolivia. Photo by www.trekker.com/shatz.com; and (b) captive, Zoo Parque Itaituba, Arlete/flicker.

PISSINATTI'S BALD-FACED SAKI

Pithecia pissinattii sp. nov.

Synonymy

- 1987 *Pithecia irrorata irrorata*. Hershkovitz, P. *Am. J. Primatol.* 12: 425–426, in part.
 2013 *P. hirsuta*. Van Roosmalen, M. G. M. and Van Roosmalen, T, 2013. *On the Origin of Allopatric Primate Species and the Principle of Metachromic Bleaching*. E-book, printed privately, p.63.

Etymology. Named for Dr. Alcides Pissinatti, a Brazilian veterinarian, director and co-founder of the Centro de Primatologia do Rio de Janeiro (CPRJ/FEEMA), and Vice President of the Brazilian Academy of Veterinary Sciences. For nearly two decades Dr. Pissinatti has almost single-handedly pioneered captive breeding programs for endangered Brazilian primates, including the successful breeding and management of the muriqui (*Brachyteles*) in captivity. Because of his genuine kindness and intellect, and his devotion to the primates of Brazil including *Pithecia*, I dedicate this species to him.

Holotype. BMNH No. 26.5.5.7, adult male, skin and skull, collected by W. Ehrhardt, 14 November 1925.

Paratype. BMNH No. 25.12.11.2, adult male, skin and skull, and BMNH 27.8.11.13, adult female, skin and skull, collected from Canabouça by W. Ehrhardt, 14 November 1925. INPA No. 4060, juvenile female, skin and skull, from Autazes, collected by Marc G.M. van Roosmalen.

Type locality. BMNH holotype from “Middle Amazonas, Paraná do Jacaré, Canabouça.” Hershkovitz and others assign this location to Lago do Canabouça, just south of the Rio Solimões and between the rios Purus and Madeira.

Specimens examined. Thirty-five specimens, skins and skulls, and photos of living sakis by R.A. Mittermeier, R. Sampaio, and various tourists.

Description. Male and female faces are mostly pinkish to a darker red, tending toward black in older females. Both have distinct grizzling of white throughout the long black dorsal pelage that varies by age in its amount, but compared to other bald-faced sakis, it can be comparatively sparse in some individuals.

Males. Pelage varies, with younger males very grizzled in general, much more like females, and older males less so. The color bands of grizzling in the dorsal pelage vary as well from whitish to buffy-cream to tan, particularly on the forearms and shoulders, often with whiter cuffs at the wrist. The hind legs are often darker, brownish to blackish,



sometimes with dark bands lacking the white grizzling. The ventrum is lightly covered in black hairs with a distinct ruff ranging from bright orange to dull orange/light tan, generally with lighter roots. The hands and feet are white. Males have a white crown band of “bangs,” hair that is distinct, but not thick as in other species, that drapes over the forehead. Faces are mostly bare and are a deep reddish that seems almost a waxy reddish/black, even in well-preserved museum specimens. The hair on the face is lacking to sparse in adults, but with white malar lines that extend up under the eyes. Fine hairs above the eyes and around the back edges of the face sometimes remain even on older animals. Lips and muzzles can have sparse indistinct white hairs. In younger males, the faces can have more fine hair, but not nearly as much as the juvenile males east of the Rio Madeira (*P. mittermeieri*).

Females. Females often have more grizzling in the dorsal pelage than males—the back is tanner than in males, and especially on the arms and legs. Like males, their back legs can be half black along the front edge over the knee. The

ruff is present with dark brown base hairs ending in lighter tan to buffy bands. They often have darker wrist cuff bands above the hands. The faces of adult females are covered in white soft hairs that cover the forehead, cheeks, and eyebrows. Females often have light white hairs especially on the forehead, and in older females, a loose white-grey band around the face, with a skin “diamond” in the center of the forehead just above the nose, between the eyes. The white malar lines are more obvious and often shaggier than in males. The skin above and below the eyes is light pinkish, especially in younger females, with the rest of the bare parts of the face black. In older individuals, the bare skin is blacker overall.

Diagnosis. Populations of *P. pissinattii* collected in 1935 in the region are very similar to those photographed by tourists on the Rio Juma (at Juma Jungle Lodge) as recently as 2009 (Figure 96, 98 a,b). *Pithecia pissinattii* are most similar to *P. mittermeieri* on the eastern side of the Rio Madeira, in that adult males with darker faces appearing black can in some photos seem similar to *P. mittermeieri*, especially when coupled with the brighter orange ruffs. However, juvenile and subadult male *P. mittermeieri* are very different from those of *P. pissinattii*. The young *P. mittermeieri* males have very bright pink eye spots that give way to white facial hair that in older subadults makes them have an overall “grey appearance,” and this does not seem to be the case for *P. pissinattii*. However, it is possible that *P. pissinattii* may

have legacy populations that were on both sides of the Rio Madeira, lending to features we now see in *P. mittermeieri*, particularly in females.

Measurements. See Table 26. Additional information: One skull measured, BMNH No. 25.12.11.1, subadult male (mm): braincase length 81.8, braincase width 42.1, zygomatic arch width 55.1, outer span of orbits 42.5, nasal constriction 0.74, orbit width – inner 15.2, outer 16.0, muzzle width 24.5, and mandible width 50.1.

Distribution. Map 16. In Brazil only, they are found south of the Rio Solimões in the northern area between the rios Purus and Madeira, including Autazes, Lago do Canabouça, lago Sampaio and Miguel (including the area formerly called “Rosarinho”), Rio Juma, and one specimen reported from Itaboca, which appears to be a juvenile male *P. pissinattii* collected from the right bank (NHRM No. A62-1200). It is not known how far south between the Purus/Madeira these animals occur before they meet with *P. irrorata*, if they do at all.

Specific locations. Appendix I. BRAZIL. *Amazonas*: Solimões – Parana do Jacaré, Canabouça, Lago Canabouça; Rio Purus – Lago Jari, Itaboca; Autazes; Rio Juma - Juma Lodge; Rio Madeira - Rosarinho, Lago Miguel, Lago Sampaio; Manaquiri.

Discussion. *Pithecia pissinattii* sakis may occur east of the Rio Madeira, and gene flow with *P. mittermeieri* may be impacting the population west of the Rio Madeira. More research is needed, however. As with many saki populations in this monograph, the convention of large watersheds is used as a preliminary hypothesis for the separation of species, particularly in their lower, wider reaches.

Table 26. Reported measurements for *P. pissinattii* from Paraná do Jacaré, Canabouça, Brazil.

Post-crania (cm)	Head-body	Tail	Hind foot	Ear
Males				
BMNH 25.12.11.2	55	48	–	–
BMNH 26.5.5.7	54	48	–	–
BER 33937	51	52	–	–
BER 91314 (SAM)	50	47	–	–
BMNH 27.8.11.19 (Juv)	45	42	–	–
MNRJ 3313	45	48	11.5	2.4
MNRJ 3316	50	48	12.5	2.3
SEN 6917	47	47	–	–
NHRM A64-0097	49	48	–	–
Females				
NHRM 3314	50	45	11.8	2.4
BMNH 26.5.5.8	51	49	–	–
BMNH 27.8.11.14	50	49	–	–
BMNH 25.12.11.4	43	45	–	–
BMNH 27.8.11.13	53	47	–	–
BMNH 27.8.11.16	51	48	–	–
BMNH 25.12.11.3	52	48	–	–
BMNH 27.8.11.20	41	43	–	–



Map 16. Geographic distribution of *Pithecia pissenattii*.

Brazil

- 1. Itaboca
- 2. Rio Jari
- 3. Canabouça (by gazetteer Paynter Jr & Traylor Jr. 1991)

- 4. Manaquiri
- 5. Juma Lodge
- 6. Autazes

- 7. Rosarinho
- 8. Lago Sampaio
- 9. Lago Miguel



Figure 93. *Pithecia pissinattii*. Holotype BMNH No. 26.5.5.7, adult male, skin.



Figure 94. *Pithecia pissinattii*. Holotype BMNH No. 26.5.5.7, adult male, skull.



Figure 95. *Pithecia pissinattii*. Paratype BMNH No. 27.8.11.13, adult female skin and skull.



Figure 96. Adult male *Pithecia pissinattii* at Juma Jungle Lodge, Rio Juma, Brazil. Photo by Crijnfotin via Flickr.



Figure 97. *Pithecia pissinattii* subadult male from Manaquiri. Photo by Ricardo Sampaio.

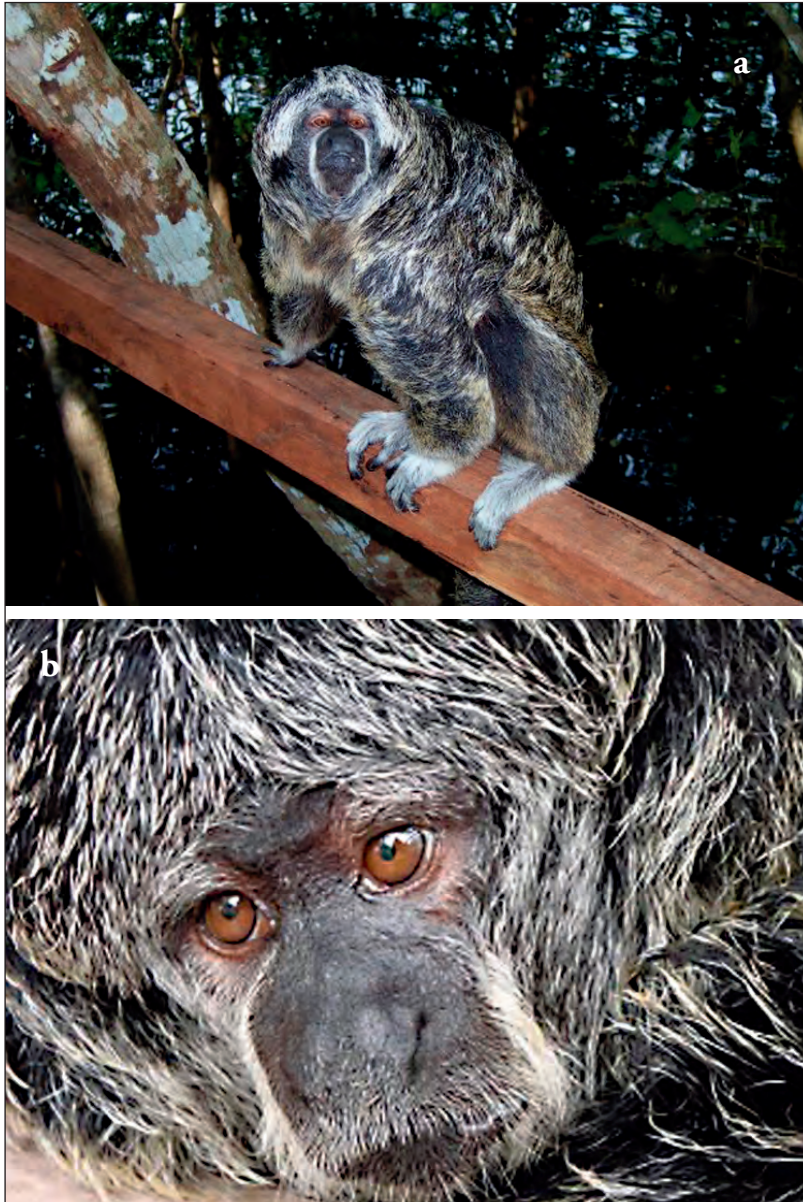


Figure 98. *Pithecia pissinattii*. (a) Adult female, photo by Trip Wow Website and (b) juvenile female, photo by Crijnfotin via Flickr, both at the Juma Jungle Lodge, Rio Juma, Brazil.

DISCUSSION

I think it is important to emphasize my goals with this monograph, as well as the goals of taxonomy in general. Groves (2001) said: "Taxonomy, like other fields of biology (ecology, ethology, physiology, genetics), is a dynamic science. Classifications are not engraved in stone, nor should they be; it is unfortunate that advances in the taxonomic field, unlike those in ecology and other disciplines, often require changing the names we give to species [...] but that is the way it must be, and the irritation felt [...] will pass quickly. Indeed, new predictions, to be tested in the field, may well emerge from the reclassification" (p.5). It is exactly my intent to create a hypothesis for the taxonomy of *Pithecia* so that we can continue to piece together the story, historic and present-day in the field, to give us greater detail for understanding this fascinating group of monkeys. Ultimately, the goal is to conserve as many saki species in the wild as possible, and that is only achievable with a working taxonomy. My rationale for this work was to "tame the madness" of *Pithecia* taxonomy, not to perfectly corroborate every specimen or living saki out there. I think this treatment comes close—even though in many cases I was a "lumping splitter," I feel I gave as much rigor as possible to the determinations with the data at hand.

Taxonomic hygiene

I mentioned in the "Introduction" the trouble with comparative studies, especially in genetics, that are lax in assuming that *P. monachus*, *P. irrorata*, or other previous "catch-all" species are well-defined and valid taxonomic units. Even cladistic relationships between genera, such as those comparing *Pithecia* to other pitheciids, one would think to be "safe." However, if samples, specimens or individuals are used from more than one geographic location, the lack of a rigorous taxonomy makes it entirely possible that more than one species is being lumped together to represent the "*Pithecia*" unit.

Researchers in cladistics, genetics, and morphology rarely report exactly what specimens were used, where they were collected, or on what grounds they are determining the species' name. Those that do report detailed information on their test subjects, even if the taxonomy changes are at least able to clearly compare their work with others in the future.

Bortolus (2008) found that biology, ecology, biodiversity, genetics, and like disciplines, tend to disregard reporting the taxonomic pedigree. This occasions "a cascade of errors with negative consequences for the development of scientific knowledge, as well as for biodiversity and human welfare." He concluded that, "a single incorrect taxonomic identification has a great potential to be assimilated into many different biological and ecological studies and then in several environmental management studies and programs, multiplying

its impact synergistically." He maintained that these kinds of errors are likely to have a variety of negative consequences, such as identifying a population as homogeneous and monospecific when it should actually be recognized as a complex assemblage with distinct geographic distributions. At a minimum, cascading errors in taxonomy in our field are annoying and inaccurate, at worse they are affecting our ability to do good science, conserve species, or get funding.

Bortolus correctly argues that there is a real need for reliable taxonomic confirmation of the different taxa we work with through updated methods and perspectives. He maintains, "Ecologists usually have the feeling that taxonomic assistance may not be needed when working in areas that have been studied for decades (or centuries) by many other ecologists. However, it is clear that just because many other ecologists have been working in the exact same place we are now does not guarantee that the existing species assemblages are currently the same or prevent cryptic non-native species or genotypes from being introduced and unnoticed." It is clear that we can easily substitute 'primatologists' for his 'ecologists' as we all suffer the same biases. And while we may not necessarily have cryptic species, we certainly might have more than one species within an historically named taxa, or, as is the case with *Pithecia*, species whose juvenile members have such vast color variations that in the past they were called out as new species.

It is clear in primatology, as it is in biology generally, that taxonomy is all too often seen as a dead science. I myself as a trained field ecologist could not think of anything worse than having to riffle through dead animals in the dusty stacks of a museum. But the lesson learned was a valuable one: we are making more of a mess by perpetuating mistakes than consulting our taxonomists when we do our research. Bortolus says this: "A main causal factor in the error cascade is that even though we recognize taxonomy as an important part of biology as a whole, during the last decades taxonomists have lost consideration from the rest of the scientists. If ecologists disregard or underestimate the work of taxonomists, then they must show reliability and excellence in their taxonomic identifications, and this is not what presently seems to be occurring."

The path forward

So what can we do? I concur with Bortolus that in an ideal world we would be sure to consult with taxonomists directly and involve or consult them about the different taxa in our studies before we publish so we know exactly what species we are studying, comparing, or reporting on. However, in our field I can literally count on less than one hand the number of trained taxonomists at our disposal. Which means we all need to practice taxonomic hygiene when we publish our work, so that at a minimum we can accurately compare our findings.

To do this I suggest the following for all studies of primates.

1. Add a voucher photograph. This is especially important if you are studying *Pithecia*, but is needed for any species. If your document is published online, make sure it is in color. If your specimen is dead—either as a skin, skeletal material, fluid, tissue, DNA, mount, or other—add a photo of the living source, if possible. If it is not possible to obtain a photo, then a detailed description of the once-living animal could suffice.
2. Provide a specific location for where you are working or where your (living/dead) subject is from. Field primatologists tend to be good at this since they need to let us know where their field sites are. But an extra level of detail would be nice when speaking about study animals even *in situ*, such as sides of a river (left or right are old conventions, use ordinates), or how far from a river you traveled and in what direction you were when you (encountered, heard, studied, took samples from) the species.
3. Report as much information as you have on samples. If doing genetics, cladistics, or other experiments: specimen numbers, collection dates, locations, collectors, museums of origin, where you got the tissue sample—anything you can report is very important. If you receive samples from a catalog or bio supply house, it may take some doing, but track down the necessary source information.

If you believe you have a new species of primate, there are some immediate things to do before dashing off a publication about it.

1. Contact a taxonomist. There are many subject matter experts, but contacting one of our known primate taxonomists and have them direct you is so important. And if you do not know a taxonomist, look one up: every natural history museum has one.
2. Do not kill anything (not at first anyway). Get good photos, maybe dart it and take material for analysis, but do not take a voucher until it is clear you have a new species;
3. Do the work. If no one has done a paper (like this one) recently, you might need to track down all of the museum specimens, living photos, field sites, maybe do more field work—before you can rightfully declare a new species.

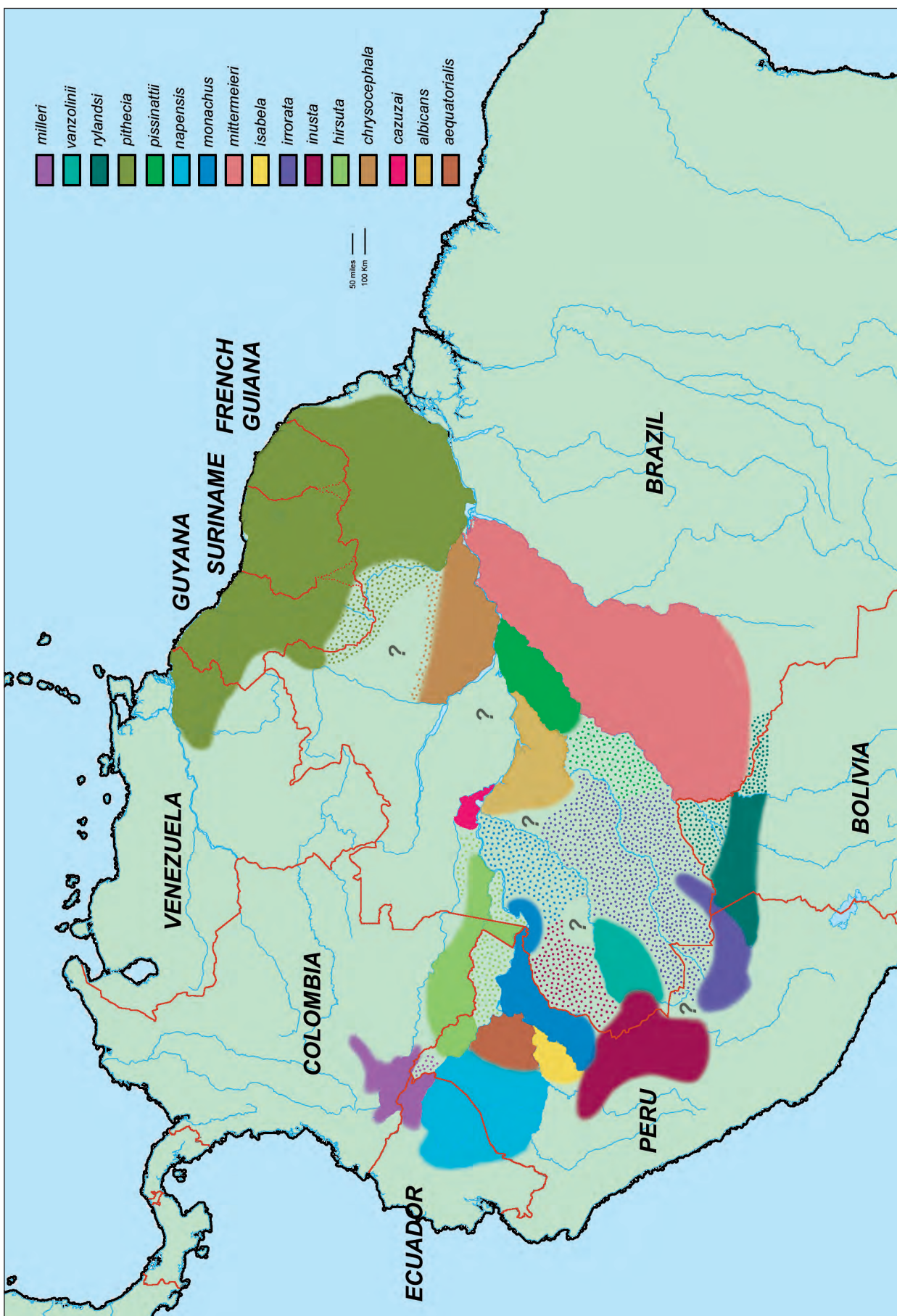
In conclusion, I implore all of us to do a better job in the nomenclature and taxonomy of Primates. Because it cannot be said enough, a reliable taxonomy is among the major factors guaranteeing the accurate identification of biodiversity hotspots, wilderness areas, endangered species, and areas of greatest concern that impact all of the animals

we care so much about...and besides, researchers 200 years from now will thank you.

Summary

In this revision, there are five original species, three species elevated from subspecific rank, three historic species reinstated, and five newly described species. The total number of *Pithecia* species is 16.

Map 17 illustrates the full range of *Pithecia* in the Amazon Basin and Shield countries. Figure 99 is a rough distributional schematic, and Figures 100 and 101 provide side-by-side representation of all species and schematics of all species described in this publication. Appendix III provides an interpretation based on this taxonomy of the Hershkovitz (1987) paintings by Zorica Dabich, which recently became available in color for our use through the courtesy of Field Museum of Natural History.



Map 17. The approximate distributions of the saki monkeys, *Pithecia*, following the classification proposed. Map by Stephen D. Nash.

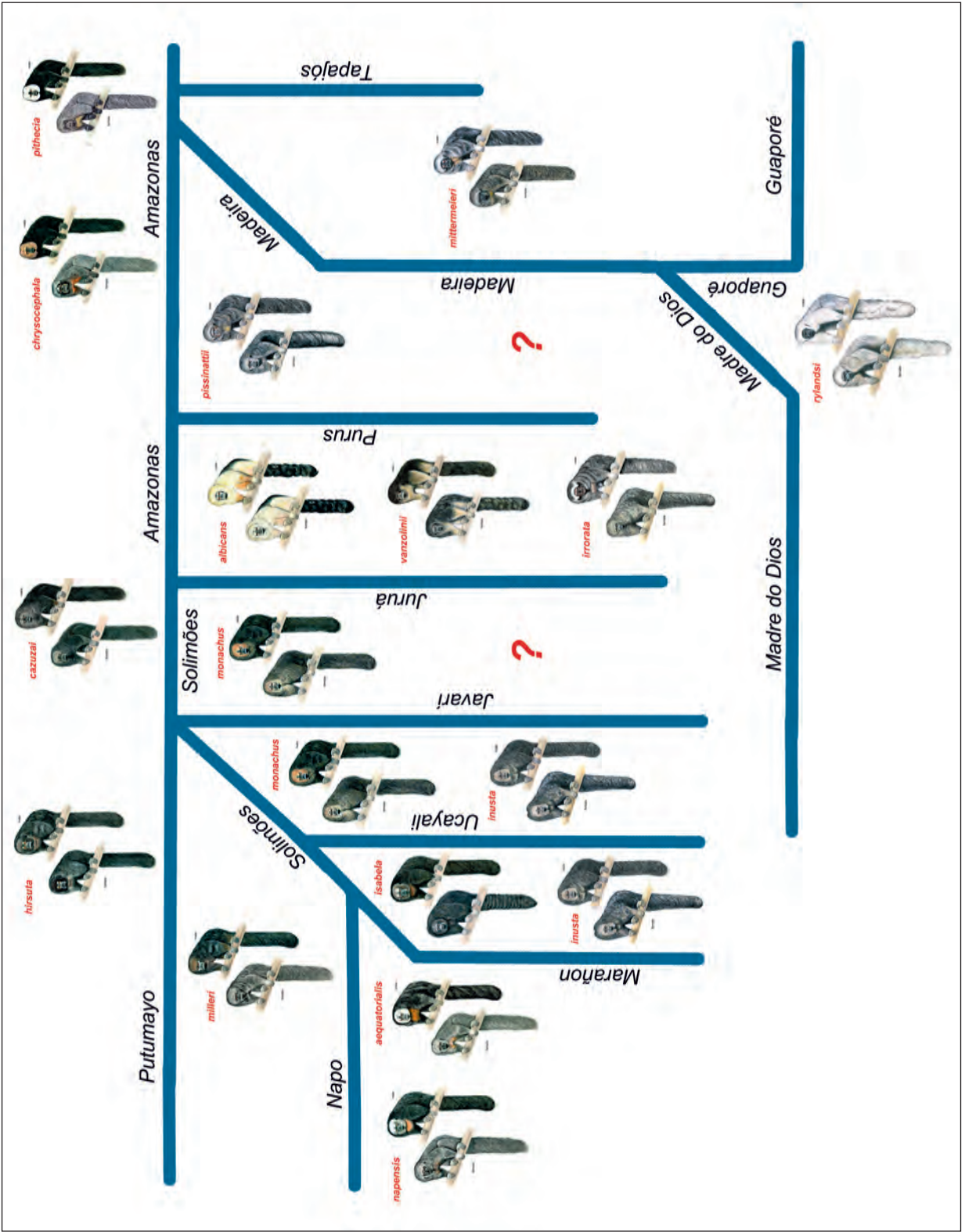


Figure 99. Schematic of all *Pithecia* species. Illustration by Stephen D. Nash.



Figure 100. Male and female faces of all *Pithecia* species in a roughly geographic arrangement. Illustration by Stephen D. Nash.



Figure 101. The species of *Pithecia*, male and female, full bodies, in roughly geographic arrangement. Illustration by Stephen D. Nash.

Acknowledgements

A project like this cannot happen without a lot of support, help, and confidence from my colleagues. So, while I will start with a blanket statement about my appreciation for everyone literally around the world who helped me—and truly I cannot thank each of you enough—I will also do my best below to call out specific persons and institutions.

First, I absolutely must make a fuss over Colin Groves, Anthony Rylands, and Russell Mittermeier for not only schooling me in taxonomy, but for sharpening my skills as a scientist, for being clear, unwavering guidance through this maze, and for being good friends. So much gratitude and love to you guys! Thank you over and over to Stephen Nash for all of his patience in illustrating everything in this volume. It was such a privilege to work and to share comic book fandom with you!

None of this work would have been possible without the gracious support of Conservation International, Primate Action Fund, the Margot Marsh Biodiversity Foundation, Primate Conservation Inc. and Noel Rowe especially, St. Louis Rainforest Advocates, and Global Conservation Institute. In particular, I want to thank Jeanne Fair for all of her help and support over the years with this project. Thank you, thank you, thank you! I am also grateful for helpful comments over the years from Marilyn Norconk, Thomas Defler, Andrew Kitchener, José de Sousa e Silva-Júnior “Cazuza”, Mário de Vivo, Rolando Aquino, Luis Albuja, and Erwin Palacios—muchísimas gracias, muito obrigada, and thank you all again so very much.

Austria. Vienna. Much thanks to Simon Englberger and Alice Schuhmacher for their excellent work and photos from the Naturhistorisches Museum Wien.

Bolivia. Many thanks to Leila Porter and Rob Wallace for all of the helpful information, and photos of animals from the field.

Brazil. Belém: Museu Paraense Emílio Goeldi staff and students (including Paulo Henrique), but particularly huge thanks to the late Liza Viega for helping me and letting me stay in her lovely apartment, and Cazuza (José de Sousa e Silva-Júnior) for everything; and the Centro Nacional de Primatas to the staff and helpful curators. Manaus: Instituto Nacional de Pesquisas da Amazônia, especially Manoela Borges, Fabio Röhe, and Wilson Spironello, and the staff of the Projeto Dinâmica Biológica de Fragmentos Florestais (PDBFF) – Ze (José Luis Camargo) and especially Bryan Lenz (thanks for the hammock!). Rio de Janeiro: Museu Nacional Rio de Janeiro, with a full heart and world of gratitude to João Alves Oliveira and Leandro Salles; Jardim Zoológico do Cidade do Rio de Janeiro’s Curator of Mammals and primate keepers; Centro de Primatologia do Rio de Janeiro, with special thanks to Alcides Pissinatti—you are truly one of our greats. São Paulo: Museu de Zoologia da Universidade de São Paulo, many, many thanks to Mário de Vivo and all of his wonderful staff and students; São Paulo Zoo – thanks to Maria Cristina Marques for the behind the scenes tour.

Colombia. Personal thanks for incredible help to Xyomara Carretero-Pinzón for work in the museums. Bogotá: Thank you to the curators and directors in the collections of: Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Universidad Nacional de Colombia Instituto de Ciencias Naturales, Museo de Historia Natural, Universidad de los Andes, and the Colección Manuel Ruiz-García de la Pontificia Universidad Javeriana.

Ecuador. Quito: All of the staff and students for the TBS Office at Universidad San Francisco de Quito, but particularly Kelly Swing and David and Consuelo Romo; the collection at Pontificia Universidad Católica del Ecuador; special thanks to Luis Albuja for allowing us access to the collection at Escuela Politécnica Nacional; Nataly Orbe Ortiz at Museo Amazónico. Napo: special thanks to Franklin, Jendry, and Romero and their families who worked with me and my field staff: Shayna Whitaker, Cindy Thorstad, and Domingo Canales Espinosa to Yarina, Yuturi, and Comuna Pamiwa Kocha; Tiputini Biodiversity Station: huge thanks to Bette Loiselle for having me work there initially back in 2001, thanks to Tony DiFiore for early help, and to Jose Hidalgo for field and museum work. Pastaza: thanks to Jarol Fernando Vaca for letting us be some of the first visitors at Shiripuno Lodge. Tena: thank you for the personalized visit at AmaZOOnico.

France. Many thanks for gracious help from Anne Previato, Geraldine Veron and Jacques Cuisin of Museum d’Histoire naturelle de Paris. The holotype vault is so impressive!

Germany. Berlin: Peter Giere and Frieder Mayer, thank you so much for your help in the collections of the Museum für Naturkunde. I really enjoyed your museum. Bonn: Many thanks to Gustav Peters for interesting discussions and data from Zoologisches Forschungsmuseum Alexander Koenig and the Cologne Zoo. Frankfurt: Grateful thanks to Katrin Krohman at Naturmuseum Senckenberg.

You made me feel so welcomed. Munich: Richard Kraft, I cannot thank you enough for allowing me to stay and study in the Zoologische Staatssammlung. Your expertise and friendship was greatly appreciated.

Hungary. Thank you to Gabor Csorba for sending photos from the collection in the Hungarian Natural History Museum.

Italy. I appreciated so much meeting Dr. Cecilia Veracini in Torino, and getting photos and data from the collection in the Museo di Storia Naturale di Firenze (Florence) from her.

Japan. Many thanks for your hard work to Hikaru Wakamori and to Masanasu Takai for photos and data from the Kyoto Primate Research Institute.

Netherlands. Many thanks to Madame Bik for her hospitality for my stay in her home. Huge thanks to Chris Smeenk for his help and guidance and to Hein von Grouw for allowing me access to the collection at the Nationaal Natuurhistorisch Museum, Leiden Naturalis.

Peru. Galaxies of thanks to Fanny Cornejo for all of your help and friendship over the years, but in particular for our tour through Peru! Also a great many thanks to Fanny Fernandez Melo for letting me stay in your home. Iquitos: Huge thanks to Rolando Aquino for letting me study your specimens at the Proyecto Peruano de Primatología de la Universidad Nacional "Manuel Moro Sommo". I look forward to one day working with you! Thank you to the staff of the Museo de Zoología FCB-UNAP for allowing us access to all of your skulls, and special thanks to César Terrones Ruiz and Fanny Cornejo for help measuring them; thank you to all of the staff at Isla de los Monos and Pilpintuwasi for allowing us access to your animals. Lima: Hundreds of thanks to the Mastozoología Peruana group, Sandra Mori, Carlos Tello, all of the students and staff, and particularly director Victor Pacheco of the Museo de Historia Natural "Javier Prado" de la Universidad Nacional Mayor de San Marcos for allowing me to work in your collection; many grateful thanks to the curators and keepers of Parque de las Leyendas and Parque Zoológico de Huachipa for your help and behind the scenes tours.

Sweden. I am so grateful for the help and friendship of Olavi Gronwall and the staff of the Naturhistoriska Riksmuseet, Stockholm. I loved all of the mandatory staff breaks and lunches!

Switzerland. I really enjoyed working at the University of Zürich-Irchel Anthropological Institute and Museum. Lots of thanks to all of the staff and students who helped me while I was there.

United Kingdom. London: Great thanks to Paula Jenkins and the mammal division of the British Museum of Natural History. Such an amazing collection! Also thanks to Malcom Fitzpatrick of the London Zoo for the personalized tour. Scotland: Great thanks to Andrew Kitchener for your kind guidance and help at the Royal Scottish Museum in Edinburgh and at the Edinburgh Zoo. I look forward to working with you again!

United States. Berkeley, CA: Special thanks to Francisco Boavista Pontual (Chico) for being my eyes while working at the Berkeley Natural History Museum, University of California. Chicago, IL: Thank you to my long time friends and colleagues Robin Foster and Tyana Watcher for initially steering me to the right people, namely Bill Stanley and Michi Schulenberg of The Field Museum for my multiple visits. It was so amazing to work in the collection that Philip Hershkovitz once curated, and to see original saki paintings from his publications. Los Angeles, CA: Thanks to Jim Dines at the Los Angeles County Museum of Natural History for being my first museum on the long path to saki discovery! New York, NY: Thank you for having me several times especially to Eileen Westwig of the American Museum of Natural History. Special thanks to Brandon Pearson for all of your work in the collection to fill in some of the data that crashed. Washington, DC: Thank you so much to Linda Gordon and David Schmidt of Smithsonian Institution.

And finally, to many, many individuals the world over who offered advice, photos, data, help, and support, including (but not limited) to: Azra Marghoob, Mark Bowler, Eckhard Heymann, Anne Savage, Susan Palminteri, Leila Porter, Tremie Gregory, Jan Vermeer, Ricardo Sampaio, Horácio Schneider, Jean Boubli, Andrew Young, Andrew Johns, Júlio César Bicca-Marques, Felipe Ennis, Eduardo Paschoalini, Stephen Ferarri, Javier Garcia, Janice Chism, Alexey Tishechkin, Bruce Junek, Dave Freeman, Shawn Heflick, Joanna Buerling, Michael Turco, and the Pitheciine Action Group.

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APPENDIX I: *PITHECIA* GAZETTEER AND COLLECTING LOCALITIES

- Acajutuba, Rio Negro, Amazonas, Brazil [03°02'S, 60°25'W; E. Sneath 1916].
- Acre, Estação Ecológica do Rio Acre, Brazil [PH].
- Aguarico (Río), Sucumbios, Ecuador [-0.27, -76.38].
- Altamira, Río Manu, Madre de Dios, Peru [-11.8, -70.8 // 12°12'S, 71°08'W; C. Kalinowski, 1960, 1961].
- Amacayacu National Park, Amazonas, Colombia [-3.29, -70.14].
- Amazonia, Parque Nacional da; near Itaituba, Pará, Brazil [-4.3, -56.7].
- Amorin (Igarapé), Pará, Brazil [-2.0, 54.9; Olalla Brothers 1931 in Paynter Jr. and Traylor Jr. 1991].
- Anavilhanas Archipelago, Estação Ecológica, [02°45'S, 60°45'W; PH].
- Andira (Lago), Amazonas, Brazil [-2.3, -56.9].
- Andira (Rio), mouth; Amazonas, Brazil [-2.4, -56.8].
- Aniba (Igarapé); Amazonas, Brazil [02°55'S, 58°33'W; A.M. Olalla 1936].
- Apuau (Rio), Amazonas, Brazil ["02°32'S, 60°48'W"; M.C. Mello 1959].
- Aripuaná (old), Mato Grosso, Brazil [09°10'S, 60°38'W; F. Stolle 1914].
- Aripuaná (Rio) [-4.2, -60.4; F. Röhe].
- Arrawarra Creek, Nickerie, Suriname [5.46, -55.71].
- Arouani River, French Guiana [4.74, -53.78].
- Arua, Rio Arapiuns, Pará, Brazil [02°39'S, 55°38'W; A.M. Olalla 1936].
- Arumá, Rio Purus, Amazonas, Brazil [04°44' S, 62°08'W; A.M. Olalla 1935].
- Atabani (Rio) (= Itabani, Rio), Amazonas, Brazil [02°47'S, 58°14'W; A.M. Olalla 1937].
- Atalaya do Norte, Rio Javari, Amazonas, Brazil [-4.24, -70.19].
- Auara (Igarapé), Rio Madeira, Amazonas, Brazil [4°24' S, 59°35'W; Olalla brothers. 1930].
- Autazes, Rio Madeira, Amazonas, Brazil [-3.58, -59.13].
- Ayapua (Lago), Amazonas, Brazil [-4.35, -62.14].
- "Bacabal Cuieira Apuau", Rio Negro, Amazonas, Brazil [M.C. Mello. April 1959; PH].
- Baeza, Napo, Ecuador [-0.2, -77.9; W.M. Richardson, January 1913].
- Balbina (Balbina Dam, Represa de Balbina, south end), Rio Uatumá, Amazonas [-1.7, -59.4].
- Balta, Rio Curanja, Rio Purus, Ucayali, Peru [10°08'S, 71°13'W; J.P. O'Neill 1963 and A.L. Gardner 1966, 1968, 1971 (PH)].
- Barra do Rio Negro (= Manaus), Amazonas, Brazil [-3.06, -59.97].
- Bartica, Demerara-Essequibo, Guyana [6.41, -58.62].
- Base Atun, Río Samiria, Reserva Nacional Pacaya-Samiria, Loreto, Peru [-5.17, -74.67].
- Belen, Río Cunucunuma, Amazonas, Venezuela [03°39'N, 65°46'W; M. Tuttle 1967].
- Benjamin Constant, Rio Javari, Amazonas, Brazil [-4.25, -70.03].
- Berbice; Guyana [05°27'N, 57°57'W; PH].
- Bigi Poika, Para SR, Suriname [5.64, -55.49].
- Blanco (Quebrada), Loreto, Peru [4°19'S, 73°14'W].
- Bobonaza (Río), Morona-Santiago, Ecuador [01°44'S, 77°29'W // mouth: -2.57, -76.63].
- Boia (Lago), Rio Tefé, Amazonas, Brazil [approx. 04°10'S, 65°7'W; Paynter Jr. and Traylor Jr. 1991].
- Boiuçu, Buiussu (Igarapé) (= Boiussu, Igarapé), Pará, Brazil [01°53'S, 54°53'W].
- Bolivia (Igarapé); Amazonas, Brazil [03°08'S, 60°01'W; E. Sneath 1916].
- Bolivar Botanical Garden, Orinoco, Venezuela [7.8, -63.3].
- Bomba, Río Bomba at mouth, Loreto, Peru [07°19'S, 73°55'W; Stevens and Traylor Jr. 1983].
- Bonasia (= Bonasika); Essequibo, Guyana [06°45'N, 58°30'W].
- Bonnesique Creek (Bonasika River), Essequibo, Guyana [06°45'N, 58°30'W].
- Borba, Rio Madeira, Amazonas, Brazil [-4.34, -59.59].
- Botonamo (Rio), near Río Cuyuni, Bolivar, Venezuela [06°59'N, 61°11'W; PH].
- Branco (Rio), Acre, Brazil [-9.8, -67.8].
- Branco (Rio), alto, at Rio Maracá, Amapá, Brazil [00°32'N, 52°13'W; PH].
- Brabo, (Bravo), Pará, Brazil [-2.0, 54.9; Olalla brothers 1931 in Paynter Jr. and Traylor Jr. 1991].
- Bratica, Guyana [6.44, -58.61].
- Bravo, Edo. do Eira (= Lara), Pará, Brazil [-1.89, -55.18].
- Bravo (Igarapé), Rio Tapajós Pará, Brazil [02°26'S, 55°00'W; PH].
- Bravo Ravine, Río Cotuhe, Amazonas, Colombia [3.03, -70.16].

- Brownsberg Nature Preserve, Brokopondo, Suriname [5.00, -54.87; R. A. Mittermeier].
- Brownsberg Nature Preserve, Sipaliwini, Suriname [05°1'N, 55°34'W; M. Norconk].
- Caciporé do Amapá (Rio), Amapá, Brazil [3.8, -51.2].
- Cacoal Selva Park, Rondônia, Brazil [-10.9, -61.5].
- Cachoeira do Tronco, Rio Erepecuru (= Rio Parú do Oeste), Pará, Brazil [01°04'S, 56°02'W; M. Lasso 1937].
- Cahuinari (Río), Amazonas, Colombia [-1.38, -71.65].
- Caititu (Igarapé), Rio Uatumá, Amazonas, Brazil [-1.75, -59.75].
- Canabouça, Paraná do Jacaré; Amazonas, Brazil [03°30'S, 60°41'W; K. Lako 1932, W. Ehrhardt 1925-26 (PH)].
- Canabouça (Lago); Amazonas, Brazil [cf., Canabuoca].
- Canacari (Lago) or Canacary, Amazonas, Brazil [02°57'S, 58°15'W; A.M. Olalla 1935].
- Caño Agua Blanca, Curare-Los Ingleses Indigenous Reserve, Colombia [01°19'36"S, 69°46'02"W; E. Palacios]
- Caño Arapa, Puré National Park, Colombia [02°19'S, 69°44'W; E. Palacios]
- Caño Curare, Curare-Los Ingleses Indigenous Reserve, Colombia [01°20'5"S, 69°49'22"W; E. Palacios]
- Caño El Boliviano, Camaritagua Indigenous Reserve / Vereda Madroño, Colombia [01°24'42"S, 69°34'58"W; E. Palacios]
- Caño Esperanza, Puré National Park, Colombia [01°50'23"S, 69°43'39"W; E. Palacios]
- Caño Mateo, Puré National Park, Colombia [02°08'S, 69°48'W; E. Palacios]
- Caño Zumaeta, Curare-Los Ingleses Indigenous Reserve, Colombia [01°22'19"S, 69°58'04"W; E. Palacios]
- Caruaro (Lago), Rio Iça at Solimões, Amazonas, Brazil [03°29'S, 68°02'W; K. Lako and Salatke (PH)].
- Carvara, (Lago do), Brazil [03°07'S, 68°02'W; PH].
- Cassipore (Rio) (= Rio Caceporé do Amapá); Amapá, Brazil [PH].
- Caterpiza (Río), Río Santiago, Amazonas, Peru [-3.6, -77.7].
- Caucaya Airport, Puerto Leguizamo, Putamayo, Colombia [-0.12, -74.76].
- Caucaya (Quebrada), Limoncocha, Miguel Velasquez Farm, Putamayo, Colombia [-0.07, -74.83].
- Cayenne, French Guiana [5.03, -52.33].
- Cerro Azul, Río Ucayali, Ucayali, Peru [07°14'S, 74°34'W; J.M. Schunke 1947].
- Chamicuros, Río Samiria, Loreto, Peru [05°30'S, 75°15'W; H. Bassler Collection 1927 (PH)].
- Chicosa, Río Ucayali, Ucayali, Peru [10°21'S, 74°00'W; R.W. Hendee 1927].
- Cipotuba (Lago do), Rio Aripuaná, Rondônia, Brazil [-4.8, -60.2].
- Chupinguaia, near RO-391, Rondônia, Brazil [-12.0, -61.0].
- Cobija, Río Acre Pando, Bolivia [11°01'S, 68°44'W; C. Freese, P. Heltne, N. Castro, and G. Whiteside 1975 (PH)].
- Cocha Cashu, Río Madre de Dios, Madre de Dios, Peru [-11.88, -71.39].
- Colina do Veado, Óbidos; Pará, Brazil [01°54'S, 55°31'W; E. Snethlage 1912 (PH)].
- Cononaco (Río), Ecuador [-1.2, -75.9].
- Contamana, Loreto, Peru [-7.34, -75.01].
- Copataza (Río), Pastaza, Ecuador [02°07'S, 77°27'W; C. Buckley 1877, 1878].
- Coppename River, Lolopasi west bank, across from Foengoe Island, Sipaliwini, Suriname [4.86, -55.96].
- Côrrego do Campo, Pimento Bueno, Rondônia, Brazil [q.v.; Comissão Rondon, 1914 (PH)].
- Cotuhe (Río), Tarapaca, Amazonas, Colombia [-2.77, -69.72].
- Cravari, Mato Grosso, Brazil [PH].
- Cruzeiro do Sul, Amazonas, Brazil [-7.63, -72.68].
- Cuieiras (Rio), mouth of, Rio Negro, Amazonas, Brazil [-2.83, -60.50].
- Cuipeua (Lago), near Boiussu, Pará, Brazil [PH].
- Cuiteua (Lago) (= Lago Cuipeua), Pará, Brazil [-1.84, -55.5].
- Cumeria (= Cumaria), Río Ucayali, Ucayali, Peru [09°52'S, 74°01'W; R.W. Hendee, August 1927].
- Curaca (Quebrada), Loreto, Peru [04°60'S, 73°43'W; F. Cornejo].
- Curaray (Río), mouth; Loreto, Peru [-2.0, -74.1].
- Curaray and Nahiño (between ríos), Peru [-1.3, -75.5; R. Aquino].
- Curaray (Río), mouth, at Río Napo, Ecuador [02°22'S, 74°05'W; Olalla brothers, October, November, December 1925].
- Curumo (Río), Bolivar, Venezuela [07°15'N, 61°20'W; PH].
- Cuyabeno National Park (incl. Laguna Garza Cocha) [-0.10, -75.86].
- Dadanawa, Rupununi, Guyana [02°50'N, 59°30'W; PH].
- Demerara Coast Region, Guyana [7.5, -58.6].
- Demerara River, Guyana [5.88, -58.4].

- Destacamento, Río Marañón, Loreto, Peru [03°21'S, 72°45' W; M. Ximenez de la Espada, 1865].
- Destacamento do Ribeiro, Rondônia, Brazil [-9.6, -65.3; Natterer 1883]
- Ega (= Tefé), Amazonas, Brazil [cf. Tefé]
- Eiru (Río), mouth at Rio Juruá, Amazonas, Brazil [06°26'S, 69°52'W].
- Eirunepé (= João Pessoa); Amazonas, Brazil [06°0'S, 69°52'W].
- El Dorado, Bolívar, Venezuela [06° 44'N, 61° 38'W; PH].
- El Hacha (Quebrada) Caquetá River Expedition 1960 [-0.15, -74.57].
- El Infierno Farm, Puerto Santander, Río Caquetá, Caquetá, Colombia [0.70, -75.20].
- El Manaco, 59 Km SE of El Dorado at Km 74, Bolívar, Venezuela [7.2, -61.6].
- Erepecurú (Río) (now upper Río Parú do Oeste) [01°30'N, 56°00'W].
- Espelho (Serra), Pará, Brazil [cf. Faro, PH].
- Esperanza, Quebrada, Río Yavari-Mirim, Loreto, Peru [04°21'S, 71°58'W; C. Kalinowski, 1957].
- Essequibo (River), West Demerara, Guyana [6.70, -58.58].
- Estación Biológica Pithecia Loreto, Río Samiria, Peru [05°10'S, 74°40'W; PH].
- Estación Biológica Panguana, Río Lullapichis, Huanaco, Peru [09°36'S, 74°56'W].
- Estribaciones, Ecuador [00°32'S, 77°34'W; L. Albuja].
- Estirão do Equador, Ro Javari, Amazonas, Brazil [-4.38, -71.55].
- Faro, Río Nhamunda, Pará, Brazil [02°11'S, 56°44'W].
- Flexal (Lago) (also see Bravo), Pará, Brazil [-1.89, -55.18].
- Fonte Boa, Río Solimões, Amazonas, Brazil [-2.44, -66.07].
- Fordlândia, Río Tapajós, Pará, Brazil [03°40'S, 55°30'W; PH].
- Forte do Río Branco, Roraima, Brazil [03°01'N, 60°28'W].
- Galvez (Río), Loreto, Peru [05°15' S, 73°10'W].
- Gi-Paraná (Río), (= likely Río Ji-Paraná), Rondônia, Brazil [08°03'S, 62°52'W; PH].
- Gordão (Igarapé), Río Juruá, Amazonas, Brazil [06°35'S, 69°52'W; A.M. Olalla, 1936].
- Grande (Igarapé), left bank Río Juruá, Amazonas, Brazil [06°37'S, 69°52'W; A.M. Olalla, 1937].
- Grande (Lago), Río Juruá, Amazonas, Brazil [06°41'S, 69°53'W; A.M. Olalla 1936].
- Grande (Río), Bolívar, Venezuela [08°16'N, 61°17'W; PH].
- Guajará-Mirim, Rondônia, Brazil [-10.80, -65.34].
- Guaporé (Río); Rondônia, Brazil (= Río Mamoré, Beni, Bolivia) [11°55'S, 65°10'W].
- Guri, Operación Rescate, Río Caroni, Bolívar, Venezuela [07°40'N, 63°00'W; PH].
- Guri (Lago), Bolívar, Venezuela [8.2, -62.9].
- Gurisoco, El Palmar; Bolívar, Venezuela [08°01'N, 61°56'W; PH].
- Hanover, Weg (nearby), Para SR, Suriname [5.57, -55.13].
- Humaitá, Río Madeira, Amazonas, Brazil [-6.9, -63.0].
- Humboldt, Von (= Von Humboldt), Huanuco, Peru [08°45'S, 75°05'W; PH].
- Iaunari (= Yavanari or Javanari), Amazonas, Brazil [-0.3, -64.8].
- Itaboca, Río Purus, Amazonas, Brazil [04°53'S, 62°41'W; A.M. Olalla 1935].
- Inuya (Río), mouth at Río Urubamba, Ucayali, Peru [-10.68, -73.46].
- Ipousin (= Ipoucin Crique), French Guiana [04°09'N, 52°24'W].
- Iqué-Aripuaná, Estação Ecológica, Mato Grosso, Brazil [PH].
- Iqué, Estação Ecológica, Mato Grosso, Brazil [PH].
- Iqué-Juruena, Estação Ecológica, 11°30'–12°21'S, 58°42'–59°53' W; E.Z.F. Setz and K. Milton 1983 (PH).
- Iquitos, Río Amazonas, Loreto, Peru (03°46'S, 73°12'W).
- Irاندuba, Río Amazonas, Amazonas, Brazil [-3.0, -60.2].
- Itabani (Río), or Atabani, Amazonas, Brazil [02°47'S, 58°14'W; A.M. Olalla 1937].
- Itaboca, Río Purus, Amazonas, Brazil [-4.83, -62.76].
- Itacoatiara, Río Amazonas, Amazonas, Brazil [-3.04, -58.44].
- Itaituba; Pará, Brazil [04°17'S, 55°59'W; PH].
- Jaburu, Río Purus, Amazonas, Brazil [05°36'S, 64°03'W; PH].
- Jacarécanga; Pará, Brazil [-6.23, -57.77].
- Jamundá (cf. Nhamundá), Pará, Brazil.
- Jari (Río) at Lago Jari, Pará, Brazil [-4.93, -62.37].
- Jaru, Reserva Biológica Federal; Rondônia, Brazil [10°00' S, 62°00'W; PH].
- Javanari, (cf. Yavanari), Amazonas, Brazil.
- João Pessoa (= Eirunepé), Amazonas, Brazil [06°40'S, 69°52'W; A.M. Olalla, 1936].
- Juma Lodge, Lago Juma/Río Juma, Amazonas, Brazil [03°48'S, 59°49'W].
- Juruá (Río); mouth, at Río Amazonas, Amazonas, Brazil [-2.64, -65.75].
- Kabalebo River, Sipaliwini, Suriname [4.40, -56.98].

- Kaieteur Falls, Essequibo, Guyana [5.27, -59.49].
- Kaiserberg Airstrip; Nickerie, Suriname [03°10'N, 56°15'W; PH].
- Kapoeri Creek, Nickerie, Suriname [5.41, -57.13].
- Kayser Gebergte, current airstrip nearby, Sipaliwini, Suriname [3.3, -56.4].
- Kayser Mountains, Sipaliwini, Suriname [3.3, -56.7; M. van Roosmalen study].
- Kalacoon, Mazaruni-Potaro, Guyana [06°24'N, 58°39'W; Stephens and Traylor Jr. 1985].
- Kartabo, Mazaruni-Potaro, Guyana [06°23'N, 58°41'W; Stephens and Traylor Jr. 1985].
- Km 16, BR 230, Rondônia, Brazil [-7.2, -62.6].
- Km 19, Itaituba-Jacarácanga, Pará, Brazil [06°13'S, 57°44'W; PH].
- Km 21, BR 174 Tarumã, Manaus, Amazonas, Brazil [-2.97, -60.0].
- Km 104-200, Manaus-Itacoatiara; Amazonas, Brazil [02°58'S, 58°59'W; M. Mello 1967].
- Km 105, BR 174 N, Manaus, Amazonas, Brazil [-1.94, -60.08].
- Km 212, Itaituba-Jacarácanga, Para, Brazil [04° 53' S, 56° 47' W; PH].
- Km 165, Manaus-Itacoatiara; Amazonas, Brazil [03°01'S, 59°00'W; M. Mello 1965, A. Faustino 1965].
- Km 170, Manaus-Itacoatiara; Amazonas, Brazil [03°01'S, 58°58'W; M. Mello 1967].
- Km 190, Manaus-Itacoatiara; Amazonas, Brazil [02°58'S, 58°52'W; M. Moreira 1966, M. Mello 1967].
- Kourou Road, Saut Laurent, French Guiana [5.38, -53.07].
- La Coca, Río Napo, Napo, Ecuador [00°28'S, 76°58'W; M. Jiménez de la Espada, 1865].
- Lagarto, Río Ucayali, approx. Olalla camp, Ucayali, Peru [-10.64, -73.81].
- Lagarto Cocha (mouth), border Ecuador/Peru [00°39'S, 75°16'W; Olalla brothers 1926 - 1928].
- Lago Piratuba, (Reserva Ecológica), Amapá, Brazil [01°37'N, 50°10'W; A. B. Rylands and R. A. Mittermeier 1982 (PH)].
- La Chorrera, Igara-Paraná (Río), 20 km downstream of La Raicilla Ravine, Amazonas, Colombia [-1.47, -72.62].
- La Macarena, Meta, Colombia [2.21, -73.94].
- La Muralla (= Morelia), Caquetá, Colombia [1.50, -75.73].
- La Poule, Saramacca, Suriname [05°47'N, 55° 25'W; PH].
- Las Patas, Bolivar, Venezuela [07°11'N, 62°22'W; PH].
- La Solita Creek, Solita, Colombia [00°54'N, 75°39'W].
- La Trinidad, El Palmar, Bolivar, Venezuela [07°25'N, 61°49'W; PH].
- Lely Gebergte, Sipaliwini, Suriname [4.47, -54.65].
- Limoal, near Boim, Pará, Brazil [-2.82, -55.17; Paynter Jr. and Traylor Jr. 1991].
- Limoatuba, Pará, Brazil [-2.0, 54.9; Olalla brothers 1931 in Paynter Jr. and Traylor Jr. 1991].
- Limontuba (= Limoatuba), Pará, Brazil [PH].
- Llullapichis (= Yuyapichis) (Río) mouth, Huanuco, Peru [-9.62, -74.96].
- Loksie Hattie, Suramaca River, Brokopondo, Suriname [5.33, -55.35].
- Los Amigos Concesión para Conservación, Río Los Amigos, Madre de Dios, Peru [12°34'S, 70°6'W].
- Macapá, Amapá, Brazil [0.03, -51.07].
- Macas, Morona-Santiago, Ecuador [-2.1, -78.1].
- Maisisa, Ucayali, Peru [08°36'S, 74°19'W; Stevens and Traylor Jr. 1983].
- Mamirauá Reserve, Amazonas, Brazil [-2.40, -65.36].
- Mamore (Río), mouth, Beni, Bolivia, also Rio Guaporé, Rondônia, Brazil [-10.43, -65.39].
- Manacapuru, Rio Solimões, Amazonas, Brazil [-3.1, -60.6].
- Manaquiri, south of Rio Amazonas, Amazonas, Brazil [-3.37, -60.42].
- Manarica Creek, Essequibo River, Guyana [PH].
- Manaus, Amazonas, Brazil [-3.06, -59.97].
- Manu, Parque Nacional, Madre de Dios, Peru [-11.8, -70.8].
- Mapixi (Lago), (= Lago Mapiocu), Rio Purus, Amazonas, Brazil [05°43'S, 63°54'W; K. Lako 1931].
- Maracá (Rio), Roraima, Brazil [-0.1, -51.6].
- Mararu, Pará, Brazil [-10.43, -65.39].
- Marua (= cf. Mararu); Pará, Brazil.
- Matapi Creek and Kabalebo River near Corantijn River, Suriname [5.08, -57.60].
- Matapi, Suriname [5.11, -57.30].
- Mato Grosso, Mato Grosso do Sul (Natterer 1826), Brazil [-14.3, -59.9].
- Mazaruni River, Essequibo, Guyana [06°24'N, 58°39'W; PH].
- Mazan, Río Amazonas, Loreto, Peru [-3.47, -73.06].
- Mecaya (Río), below mouth, right bank, Río Caquetá, Putumayo, Colombia [00°29'N, 75°11'W; P. Hershkovitz, March 1952].
- Miguel (Lago), (approx. now Lago Bonfim), Rio Madeira, Amazonas, Brazil [-3.79, -59.11].
- Mocoa, Putamayo, Colombia [1.26, -76.65].
- Moengo, SW, Suriname [5.66, -54.44].

- Moengotapoe, Marowijne, Suriname [5.65, -54.29].
- Montalvo, Río Bobonaza, Pastaza, Ecuador [02°14'S, 76°58'W].
- Montanita, Florencia, Caquetá, Colombia [01°30'N, 75°28'W].
- Montealegre (= Monte Alegre), Huanuco, Peru [09°30'S, 74°57'W; Tessman, November 1922].
- Morelia, Río Fragua, Caquetá, Colombia [01°31'N, 75°41'W; L.E. Miller, July 1912].
- Moroni River, Suriname [5.52, -54.05].
- Mucden (= Mukden), Pando, Bolivia [-11.0, -69.1].
- Mukden, Pando Bolivia [11°25'S, 69°01'W; L. Porter, field site]
- Napo Wildlife Center, Río Napo, Ecuador [-0.2, -76.8].
- Napo (Río) at Coca, Orellana, Ecuador [-0.46, -76.98].
- Napo (Río) north near mouth of Río Curaray, Loreto, Peru [-22.0, -74.0; Olalla brothers collection 1925].
- Napo (Río), north of Iquitos, Loreto, Peru [-1.57, -74.21; Olalla brothers collection 1925].
- Nareuda (Río), Mukden, Bolivia [11°18'S, 6°46'W].
- Nashiño (Río), Peru [near -98, -75.31; R. Aquino].
- Nassau Gebergte, near Marowijne River, Sipaliwini, Suriname [4.85, -54.60].
- Nauta, Loreto, Peru [-4.58, -73.77].
- Navio, Serra do (=Vila do Serra), Amapá, Brazil [1.1, -52.0].
- Negro (Rio) mouth at Rio Amazonas, Amazonas, Brazil [-3.13, -59.90].
- Nevati (Mission, right bank), Río Pichis, Oxapampa, Pasco, Peru [10°21'S, 74°51'W; D.R. Seidel 1964, M.D. Tuttle 1963].
- Nhamundá (Rio), Pará, Brazil [02°14'S, 56°43'W].
- Nova Brasília, Rondônia, Brazil [-10.4, -61.9].
- Nuevo San Juan, Río Galvez, Loreto, Peru [05°15'S, 73°10'W].
- Nuria (Altiplanicia); Bolivar, Venezuela [07°50'N, 61°40'W; PH].
- Óbidos, Pará, Brazil [-1.84, -55.51].
- Oiapoque, French Guiana [3.97, -51.83].
- Oko Mountains, Cuyuni-Mazaruni, Guyana [06°25'N, 58°57'W; E.R. Blake 1937 (PH)].
- Oriximiná; Pará, Brazil [-1.4, -55.9].
- Orosa, Río Amazonas, Loreto, Peru [03°23'S, 72°07'W; Olalla brothers 1926].
- Orosa (Río), Loreto, Peru [-3.69, -72.44; R. Aquino].
- Pacáas Novos (Rio), Rondônia, Brazil [-10.85, -65.00; Natterer 1829].
- Pacáas Novos, Parque Nacional, Rondônia, Brazil [10°30'S, 63°35'W; PH].
- Pacaya-Samiria, Reserva Nacional, Loreto, Peru [-5.20, -74.59].
- Pachitea (Río) mouth, Huanuco, Peru [-8.74, -74.50].
- Palmares, Amazonas, Brazil [PH].
- Palomeu River Camp, Tapanahoni River, Marowijne, Suriname [3.3, -55.4].
- Papel Azul (Igarapé); Amazonas, Brazil [02°45'S, 60°40'W; PH].
- Paramaribo, Suriname [5.87, -55.16].
- Pastaza (Río) mouth at Rio Marañon, Pastaza, Peru [04°54'S, 76°24'W].
- Paranova (Lagoinho), Rio Guaporé, Rondônia, Brazil [11°55'S, 65°10' W; J. Natterer, 1829].
- Paratuco (Rio) (= Piratucu), Amazonas, Brazil [01°59'S, 56°58' W; Olalla brothers 1930].
- Perica River, Moengo, Suriname [5.91, -54.69].
- Parinari (= Parinari Caño?), Loreto, Peru [-4.1, -74.5; Bluntsali-Peyer Expedition 1913].
- Parintins, Amazonas, Brazil [-2.2, -56.7].
- Parque Nacional da Amazônia, Rio Tapajós, Pará, Brazil [03°42'S, 57°21'W; PH].
- Parú do Oeste (Rio), Pará, Brazil [-1.1, -56.0].
- Passarinho (Igarapé), Amazonas, Brazil [PH].
- Patana (Cachoeira), Pará, Brazil [3.13, -62.35].
- Pebas, Río Amazonas, Loreto, Peru [03°20'S, 71°49'W; R.W. Hendee 1928].
- Penal Settlement, Burntbush, Mazaruni-Potaro, Guyana [06°24'N, 58°39'W; PH].
- Piratuba, Lago; Amapá, Brazil [01°37'N, 50°10'W; A. B. Rylands and R. Mittermeier 1982 (PH)].
- Pisqui (Río), Ucayali, Peru [07°45'S, 75°01'W; H. Bassler Collection, 1923].23
- Ponta da Castanha, SW bank Rio Tefé, Amazonas, Brazil [-3.81, -64.97 approx; A. Johns 1985].
- Porongaba, Rio Juruá, Acre, Brazil [-8.66, -72.82].
- Porteira, Pará, Brazil [-0.8, -57.0].
- Porto Mauá, Manaus, Amazonas, Brazil [03°08'S, 60°01'W; M. Oreira 1967, F. Almeida 1965].
- Porto Saldes, Rio Juruá, Acre, Brazil [-8.17, -72.76].
- Porto Tírios, Parú do Oeste, Pará, Brazil [02°18'N, 55°16'W; PH].
- Potaro Landing, Essequibo, Guyana [05°22'N, 59°08'W, PH].
- Pucallpa, Ucayali, Peru [-8.35, -74.55].

- Puerto Indiana, Río Amazonas, Loreto, Peru [-3.4, -73.04 //03°28'S, 73°03'W; H. Bluntschli, 1912; Olalla brothers, 1926].
- Puerto Japón, Río Peneya, Caquetá, Colombia [00°07'N, 74°24'W].
- Puerto Leguizamo and La Tagua [between rivers: -0.05, -74.73; K. Watanabe Expedition 1973–1974].
- Puerto Melendez, N bank Rio Marañon, Loreto, Peru [04°27'S, 77°31'W; H. Bassler Collection, February 1929].
- Puerto Pachitea, Río Pachitea, Huanaco, Peru [-9.93, -75.03].
- Puerto Pungo, Río Punga, Loreto, Peru [-5.7, -74.1].
- Puerto Pungo, Río Tapiche, Loreto, Peru [06°14'S, 74°02'W; PH].
- Puerto Tokio, Río Peneya, Caquetá, Colombia [00°12'N, 74°23'W].
- Puerto Victoria, Río Pachitea, Huanaco, Peru [-9.88, -74.94].
- Quebradón El Ayo, Puré National Park, Colombia [01°35'S, 69°30'W; E. Palacios]
- Quixito (Río), Loreto, Peru [04°25'S, 70°15'W].
- Reserva de Desenvolvimento Sustentavel Piagaçu-Purus, Rio Purus, Amazonas, Brazil [-4.5, -62.3].
- Reserva Nacional Allpahuayo-Mishana, Loreto, Peru [-3.91, -73.12].
- Reserva Nacional Pacaya-Samiri, Loreto, Peru [05°15'S, 74°40'W]
- Retiro do Veado Branco, Serra do Norte, Rondônia, Brazil [11°20'S, 59°00'W; Comissão Rondon].
- Rio Acre, Estação Ecológica, Acre, Brazil [10°45'S, 70°00'W; PH].
- Rockstone, Essequibo River, Guyana [5.98, -58.53].
- Rosarinho, Amazonas, Brazil [03°42'S, 59°08'W; Olalla brothers 1930].
- Rupununi River, mouth, Rupununi, Guyana [4.0, -59.0].
- Samiria (Río), mouth; Loreto, Peru [04°42'S, 74°12'W].
- Sampaio (Lago), Rio Madeira, Amazonas, Brazil [-3.84, -59.17].
- San Fernando, Río Yavari-Mirim, Loreto, Peru [04°11'S, 70°52'W; C. Kalinowski, 1957].
- San Francisco, left bank Río Napo, Napo, Ecuador [00°30'S, 76°22'W; P. Hershkovitz, March 1936].
- San Jose del Encanto, Río Caraparana, Putumayo, Colombia [01°50'S, 73°28'W; H. Hill, 1975, 1976].
- San Martín de Turumbari, Río Cuyuni, Bolivar, Venezuela [06°42'N, 61°02'W; PH].
- San Lorenzo, near border with Bolivia, Madre de Dios, Peru [-11.3, -69.3; R. Aquino Collection].
- San Salvador, Río Tapiche, Amazonas, Peru [-5.0, -73.9].
- Santa Cecilia, Río Maniti, Loreto, Peru [03°26'S, 72°46'W; C. Kalinowski, June 1957].
- Santa Cruz, Rio Eiru, Amazonas, Brazil [07°23'S, 70°47'W; PH].
- Santa Elena, Río Samiria, Loreto, Peru (05°11'S, 74°45'W; PH).
- Santa Lucia (not Santa Luisa), Río Nanay, Loreto, Peru [03°35'S, 74°30'W; C. Kalinowski 1956 (PH)].
- Santa Luisa (likely location), Río Nanay (lower near Rio Marañon), Loreto, Peru [-4.35, -74.12; Stephens and Traylor Jr. 1983].
- Santarém, Rio Tapajós, Pará, Brazil [-2.55, -54.72].
- Santa Rita do Weil (= Santa Rita), Rio Solimões, Amazonas, Brazil [-3.48, -69.31; W. Ehrhardt, 1926].
- Santiago (Río) mouth, Esmeraldas, Ecuador [-4.30, -77.63].
- Santo Antônio, Rio Eiru, Amazonas, Brazil [06°42'S, 69°52'W; PH].
- Sapote (Quebrada), Río Ucayali, Loreto, Peru [-5.18, -74.15; R. Snyder].
- Sarayacu, Río Ucayali, Loreto, Peru [-6.72, -75.10].
- Sarayaku, Morona-Santiago, Ecuador [-1.6, -77.5].
- Saut Laurent du Maroni, French Guiana [5.60, -53.99].
- Saut Sabbat, French Guiana [5.50, -53.66].
- Saut Tigre, French Guiana [5.38, -52.93].
- São Felipe at or below, Rio Juruá, Amazonas, Brazil [unknown location, ca. 07°S (PH); E. Garbe, 1901-1902].
- São Joaquim, Rio Branco, Roraima, Brazil [03°01'N, 60°29'W; PH].
- São Manoel (= São Manuel), Rio Teles Pires, Pará, Brazil [07°21'S, 58°03'W; F. Hoehne 1912, 1914].
- São Paulo (Fazenda), Amazonas, Brazil [q.v.].
- São Sebastião do Uatumã, Rio Uatumã, Amazonas, Brazil [-2.56, -58.15].
- Saramacca, Suriname [6.5, -55.5].
- Sarayacu, Pastaza, Ecuador [-1.5, -77.5].
- Sarayacu, Río Bobonaza, Pastaza, Ecuador [01°44'S, 77°29'W; PH].
- Sarayacu, Ucayali, Peru [-6.4, -75.0].
- Sarayacu, Olalla Camp (March-May 1927), Ucayali, Peru [-6.63, -75.04; Stevens and Traylor Jr. 1983].
- Sarayacu, Olalla Camp (May-June 1927), Ucayali, Peru [-6.59, -75.14; Stevens and Traylor Jr. 1983].
- Sarayacu, Olalla Camp (August 1927), Ucayali, Peru [-6.89, -75.10; Stevens and Traylor Jr. 1983].
- Seringal Oriente, Rio Juruá, Acre, Brazil [08°48'S, 72°46'W; PH].

- Serpa (Lago), Itacoatiera, Amazonas, Brazil [03°05'S, 58°30'W; A. M. Olalla 1936-1937].
- Serra de Espelho, Faro, Pará, Brazil [02°11'S, 56°44'W; A. M. Olalla 1930, 1937].
- Shiripuno Research Lodge, Río Shiripuno, Ecuador [01°06'S, 76°43'W; L. K. Marsh].
- Sushufindi, Succumbios, Ecuador [-0.04, -76.64].
- Siguin (or Sihuín), Río Pastaza, Loreto, Peru [03°07'S, 76°26'W; C. Olalla, Mission Flornoy, 1936].
- Silves, Amazonas, Brazil [02°50'S, 58°13'W; A. M. Olalla 1937].
- Sipaliwini Airstrip (1970s), Sipaliwini, Suriname [3.9, -56.2].
- Supamo (Río), Bolívar, Venezuela [07°00'N, 62°15'W; PH].
- Supinaam River, Demerara, Guyana [06°23'N, 58°41'W; Stephens and Traylor Jr. 1985].
- Tabatinga, Amazonas, Brazil [-3.7, -69.6].
- Tabalosos, Huanuco, Peru [-6.36, -76.63].
- Tabocal (Tabucal), Amazonas, Brazil [-3.03, -58.18 // Tabucal: 00° 47' S, 67° 15' W; A. M. Olalla 1929].
- Tacshacurary (Río) at Río Machete (mouth) [-2.66, -73.62].
- Tahuamanu (Río), Pando, Bolivia [11°06'S, 68°36'W; K. Izawa 1978].
- Tahuayo Lodge, Río Tahuayo, Loreto, Peru [-4.22, -73.22].
- Tamashiyacu, Río Amazonas, Amazonas, Peru [-4.01, -73.15].
- Tamboryacu (Río), Loreto, Peru [-1.5, -74.2; R. Aquino].
- Tapanahoni River (cf., Paloemeu River) [3.3, -55.4].
- Tapiche (Río), Amazonas, Peru [-5.0, -73.9].
- Tapirapoan (= Tapirapua); Mato Grosso, Brazil [PH].
- Tapirapua, Rio Cipotuba, Mato Grosso, Brazil [14°51'S, 57°45'W; F. Hoehne 1914].
- Taumaturgo (Vila), Acre, Brazil [PH].
- Tefé (Lago), Amazonas, Brazil [03°22'S, 64°42'W; H. Bates 1850-54 (PH)].
- Tefé (Río); Amazonas, Brazil [-3.81, -64.97].
- Teresinha, Rio Amaparí, Amapá, Brazil [00°58'N, 52°02'W; PH].
- Terra Santa, Lago do Algodal, Pará, Brazil [02°06'S, 56°29'W; PH].
- Tigrillo (Río), Río Tigré, Peru [04°20'S, 74°16'W; PH].
- Tiputini Biodiversity Station, Río Tiputini, Yasuní National Park, Ecuador [-0.5, -76.3].
- Tírios, Rio Parú do Oeste, Pará, Brazil [02°18'N, 55°16'W; PH].
- Tonantins (Río), Amazonas, Brazil [-2.79, -67.87; J. B. von Spix 1820].
- Tracajatuba (Rio), Amapá, Brazil [1.1, -51.1].
- Tres Troncos, La Tagua, Río Caquetá, Colombia [00°08'N, 74°41'W].
- Trombetas, Rio, Reserva Biológica, Pará, Brazil [01°05'S, 57°02'W; A. B. Rylands and R. A. Mittermeier 1982].
- Tumatumari, Potaro River, Essequibo, Guyana [05°22'N, 59°00'W; PH].
- Tushemo (= Tushma or Tusma), Ucayali, Peru [08°38' S, 74°22'W; L. Rutter, 1926].
- Tutapisco (Río), Peru [-3.02, -73.26].
- Uariní, Pará, Brazil [-2.91, -65.10].
- Uatumá (Río), Amazonas, Brazil [-2.56, -58.15].
- Uauaçú (Lago), (Coarí), Amazonas, Brazil [-4.19, -62.37].
- Urubamba (Río), mouth at Río Ucayali, Ucayali, Peru [10°44'S, 73°45'W; Olalla brothers, 1927].
- Urubamba (Río) lower, T. Gregory Field Site, Ucayali, Peru [-11.74, -72.91].
- Urubú (Río), mouth, Amazonas, Brazil [02°55'S, 58°25'W; PH].
- Urucú (Río), Amazonas, Brazil [-4.46, -64.35].
- Utoquina; Ucayali, Peru [-9.67, -74.08 // 08°16'S, 74°32'W; H. Bassler collection 1923].
- Vereda La Leona, Valparaiso, Colombia [01°08'N, 75°35'W].
- Vila Bella Imperatriz, Lago Andira, Amazonas, Brazil [02°50'S, 56°55'W; Olalla brothers 1930].
- Villa Garzón, Puerto Limón, El Picudo Indigenous Reservation, Putumayo, Colombia [1.13, -76.60].
- Vila Braga, Pará, Brazil [04°25'S, 56°17'W. [F. Lima, 1917].
- Vila Nova (Río), Amapá, Brazil [00°30'N, 51°50'W; PH].
- Voltzberg, east bank, Coppename River, Sipaliwini, Suriname [4.81, -56.04].
- West River, Wilhelmina Mountains, Nickerie, Suriname [03°45'N, 56°30'W; PH].
- Wia-Wia Nature Preserve, Moengo, Suriname [5.94, -54.44].
- Wilhelmina Mountains, approx. West River, Sipaliwini, Suriname [4.0, -56.6].
- Xapurí, Acre, Brazil [-10.4, -68.5].
- Yanayacu, Río Marañón, Loreto, Peru [-4.79, -74.95].
- Yarina Eco Lodge, Río Napo, Napo, Ecuador [-0.3, -76.8].
- Yavanari (= Iaunari); Amazonas, Brazil [-0.3, -64.8].
- Yavari (Río), near mouth, Loreto, Peru [04°21'S, 70°02'W; PH].
- Yavari Mirim (Río), Loreto, Peru [-4.51, -72.70].
- Yavari Mirim (Río) mouth, Loreto, Peru [04°29'S, 71°47'W].

Yotacuay; Delta Amacuro, Venezuela [08°30'N, 61°00'W;
PH].

Yuturi Eco Lodge, Río Napo, Ecuador [-0.5, -76.0].

Zanderij, Para SR, Suriname [5.60, -55.21].

Zinho (Igarapé) near Igarapé Aniba, Amazonas, Brazil
[-2.91, -58.55].

Zuid River, Sipaliwini, Suriname [3.4, -56.4].

* Unspecified coordinates per Gmap.

^ PH indicates locations reported by P. Hershkovitz (1987).

APPENDIX II. THE JAMARI SAKI

Introduction

The specimens presented in this appendix were mostly collected by H. Schneider in the inundation area of the Samuel hydroelectric dam (Jirau dam) of the Rio Jamari, Rondônia, Brazil. These animals appear distinct, particularly the females which do not resemble any other females in the genus, at least by the specimens available. While it was tempting to declare them as a distinct species, more data needs to be collected on living sakis in that region.

The information below follows a taxonomic format, but is without types or names.

Synonymy

1987 *P. irrorata* Hershkovitz, P. (1987). *Am. J. Primatol.* 12: 425–426, in part.

Key Specimen I. MPEG No. 21961, adult male, skin and skull, collected by H. Schneider and E. Martins, 29 April 1988.

Key Specimen II. MPEG No. 21785, adult male, skin and skull, collected by H. Schneider, 2 February 1988.

Additional Important Specimens. *Males:* MPEG Nos. 21775 subadult, skin (H. Schneider, 7 December 1987); 21791 subadult, skin (H. Schneider, 25 March 1988); 21792 subadult, skin and skull (H. Schneider, 3 March 1988); 21937 subadult, skin and skull (H. Schneider, 29 August 1987); and 21959 adult skin (H. Schneider and E. Martins, 1987). *Females:* MPEG collection Nos.: 21787 adult, skin and skull (H. Schneider, 18 January 1988); 21784 adult, skin and skull (H. Schneider, 2 February 1988); 21778 adult, lactating, skin and skull (A.P. de Souza Júnior and F. Braga, 19 November 1987); 21782 adult, skin and skull (A.P. de Souza Júnior and F. Braga, 23 November 1987); 21934 adult, skin and skull (A.P. de Souza Júnior and F. Braga, 27 November 1987); 21960 adult, skin and skull (H. Schneider and E. Martins, 1987). MNRJ Nos.: 28479 adult, skin with 28480 infant male, skin and skull (A.P. de Souza Júnior and E. Dente, 24 January 1988).

Key Specimens Locality. All key specimens from Samuel hydroelectric dam, both sides of Rio Jamari, upper Rio Madeira right side, Rondônia, Brazil.

Total Specimens Examined. 32 skins and skulls. I have not seen any confirmed living photos.

Description. *Males.* All males, young and old, have the front half of their back legs black (to varying degrees in young animals), and very black wrist cuffs on the forearms

in all ages. Based on the type series, adult males can be “*irrorata*-like” or “*rylandsi*-like.” The “*rylandsi*-like” male colorations (MPEG No. 21961) are very grizzled white with very black back legs, but with orange ruffs more similar to either *P. irrorata* or *P. mittermeieri*. Hands and feet are off-white. Faces are primarily black, but can be dark red throughout with little facial hair. There maybe a few stray white hairs between the eyes, but any facial hair is concentrated to the very white stiff lip and lower nose hairs, without discernable muzzle lines—similar to *P. rylandsi*. Older males may be like either *rylandsi* or *mittermeieri* in that they can get very white. A very white male with an orange ruff MPEG No. 21959, skin only, is an example, but the face is not preserved well. The “*irrorata*-like” adult males are less grizzled, have ruffs with dark roots and light tips, have distinct white brow bands, and have black muzzles with unpigmented or reddish facial skin. They have light, but distinct muzzle lines in addition to the stiff white lip hair. In MPEG No. 21785, there are some light white hairs above the eyes as well. Subadult and juvenile males are less and more uniformly grizzled throughout their dorsal pelage. Their ruffs are varied depending on age from very light buffy to darker with light tan roots to more orange. Young faces are mottled pink and black, but do not have distinct eyespots as in *P. rylandsi*, the pattern is much more diffuse. It is possible that as they age they become more “*irrorata*-like” but it is unclear for how long as older skulls belonging to both the black faces and the “*irrorata* faces” are among the collection.

Females. Adult females can look similar to the “*irrorata*-like” males in that they have black muzzles and unpigmented or reddish facial skin with white brow bangs. They have lighter eyespots of similar color to most of the face, save where there are patchy black pigments or the blackish muzzle. Even in young animals they have shaggy white malar lines and white lips that are not as distinct as the males. They have some light black facial hair surrounding the face in subadult females, similar to *P. irrorata* females. They also have white eyebrows similar to *P. rylandsi* subadult females, but in most cases it appears as more of a star in the forehead between the eyes. In older females, this brow can be more concentrated to between the eyes with light white and black hair dispersed over the rest of the face or a light trace of white that covers the centerline of the forehead from the hairline to the eyes. The rest of the pelage is uniformly moderately grizzled with forearms densely covered in white to buffy hairs. Ruffs are less defined than males, are dark brown, and are finely haired. Faces are variable in that when young they are very pink and unpigmented, but might have stiff white hairs forming as the eyebrows. Subadult to adult females have an enlarged vulva and obvious clitoris, and can easily be mistaken for

males especially in dried specimens. Infant females look just like males in preserved specimens.

Measurements: Tables 27 and 28.

Distribution. Map 18. Mostly collected in the region of the Samuel hydroelectric dam on the Rio Jamari, both sides of the river. It is possible that these sakis occur in the entire region of the Mamoré-Madeira-Jamari.

Discussion. Specimens from MPEG and MNRJ were collected by H. Schneider, and A.P. de Souza Júnior and F. Braga between 1987 and 1989. A juvenile male collected by S.F. Ferrari on 5 September 1990 along the BR 230 (Humaitá-Itaituba) at km 16 appears to belong to this group. If they do prove to be distinct, it would extend their distribution much further north. However, it is entirely possible that this (and possibly all) Jamari sakis belong to *P. mittermeieri* which dominates the region.

The Jamari sakis are an interesting group primarily because adult males can resemble both a variation of *P. irrorata* and *P. mittermeieri* males (although the Jamari animals in the “black phase” seem like a cross between *P. mittermeieri* and *P. rylandsi*). It is unclear if these animals are hybrids, if they are polymorphic, or if they are a described species that is very long-lived and continue to transition colors, such as *P. mittermeieri* or *P. rylandsi*. Likewise, it will be important to study in detail *P. irrorata* populations, particularly in the state of Acre to determine boundaries with this Jamari group, and with *P. mittermeieri* and *P. rylandsi* populations

north of Rio Guaporé. Looking at females alone as compared to the species potentially in the area—*irrorata*, *mittermeieri*, *rylandsi*—the Jamari sakis females are distinct as adults. And in general, it appears Jamari sakis are unique when the skulls are compared, but more study is needed.

There are specimens in the Comissão Rondon collection at MNRJ that are similar to some of the sakis in the Jamari collection (for example, MNRJ No. 3335 and MPEG No. 21937). Comparing both collections, however, does not yield enough similarities, although the possibility is not ruled out that they are the same as those collected in the upper Aripuanã region during the Comissão Rondon expeditions; however, it is equally likely that the Comissão Rondon animals are legacy *P. irrorata* (cf. *P. irrorata*) from a long ago larger distribution of these animals. It is also entirely possible that these animals are *P. mittermeieri*, but with a pelage change over the decades since the Comissão Rondon.

Because of the extreme variation in these specimens, it is difficult to say if they have ever been photographed living. It is possible that if females had darker faces and white eyebrows only, they might look similar to *P. rylandsi* subadult females, and likewise that subadult males may be mistaken for either *P. irrorata*, *P. rylandsi* or *P. mittermeieri* especially in captivity. It is critical to get some photos or to observe living sakis in the Rio Jamari watershed, particularly around Samuel hydroelectric dam, as they are likely in highly fragmented habitat, and are threatened no matter the ultimate species determination.

Table 27. Post-cranial measurements (mm) and weights (g) of specimens.

Specimen	Total Length	Tail	Hind Foot	Ear	Weight
MNRJ					
28479 - AF	860	460	110	32	1550
28480 - INF	460	260	75	–	335
MPEG					
21776 - SAF	750	450	112	17	1100
21777 - SAF	760	450	119	26	1100
21783 - JM	660	360	107	34	930
21784 - AF	833	435	116	35	1780
21785 - AM	860	440	116	36	2750
21786 - AF	785	450	115	30	1700
21787 - AF	800	410	115	31	1800
21788 - SAF	760	385	110	29	2010*
21789 - INF	550	310	93	13	560
21790 - JF	730	380	105	28	1280
21934 - AF	840	440	116	30	2000
21935 - JM	665	380	95	31	800
21936 - INF	450	230	74	25	300
22001 - JM	734	402	114	33	1580

AM = adult male, SAM = subadult male, JM = Juvenile male, AF = adult female, SAF = subadult female, JF = juvenile female, INF = infant. *Pregnant?

Table 28. Skull measurements (mm) from the Hocrácio Schneider and Arlindo Pinto de Souza Júnior and Fernando Braga collections at MPEG.

Specimen MPEG Nos.	Length of brain case	Width of brain case	Zygomatic arch width	Orbits-outer	Nose bridge	L- orbit inner width	L- orbit inner height	Muzzle width	L- mandible length	L- mandible height
Males										
21785	87.0	44.1	59.6	47.2	8.7	17.1	18.4	25.9	59.7	40.5
21783	72.9	44.1	43.0	36.7	5.6	13.3	16.	18.8	38.8	25.5
21792	86.4	44.6	58.7	43.2	6.7	16.7	17.7	26.3	55.6	40.5
21794	82.2	41.3	53.1	44.1	8.2	16.3	16.8	23.6	53.0	36.1
21935	69.5	44.0	41.1	36.0	5.5	13.9	15.5	19.4	39.3	25.7
21937*	93.0	53.5	62.0	48.0	4.3	19.6	20.8	27.5	–	–
21961	82.4	40.0	56.5	46.5	7.4	17.1	19.2	24.5	53.2	40.1
22001‡	78.1	40.1	49.5	40.3	5.6	15.0	18.0	22.0	49.1	33.3
Females										
21786	81.4	42.9	52.3	42.7	7.9	16.0	18.0	23.4	50.5	36.2
21776	75.2	43.2	45.7	37.5	5.93	13.8	16.8	21.5	46.1	29.2
21777	76.2	42.9	46.1	37.4	5.4	15.0	16.7	20.1	45.6	30.3
21780	85.1	41.9	53.1	44.3	7.1	16.6	18.7	22.6	53.7	38.3
21778	78.8	40.9	49.6	41.3	7.1	16.3	18.0	21.2	49.5	39.6
21789	79.2	41.8	48.9	41.2	6.4	13.9	17.0	21.9	50.4	33.4
21782	82.5	43.2	54.3	45.3	7.7	17.2	18.1	23.9	52.2	38.4
21788	80.7	41.3	51.1	43.4	6.9	16.9	18.4	23.3	53.7	36.0
21790	76.2	43.0	47.3	39.3	6.9	14.6	16.2	21.2	46.1	30.2
21787	82.1	43.1	51.8	44.5	7.6	17.2	17.8	23.6	51.4	34.7
21793	69.5	42.3	35.1	35.1	5.4	13.8	15.8	18.1	34.4	23.0
21934	79.4	41.1	52.4	41.0	6.1	16.0	18.1	23.1	49.2	27.5
21938	71.5	39.8	49.7	38.3	4.5	15.8	18.0	20.5	44.4	34.2
21960	80.8	42.3	50.5	40.1	6.25	15.5	17.5	21.6	50.2	35.8
23039	68.3	40.1	38.8	33.0	4.2	14.1	15.8	16.7	35.4	19.5

* Correct skull for specimen?

‡ Collected by S.F. Ferrari.



Map 18. Location map for Jamari sakis.

Brazil

1. UHE Samuel, Schneider collection site

2. Rio Jamari, Usina Hidroelétrica Samuel

3. Schneider and Junior collection sites (approx.)

4. Braga and Souza Júnior collection sites (approx.)



Figure 102. Key specimen MPEG No. 21961, adult male, skin.



Figure 103. Key specimen MPEG No. 21961, adult male, skull



Figure 104. Key specimen MPEG No. 21785, adult male, skin.



Figure 105. Key specimen MPEG No. 21785, adult male, skull.



Figure 106. Key specimen adult female MPEG No. 21934, skin.



Figure 107. Key specimen adult female MPEG No. 21787, skin.

APPENDIX III. UNDERSTANDING FIGURE 17 FROM P. HERSHKOVITZ 1987: THE TAXONOMY OF SOUTH AMERICAN SAKIS, GENUS *PITHECIA* (CEBIDAE, PLATYRRHINI): A PRELIMINARY REPORT AND CRITICAL REVIEW WITH THE DESCRIPTION OF A NEW SPECIES AND A NEW SUBSPECIES, *AM. J. PRIMATOL* 12:387–468

Introduction

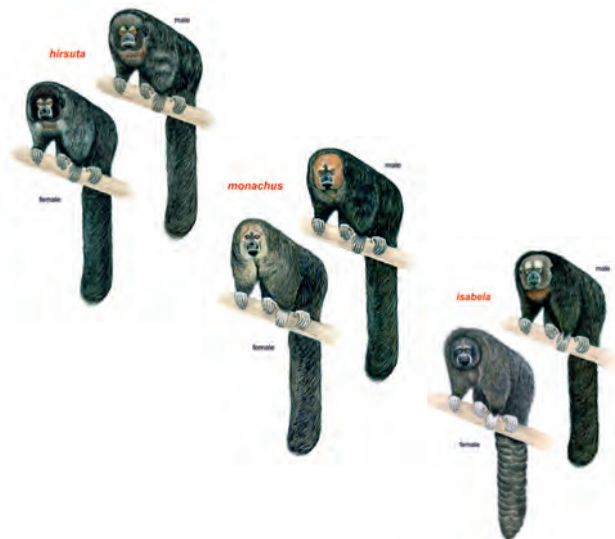
The following is a reinterpretation of the paintings commissioned by Philip Hershkovitz with artist Zorica Dabich for his unfinished volume *Living New World Monkeys, Volume 2* (Hershkovitz died before it was completed). All images used are by Zorica Dabich and Philip Hershkovitz, through the courtesy of Field Museum of Natural History.

These images were published in Hershkovitz (1987) as Figure 17. The caption for that image read:

“Fig. 17. *Pithecia*: Males of all species (and subspecies of *P. irrorata*) and female of *P. pithecia pithecia*, all to same scale; an arrangement of photographs of individual paintings in color by Zorica Dabich (from Hershkovitz, *Living New World Monkeys, Volume 2* [in preparation]). Differences between subspecies of *P. monachus* and *P. pithecia* are not apparent in the black and white figures.”

The figure shows the paintings in order of: “*P. monachus*, *P. i. irrorata*, *P. i. vanzolinii*, *P. albicans*, *P. aequatorialis*, *P. pithecia* (female), and *P. pithecia* (male).”

All of the corresponding art for comparison in this appendix is by Stephen Nash.



Painting A: *P. monachus*



This image depicts an amalgam of saki traits that lead to some of the confusion that was *P. monachus* throughout the Amazon (cf. “The Monachus Mess” in *P. monachus* Discussion). The species this painting most closely resembles is the newly described *Pithecia isabela* as some members of the species can have a faded “white wash” forehead instead of the more distinct white eye spots and have a minimal amount of white stippling throughout the body pelage (cf. *P. isabela*).

Alternatively, this image is a catchall of generic female characteristics, but it is unclear for which species. It was this painting, that turned *P. monachus* into a clumping of everything, male and female, that might fit this ambiguous image, especially since it was published in black and white.

What Hershkovitz did not realize is that the type for *monachus*, a juvenile of indeterminate sex with a white band around its face, would not grow up and retain that color pattern, but would transition, like many of the species do, into a form that looks completely different as an adult.

As a comparison, at left are *P. hirsuta*, *P. monachus*, and *P. isabela*, the likely candidates that contributed to this “blended” image.

Painting B: *P. irrorata*



This juvenile male *P. mittermeieri* appears to be the most similar to the painting from Hershkovitz (1987). Photo by L.C. Marigo (Figure 85a, *P. mittermeieri*).

This image of "*P. irrorata*" is another amalgam because Hershkovitz did not know there was more than one bald-faced saki species when he published in 1987. This image by itself looks most similar to a subadult *P. mittermeieri*, as does the photo in Hershkovitz 1987 in Figure 25 (cf. Table 2, "Introduction").

As a comparison, below are illustrations of *P. irrorata* and *P. mittermeieri*.



Painting C: *P. vanzolinii*



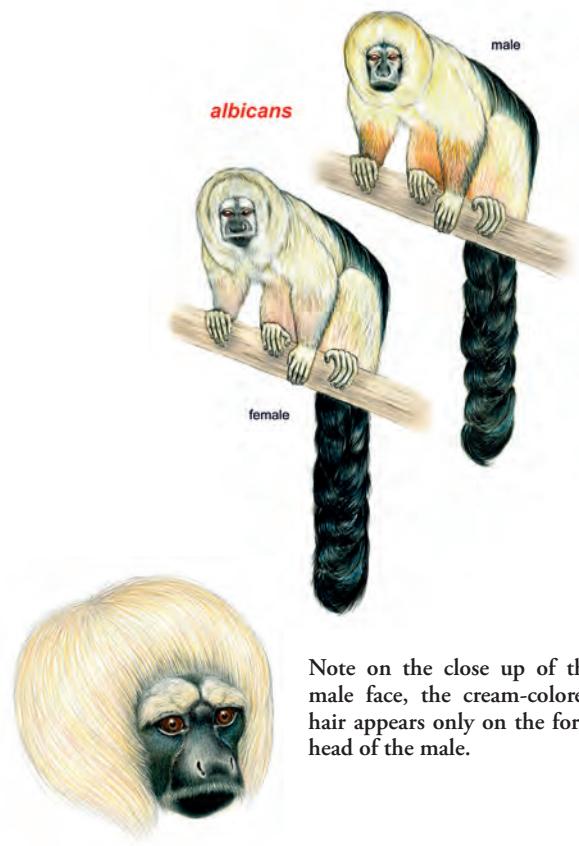
This painting of a *P. vanzolinii* male was based on museum material and fairly well represents the species. It is unlikely that Hershkovitz ever saw any of these animals alive, which is the same challenge for this taxonomy. The Nash version of male and female is pictured at the right.



Painting D: *P. albicans*



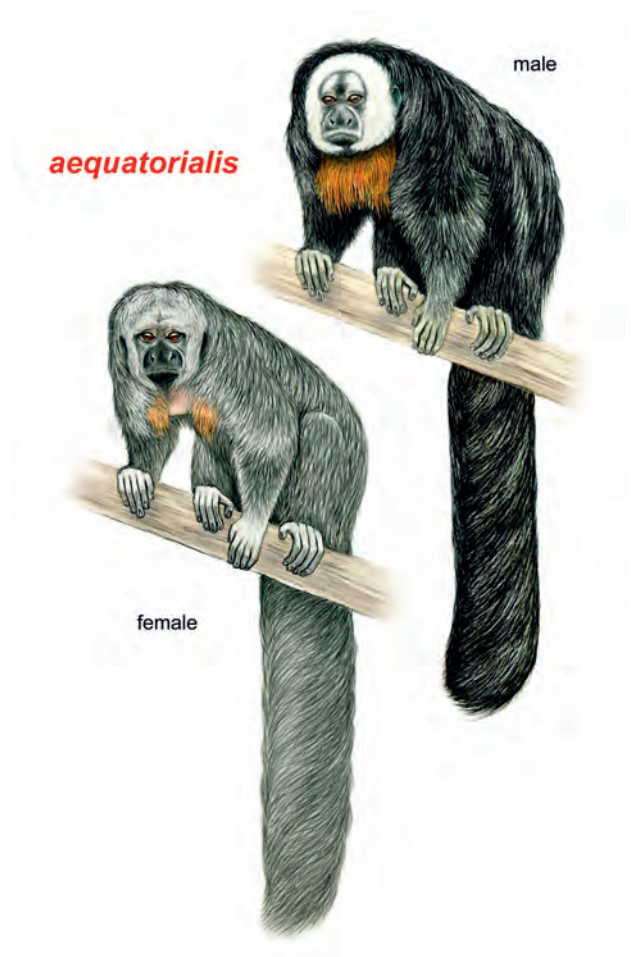
This is an interesting depiction of *P. albicans* in that the males and females are very similar in pelage, but it is the females that have the white facial hair. Thus, this painting is actually of a female *P. albicans*. Male *P. albicans* have a mostly plain face with cream-colored eyebrows, as the illustrations at right demonstrate.



Note on the close up of the male face, the cream-colored hair appears only on the forehead of the male.

Painting E: *P. aequatorialis*

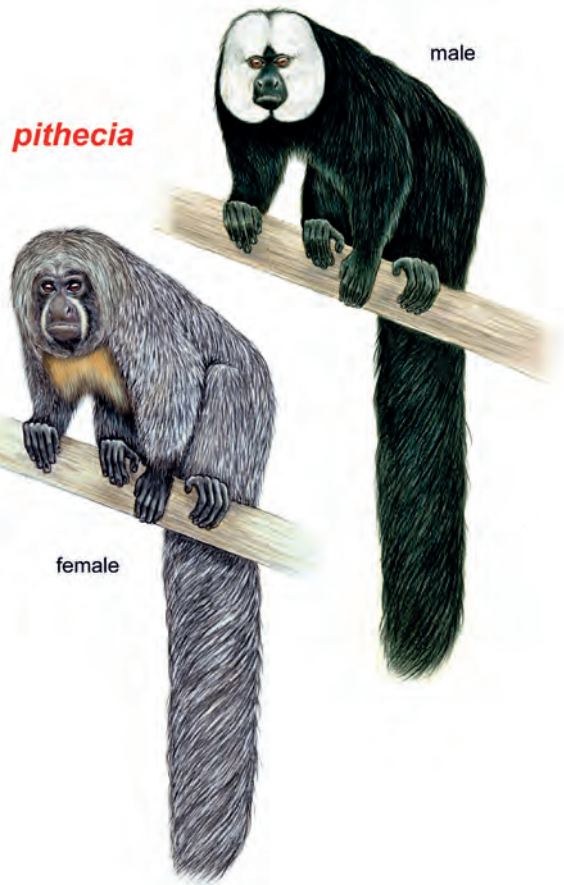
This lovely painting, the original of which hangs in the basement hallways of The Field Museum, is a nearly accurate depiction of Hershkovitz's *P. aequatorialis*. The only thing missing is the distinct orange ruff on the male. At the right for comparison, is Nash's version of the male and female.



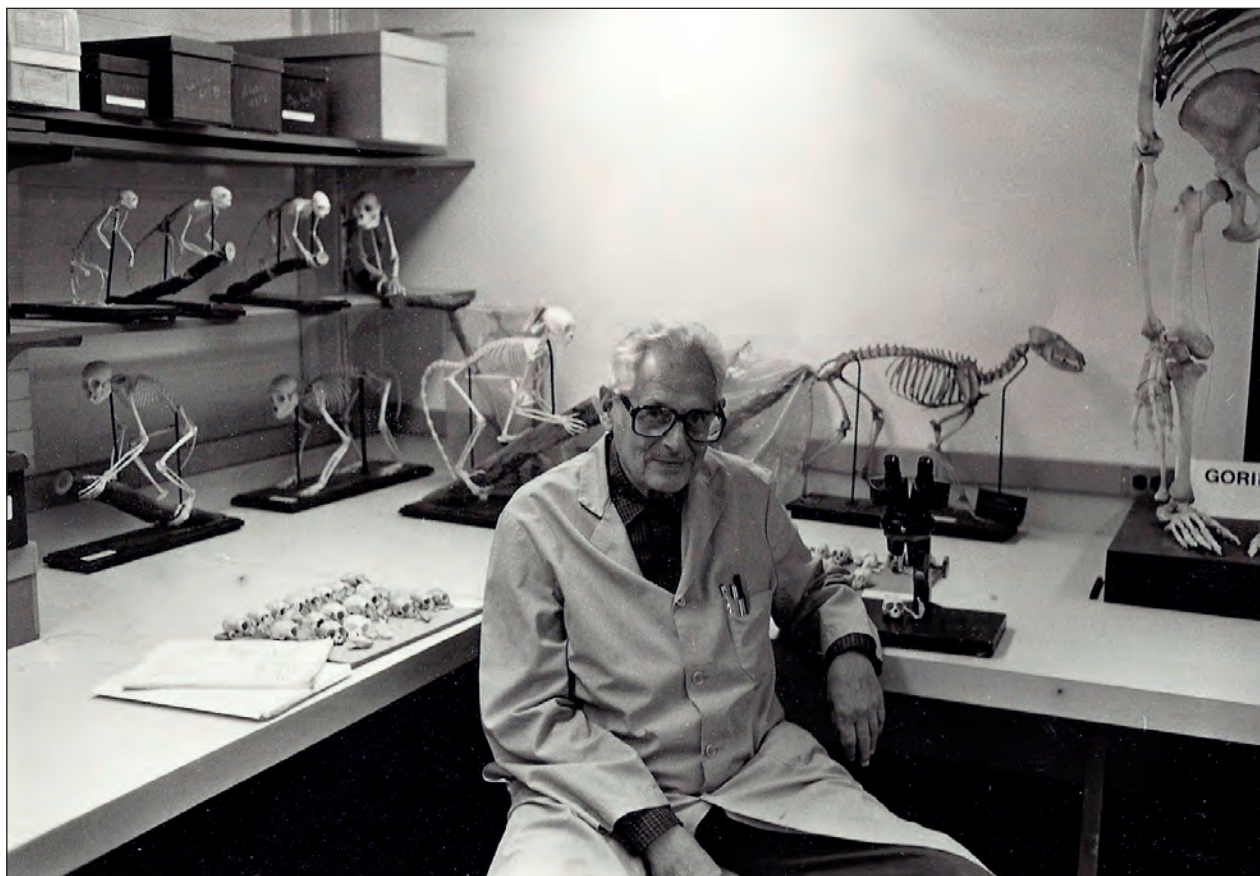
Painting F: *P. pithecia* male.



Painting G: *P. pithecia* female



The most recognizable and most collected of all of the *Pithecia* species, *P. pithecia* is perfectly well represented in these two accurate paintings. The nearly identical Nash version is at right.



Philip Hershkovitz, Emeritus Curator of Mammals in his laboratory at the Department of Mammalogy in the Field Museum of Natural History in Chicago (1.987). Photo by Stephen Nash.

Notes to Contributors

Scope

The journal/newsletter aims to provide a basis for conservation information relating to the primates of the Neotropics. We welcome texts on any aspect of primate conservation, including articles, thesis abstracts, news items, recent events, recent publications, primatological society information and suchlike.

Submissions

Please send all English and Spanish contributions to: Erwin Palacios, Conservación Internacional – Colombia, Carrera 13 # 71-41 Bogotá D.C., Colombia, Tel: (571) 345-2852/54, Fax: (571) 345-2852/54, e-mail: <epalacios@conservation.org>, and all Portuguese contributions to: Júlio César Bicca-Marques, Departamento de Biodiversidade e Ecologia, Pontifícia Universidade Católica do Rio Grande do Sul, Av. Ipiranga, 6681 Prédio 12A, Porto Alegre, RS 90619-900, Brasil, Tel: (55) (51) 3320-3545 ext. 4742, Fax: (55) (51) 3320-3612, e-mail: <jcbicca@pucrs.br>.

Contributions

Manuscripts may be in English, Spanish or Portuguese, and should be double-spaced and accompanied by the text on CD for PC compatible text-editors (MS-Word, WordPerfect, Excel, and Access), and/or e-mailed to <epalacios@conservation.org> (English, Spanish) or <jcbicca@pucrs.br> (Portuguese). Hard copies should be supplied for all figures (illustrations and maps) and tables. The full name and address for each author should be included. Please avoid abbreviations and acronyms without the name in full. Authors whose first language is not English should please have their English manuscripts carefully reviewed by a native English speaker.

Articles. Each issue of *Neotropical Primates* will include up to three full articles, limited to the following topics: Taxonomy, Systematics, Genetics (when relevant for systematics and conservation), Biogeography, Ecology and Conservation. Text for full articles should be typewritten, double-spaced with no less than 12 cpi font (preferably Times New Roman) and 3-cm margins throughout, and should not exceed 25 pages in length (including references). Please include an abstract in the same language as the rest of the text (English, Spanish or Portuguese) and (optional) one in Portuguese or Spanish (if the text is written in English) or English (if the text is written in Spanish or Portuguese). Tables and illustrations should be limited to six, except in cases where they are fundamental for the text (as in species descriptions, for example). Full articles will be sent out for peer-review. For articles that include protein or nucleic acid sequences, authors must deposit data in a publicly available database such as GenBank/EMBL/DNA Data Bank of Japan, Brookhaven, or Swiss-Prot, and provide an accession number for inclusion in the published paper.

Short articles. These manuscripts are usually reviewed only by the editors. A broader range of topics is encouraged, including such as behavioral research, in the interests of informing on general research activities that contribute to our understanding of platyrrhines. We encourage reports on projects and conservation and research programs (who, what, where, when, why, etc.) and most particularly information on geographical distributions, locality records, and protected areas and the primates that occur in them. Text should be typewritten, double-spaced with no less than 12 cpi (preferably Times New Roman) font and 3-cm margins throughout, and should not exceed 12 pages in length (including references).

Figures and maps. Articles may include small black-and-white photographs, high-quality figures, and high-quality maps. (Resolution: 300 dpi. Column widths: one-column = 8-cm wide;

two-columns = 17-cm wide). Please keep these to a minimum. We stress the importance of providing maps that are publishable.

Tables. Tables should be double-spaced, using font size 10, and prepared with MS Word. Each table should have a brief title.

News items. Please send us information on projects, field sites, courses, Thesis or Dissertations recently defended, recent publications, awards, events, activities of Primate Societies, etc.

References. Examples of house style may be found throughout this journal. In-text citations should be first ordered chronologically and then in alphabetical order. For example, "... (Fritz, 1970; Albert, 1980, 2004; Oates, 1981; Roberts, 2000; Smith, 2000; Albert *et al.*, 2001)..."

In the list of references, the title of the article, name of the journal, and editorial should be written in the same language as they were published. All conjunctions and prepositions (i.e., "and", "in") should be written in the same language as rest of the manuscript (i.e., "y" or "e", "En" or "Em"). This also applies for other text in references (such as "PhD thesis", "accessed" – see below). Please refer to these examples when listing references:

Journal article

Stallings, J. D. and Mittermeier, R. A. 1983. The black-tailed marmoset (*Callithrix argentata melanura*) recorded from Paraguay. *Am. J. Primatol.* 4: 159–163.

Chapter in book

Brockelman, W. Y. and Ali, R. 1987. Methods of surveying and sampling forest primate populations. In: *Primate Conservation in the Tropical Rain Forest*, C. W. Marsh and R. A. Mittermeier (eds.), pp.23–62. Alan R. Liss, New York.

Book

Napier, P. H. 1976. *Catalogue of Primates in the British Museum (Natural History). Part 1: Families Callitrichidae and Cebidae*. British Museum (Natural History), London.

Thesis/Dissertation

Wallace, R. B. 1998. The behavioural ecology of black spider monkeys in north-eastern Bolivia. Doctoral thesis, University of Liverpool, Liverpool, UK.

Report

Muckenhirn, N. A., Mortensen, B. K., Vessey, S., Fraser, C. E. O. and Singh, B. 1975. Report on a primate survey in Guyana. Unpublished report, Pan American Health Organization, Washington, DC.

Website

UNESCO. 2005. UNESCO Man and the Biosphere Programme. United Nations Educational, Scientific, and Cultural Organisation (UNESCO), Paris. Website: <http://www.unesco.org/mab/index.htm>. Accessed 25 April 2005. ("Accessada em 25 de abril de 2005" and "Consultado el 25 de abril de 2005" for articles in Portuguese and Spanish respectively).

For references in Portuguese and Spanish:

"and" changes to "e" and "y" for articles in Portuguese and Spanish respectively.

"In" changes to "Em" and "En" for articles in Portuguese and Spanish respectively.

"Doctoral thesis" changes to "Tese de Doutorado" and "Tesis de Doctorado" for articles in Portuguese and Spanish respectively.

"MSc Thesis" changes to "Dissertação de Mestrado" and "Tesis de Maestría" for articles in Portuguese and Spanish respectively.

"Unpublished report" changes to "Relatório Técnico" and "Reporte no publicado" for articles in Portuguese and Spanish respectively.

Neotropical Primates

A Journal and Newsletter of the IUCN/SSC Primate Specialist Group

Vol. 21(1), July 2014

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