

# The Primates of East Africa: Country Lists and Conservation Priorities

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**Abstract:** Seventeen genera, 38 species and 47 subspecies of primate occur in East Africa. Tanzania holds the largest number of primate species (27), followed by Uganda (23), Kenya (19), Rwanda (15) and Burundi (13). Six percent of the genera, 24% of the species, and 47% of the subspecies are endemic to the region. East Africa supports 68% of Africa's primate genera and 41% of Africa's primate species. In East Africa, Tanzania has the highest number and percentage of endemic genera (one, 7%) and endemic species (at least six, 22%). According to the IUCN Red List, 26% of the 38 species, and 17% of the 47 subspecies, are 'threatened' with extinction. No recent taxon of East African primate has become extinct and no recent taxon is known to have been extirpated from the region. Of the 18 threatened primate taxa (ten species, eight subspecies) in East Africa, all but four are present in at least one of the seven most 'primate species-rich' protected areas. The most threatened primates in East Africa are Tana River red colobus *Procolobus rufomitratu rufomitratu*, Tana River mangabey *Cercocebus galeritu*, and kipunji *Rungwecebus kipunji*. The most threatened, small, yet critical, sites for primate conservation in East Africa are the Tana River Primate National Reserve in Kenya, and the Mount Rungwe Nature Reserve-Kitulo National Park block in Tanzania. In order to further refine the present country-by-country primate lists for East Africa, as well as the priority actions for the conservation of primates in the region, research should focus on the prosimians of Burundi and Rwanda.

**Key words:** Burundi, East Africa, Kenya, primate, primate conservation, Rwanda, Tanzania, Uganda

**Résumé:** L'Afrique de l'Est accueille 17 genres, 38 espèces et 47 sous-espèces de primates. La Tanzanie est la plus richement dotée avec 27 espèces, ensuite viennent l'Uganda (23), le Kenya (19), le Rwanda (15) et le Burundi (13). Six pourcent des genres, 24% des espèces et 47% des sous-espèces sont endémiques dans la sous-région. L'Afrique de l'Est accueille ainsi 68% des genres de primates et 41% des espèces. De la sous-région la Tanzanie accueille le plus grand nombre et le plus grand pourcentage de genres (une, 7%) et d'espèces endémiques (au moins six, 22%). Selon la Liste Rouge de l'UICN, 26% des 38 espèces et 17% des 47 sous-espèces sont « menacées » de disparition. Aucun taxon actuel de primate est-africain ne s'est éteint, ni a été éliminé dans la sous-région. Des 18 taxons de primates menacés (dix espèces, huit sous-espèces) en Afrique de l'Est que quatre ne sont pas représentées dans au moins une des sept aires protégées les plus riches en espèces de primates. Les primates les plus en danger d'extinction en Afrique de l'Est sont le Colobe Bai du Tana *Procolobus rufomitratu rufomitratu*, le Mangabey du Tana *Cercocebus galeritu* et le Kipunji *Rungwecebus kipunji*. Les sites de conservation des primates les plus menacés, les plus petits néanmoins essentiels sont la Réserve Nationale des Primates du Fleuve Tana au Kenya et l'ensemble de la Réserve Naturelle du Mont-Rungwe avec le Park National de Kitulo en Tanzanie. Afin d'améliorer les listes actuels des primates par pays en Afrique de l'Est, ainsi que pour l'élaboration des actions prioritaires pour la conservation des primates dans la sous-région, la recherche devrait se focaliser sur les prosimians du Burundi et du Rwanda.

## INTRODUCTION

East Africa is a large (1,705,880 km<sup>2</sup>), tropical region comprised of Burundi, Kenya, Rwanda, Tanzania and Uganda (Figure 1, Table 1). The major geographic features of East Africa include the Albertine (Western) Rift Valley, Gregory (Eastern) Rift Valley, Africa's three highest mountains (Mount Kilimanjaro, Mount Kenya, and Rwenzori Mountains; all >5100 m asl), Africa's largest lake (Lake Victoria; 68,800 km<sup>2</sup>), and Africa's second-largest and deepest lake (Lake Tanganyika; 32,900 km<sup>2</sup>; 1470 m deep; Figure 2). The complex geography, together

with wide ranges for rainfall and temperature, mean that East Africa supports numerous habitat types as well as many barriers to the dispersal of species.

The primary vegetation types of East Africa are grassland, bushland/ticket, and woodland, but much of the region's species richness and endemism is associated with the more moist vegetations types, particularly forests (Britton, 1980; White, 1983). Although biological diversity is lower in East Africa than in the Guineo-Congolese Forest Block, species endemism is higher in East Africa (Jenkins, 1992).



**Figure 1.** Map of Africa showing the location of the five countries of East Africa: Burundi, Kenya, Rwanda, Tanzania, and Uganda.

Primates represent one of East Africa's best-studied taxonomic groups of mammals. Nonetheless, the taxonomic status of many of the region's primates is still under debate and the geographical distribution and conservation status of many of the primate taxa remain poorly understood. The aim of this paper is to, for each East Africa country, provide an overview of primate diversity, highlight those primate taxa that are under greatest threat, list those sites most critical to primate conservation, and point out some of the more important biogeographical questions that remain.

## RESULTS AND DISCUSSION

The taxonomy applied here is taken from *Mammals of Africa* (Butynski *et al.*, in press)—which is based largely on Groves (2001, 2005, 2007) and Grubb *et al.* (2003). The vernacular (common) names used here also are taken from *Mammals of Africa*. A conservative approach has been taken in compiling the list of the primate taxa for East Africa (Tables 1 & 2). For a primate taxon that is likely present in a country, but for which a specimen, photograph or authoritative sighting is absent or unknown, a single question mark is shown after the abbreviation of the country name. For a primate taxon reported to occur in a country, but for which a specimen, photograph or authoritative sighting is absent or unknown, and for which presence seems unlikely, two question marks are shown after the abbreviation of the country name.

### *Primate diversity in East Africa*

A total of 17 genera (see Appendix), 38 species and 47 subspecies of primate occur in East Africa (Tables 1 & 2). Genera diversity is highest in Uganda (15) and Tanzania (14). The largest of the five countries, Tanzania, is richest in primate species (27) and subspecies (28). Tanzania is particularly diverse in prosimians, with 11 species. Burundi and Rwanda, given their small size, are relatively rich in species of primates with 13 and 15, respectively.

There are 25 genera and 93 species of primate in Africa (Butynski *et al.*, in press). Thus, East Africa supports 68% of Africa's primate genera and 41% of Africa's primate species.

**Table 1 - The land area of each of the five countries of East Africa and the number of primate genera, species, and subspecies present in each country. The species and subspecies that require confirmation are not included in the totals.**

Country	Land area (km <sup>2</sup> )	Genera	Species	Subspecies
Burundi	25,650	11	13 (4? <sup>1</sup> , 1?? <sup>2</sup> )	6 (3?, 1??)
Kenya	569,690	12	19 (1?)	24 (3?)
Rwanda	24,950	12	15 (3?, 1??)	9 (3?, 1??)
Tanzania	886,040	14	27 (3?)	28 (2?)
Uganda	199,550	15	23 (2??)	19 (1?, 2??)
<b>Total</b>	<b>1,705,880</b>	<b>17</b>	<b>38</b>	<b>47</b>

<sup>1</sup> Likely present but requires confirmation.

<sup>2</sup> Reported to be present but this seems unlikely. Requires confirmation.

Table 2 - The primate taxa of East Africa, together with endemic status, countries of occurrence, and category of threat (IUCN, 2011).

Genus/species/subspecies	Vernacular	Country <sup>1</sup>	Threat <sup>2</sup>
<b>GORILLA I. Geoffroy, 1852</b>	<b>Gorillas</b>		
<i>Gorilla beringei</i> Matschie, 1903	Eastern gorilla	R, U	EN
<i>G. b. beringei</i> Matschie, 1903	Mountain gorilla	R, U	CR
<b>PAN Oken, 1816</b>	<b>Chimpanzees</b>		
<i>Pan troglodytes</i> (Blumenbach, 1775)	Robust chimpanzee	B, R, T, U	EN
<i>P. t. schweinfurthii</i> (Giglioli, 1872)	Eastern chimpanzee	B, R, T, U	EN
<b>HOMO Linnaeus, 1758</b>	<b>Humans</b>		
<i>Homo sapiens</i> Linnaeus, 1758	Modern human	B, K, R, T, U	LC
<b>COLOBUS Illiger, 1811</b>	<b>Black colobus, black-and-white colobus</b>		
<i>Colobus angolensis</i> Sclater, 1860	Angola colobus	B, R, K, T, U	LC
<i>C. a. palliatus</i> Peters, 1868*	Peters' Angola colobus	K, T	LC
<i>C. a. ruwenzorii</i> Thomas, 1901	Rwenzori Angola colobus	B, R, T, U	VU
<i>C. a. ssp. nov.**</i>	Mahale Mountains Angola colobus	T	NE
<i>Colobus guereza</i> Rüppel, 1835	Guereza	K, T, U	LC
<i>C. g. caudatus</i> Thomas, 1885**?	Mount Kilimanjaro guereza	K? <sup>3</sup> , T	LC
<i>C. g. occidentalis</i> (Rochebrune, 1887)	Western guereza	U	LC
<i>C. g. matschiei</i> Neumann, 1899*	Mau Forest guereza	K, T, U	LC
<i>C. g. kikuyuensis</i> Lönnberg, 1912**	Mount Kenya guereza	K	LC
<i>C. g. percivali</i> Heller, 1913**	Mount Uarges guereza	K	EN
<b>PROCOLOBUS Rochebrune, 1887</b>	<b>Olive colobus, red colobus</b>		
<i>Procolobus rufomitratu</i> s (Peters, 1879)	Eastern red colobus	K, T, U	LC
<i>P. r. rufomitratu</i> s (Peters, 1879)**	Tana River red colobus	K	EN
<i>P. r. tephrosceles</i> (Elliot, 1907)*	Ashy red colobus	T, U	EN
<i>P. r. ellioti</i> (Dollman, 1909)	Semliki red colobus	U	NE
<i>Procolobus gordonorum</i> (Matschie, 1900)**	Udzungwa red colobus	T	EN
<i>Procolobus kirkii</i> (Gray, 1868)**	Zanzibar red colobus	T	EN
<b>CERCOCEBUS É. Geoffroy, 1812</b>	<b>Drill-mangabeys</b>		
<i>Cercocebus galeritus</i> Peters, 1879**	Tana River mangabey	K	EN
<i>Cercocebus sanjei</i> Mittermeier, 1986**	Sanje mangabey	T	EN

Table 2 continued:

Genus/species/subspecies	Vernacular	Country <sup>1</sup>	Threat <sup>2</sup>
<b>LOPHOCEBUS Palmer, 1903</b>	<b>Baboon-mangabeys</b>		
<i>Lophocebus johnstoni</i> (Lydekker, 1900)	Johnston's grey-cheeked mangabey	B, R, U	NE
<i>Lophocebus ugandae</i> (Matschie, 1913)*	Uganda grey-cheeked mangabey	T, U	NE
<b>RUNGWECEBUS Davenport, Stanley, Sargis, De Luca, Mpunga, Machaga &amp; Olson, 2006**</b>	<b>Kipunji</b>		
<i>Rungwecebus kipunji</i> (Ehardt, Butynski, Jones & Davenport, 2005)**	Kipunji	T	CR
<b>PAPIO Erxleben, 1777</b>	<b>Baboons</b>		
<i>Papio cynocephalus</i> (Linnaeus, 1766)	Yellow baboon	K, T	LC
<i>P. c. cynocephalus</i> (Linnaeus, 1766)	Central yellow baboon	K?, T	LC
<i>P. c. ibeanus</i> Thomas, 1893	Ibean yellow baboon	K, T?	LC
<i>P. c. kindae</i> Lönnberg, 1919	Kinda yellow baboon	T	LC
<i>Papio anubis</i> (Lesson, 1827)	Olive baboon	B, K, R, T, U	LC
<b>ERYTHROCEBUS Trouessart, 1897</b>	<b>Patas monkey</b>		
<i>Erythrocebus patas</i> (Schreber, 1775)	Patas monkey	K, T, U	LC
<i>E. p. pyrrhonotus</i> (Hemprich & Ehrenberg, 1829)	Eastern patas monkey	K, U	NE
<i>E. p. baumstarki</i> Matschie, 1905**?	Southern patas monkey	K?, T	NE
<b>CHLOROCEBUS Gray, 1870</b>	<b>Savannah monkeys</b>		
<i>Chlorocebus tantalus</i> (Ogilby, 1841)	Tantalus monkey	K, U	LC
<i>C. t. budgetti</i> (Pocock, 1907)	Budgett's tantalus	K, U	LC
<i>Chlorocebus pygerythrus</i> (F. Cuvier, 1821)	Vervet monkey	B, K, R, T, U	LC
<i>C. p. rufoviridis</i> (I. Geoffroy, 1843)	Reddish-green vervet	B?, R?, T, U	LC
<i>C. p. hilgerti</i> (Neumann, 1902)	Hilgert's vervet	K, T, U	LC
<i>C. p. nesiotus</i> (Schwarz, 1926)**	Pemba vervet	T	NE
<i>C. p. excubitor</i> (Schwarz, 1926)**	Manda vervet	K	NE
<b>ALLOCHROCEBUS Elliot, 1913</b>	<b>Mountain monkeys</b>		
<i>Allochrocebus lhoesti</i> (Sclater, 1899)	L'Hoest's monkey	B, R, U	VU
<b>CERCOPITHECUS Linnaeus, 1758</b>	<b>Arboreal guenons</b>		
<i>Cercopithecus neglectus</i> Schlegel, 1876	De Brazza's monkey	K, T?, U	LC

Table 2 continued:

Genus/species/subspecies	Vernacular	Country <sup>1</sup>	Threat <sup>2</sup>
<b>CERCOPITHECUS (continued):</b>			
<i>Cercopithecus denti</i> Thomas, 1907	Dent's monkey	B, R, U	LC
<i>Cercopithecus hamlyni</i> Pocock, 1907	Owl-faced monkey	B?, R, U?? <sup>4</sup>	VU
<i>C. h. hamlyni</i> Pocock, 1907	Nose-stripe owl-faced monkey	B?, R, U??	NE
<i>Cercopithecus mitis</i> Wolf, 1822	Gentle monkey	B, K, R, T, U	LC
<i>C. m. albogularis</i> (Sykes, 1831)*	Zanzibar Sykes's monkey	K, T	LC
<i>C. m. monoides</i> I. Geoffroy, 1841	Tanzania Sykes's monkey	T	LC
<i>C. m. stuhlmanni</i> Matschie, 1893	Stuhlmann's blue monkey	K, U	LC
<i>C. m. moloneyi</i> Sclater, 1893	Moloney's monkey	T	LC
<i>C. m. albotorquatus</i> Pousargues, 1896**?	Pousargues's monkey	K	VU
<i>C. m. kolbi</i> Neumann, 1902**	Kolb's monkey	K	LC
<i>C. m. kandti</i> Matschie, 1905	Golden monkey	R, U	EN
<i>C. m. doggetti</i> Pocock, 1907	Doggett's silver monkey	B, R, T, U	LC
<i>Cercopithecus ascanius</i> (Audebert, 1799)	Red-tailed monkey	B, K, R, T, U	LC
<i>C. a. schmidti</i> Matschie, 1892	Schmidt's red-tailed monkey	B, K, R, T, U	LC
<b>PERODICTICUS Bennett, 1831</b>			
<b>Potto</b>			
<i>Perodicticus potto</i> (Müller, 1766)	Potto	B, K, R, T?, U	LC
<i>P. p. ibeanus</i> Thomas, 1910	Eastern potto	B, K, R, T?, U	LC
<i>P. p. stockleyi</i> Butynski & De Jong, 2007**	Mount Kenya potto	K	DD
<b>OTOLEMUR Coquerel, 1859</b>			
<b>Greater galagos</b>			
<i>Otolemur crassicaudatus</i> (É. Geoffroy, 1812)	Large-eared greater galago	B, K, R, T, U	LC
<i>O. c. monteiri</i> (Bartlett in Gray, 1863)	Miombo silver galago	B, K, R, T, U?	LC
<i>O. c. argentatus</i> (Lönnerberg, 1913)*	Northern silver galago	K, T, R?, U	LC
<i>Otolemur garnettii</i> (Ogilby, 1838)	Small-eared greater galago	K, T	LC
<i>O. g. garnettii</i> (Ogilby, 1838)**	Zanzibar small-eared galago	T	LC
<i>O. g. lasiotis</i> (Peters, 1876)	White-tailed small-eared galago	K, T	LC
<i>O. g. panganiensis</i> Matschie, 1905	Pangani small-eared galago	K, T	LC
<i>O. g. kikuyuensis</i> (Lönnerberg, 1912)**	Kikuyu small-eared galago	K	LC

Table 2 continued:

Genus/species/subspecies	Vernacular	Country <sup>1</sup>	Threat <sup>2</sup>
<b>GALAGO E. Geoffroy, 1796</b>	<b>Lesser galagos</b>		
<i>Galago senegalensis</i> É. Geoffroy, 1796	Northern lesser galago	B?, K, R?, T, U	LC
<i>G. s. senegalensis</i> É. Geoffroy, 1796	Senegal lesser galago	B?, K, R?, U	LC
<i>G. s. braccatus</i> Elliot, 1907*	Kenya lesser galago	K, T	LC
<i>G. s. sotikae</i> Hollister, 1920*	Uganda lesser galago	K, T, U	LC
<i>Galago moholi</i> A. Smith, 1836	Southern lesser galago	B??, R??, T, U??	LC
<i>G. m. moholi</i> A. Smith, 1836	Moholi lesser galago	B??, R??, T, U??	LC
<i>Galago gallarum</i> Thomas, 1901	Somali lesser galago	K	LC
<i>Galago matschiei</i> Lorenz, 1917	Spectacled lesser galago	B, R, T?, U	LC
<b>GALAGOIDES, A. Smith, 1833</b>	<b>Dwarf galagos</b>		
<i>Galagoides zanzibaricus</i> (Matschie, 1893)**	Zanzibar dwarf galago	T	LC
<i>G. z. zanzibaricus</i> (Matschie, 1893)**	Zanzibar dwarf galago	T	LC
<i>G. z. udzungwensis</i> Honess, 1996**	Matundu dwarf galago	T	LC
<i>Galagoides rondoensis</i> Honess, 1996**	Rondo dwarf galago	T	CR
<i>Galagoides orinus</i> (Lawrence & Washburn, 1936)**?	Mountain dwarf galago	K?, T	NT
<i>Galagoides granti</i> (Thomas & Wroughton, 1907)	Mozambique dwarf galago	T	LC
<i>Galagoides cocos</i> (Heller, 1912)*	Kenya coast dwarf galago	K, T	LC
<i>Galagoides demidovii</i> (G. Fischer, 1808)	Demidoff's dwarf galago	B?, R?, T, U	LC
<i>Galagoides thomasi</i> (Elliot, 1907)	Thomas's dwarf galago	B?, R?, T, U	LC

\* Endemic to East Africa.

\*\* Endemic to one East African county.

\*\*? Possibly endemic to one East African country. Requires confirmation.

<sup>1</sup> B: Burundi; K: Kenya; R: Rwanda; T: Tanzania; U: Uganda.

<sup>2</sup> CR: Critically Endangered; EN: Endangered; DD: Data Deficient; LC: Least Concern; NE: Not Evaluated; NT: Near Threatened; V: Vulnerable.

<sup>3</sup> Likely present but requires confirmation.

<sup>4</sup> Reported to be present but this seems unlikely. Requires confirmation.

**Primate endemism in East Africa**

There are no primate taxa endemic to Burundi, Rwanda or Uganda. The following primate taxa are endemic to Kenya, Tanzania, and East Africa:

## Kenya endemic species

*Cercocebus galeritus* (Tana River mangabey)

## Kenya endemic subspecies

*Colobus guereza kikuyuensis* (Mount Kenya guereza)  
*Colobus guereza percivali* (Mount Uargues guereza)  
*Procolobus rufomitratatus rufomitratatus* (Tana River red colobus)  
*Chlorocebus pygerythrus excubitor* (Manda vervet)  
 ? *Cercopithecus mitis albotorquatus* (Pousargues's monkey)  
*Cercopithecus mitis kolbi* (Kolb's monkey)  
*Perodicticus potto stockleyi* (Mount Kenya potto)  
*Otolemur garnettii kikuyuensis* (Kikuyu small-eared galago)

## Tanzania endemic genera

*Rungwecebus* (kipunji)

## Tanzania endemic species

*Procolobus gordonorum* (Udzungwas red colobus)  
*Procolobus kirkii* (Zanzibar red colobus)  
*Cercocebus sanjei* (Sanje mangabey)  
*Rungwecebus kipunji* (kipunji)  
*Galagoides zanzibaricus* (Zanzibar dwarf galago)  
*Galagoides rondoensis* (Rondo dwarf galago)  
 ? *Galagoides orinus* (mountain dwarf galago)

## Tanzania endemic subspecies

*Colobus angolensis* ssp. nov. (Mahale Mountains Angola colobus)  
 ? *Colobus guereza caudatus* (Mount Kilimanjaro guereza)  
 ? *Erythrocebus patas baumstarki* (southern patas monkey)  
*Chlorocebus pygerythrus nesioties* (Pemba vervet)  
*Otolemur garnettii garnettii* (Zanzibar small-eared galago)  
*Galagoides zanzibaricus zanzibaricus* (Zanzibar dwarf galago)  
*Galagoides zanzibaricus udzungwensis* (Matundu dwarf galago)

The following primate taxa are endemic to East Africa but present in more than one country:

## Species

*Lophocebus ugandae* (Uganda grey-cheeked mangabey)  
*Galagoides cocos* (Kenya coast dwarf galago)

## Subspecies

*Colobus angolensis palliatus* (Peters' Angola colobus)  
*Colobus guereza matschiei* (Mau Forest guereza)  
*Procolobus rufomitratatus tephrosceles* (ashy red colobus)  
*Cercopithecus mitis albogularis* (Zanzibar Sykes's monkey)  
*Otolemur crassicaudatus argentatus* (northern silver galago)  
*Otolemur garnettii panganiensis* (Pangani small-eared galago)  
*Galago senegalensis braccatus* (Kenya lesser galago)  
*Galago senegalensis sotikae* (Uganda lesser galago)

One (6% of 17) genus, at least nine (24% of 38) species, and at least 22 (47% of 47) subspecies of primate are endemic to East Africa. Tanzania has the highest number and percentage of endemic genera (one, 7%) and endemic species (at least six, 22%), whereas Kenya has the highest number and percentage of endemic subspecies (at least seven, 29%). Tanzania is particularly rich in endemic prosimians with at least two endemic species and three endemic subspecies.

Although *Colobus angolensis palliatus* has been reported to occur in northern Malawi (e.g., Misuku Hills), this has never been confirmed (Ansell, 1974; Ansell & Dowsett, 1988). In this paper, therefore, this taxon is considered to be endemic to Kenya and Tanzania. Tim Davenport (pers. comm.) recently observed *C. a. palliatus* at Umalila, Tanzania, which is only ca. 15 km from Malawi. Umalila is the Tanzanian extension of Malawi's Misuku Hills. The search for *C. a. palliatus* in northern Malawi should continue.

**Threatened primates of East Africa**

In East Africa, the genera with the highest number of 'threatened species' (i.e., 'Vulnerable', 'Endangered' or 'Critically Endangered'; IUCN, 2011) are *Procolobus* and *Cercocebus*, each with two species (66% and 100% of total species, respectively; Tables 2 & 3). Ten (26%) of

the 38 primate species, and eight (17%) of the 47 primate subspecies in East Africa are threatened (Tables 2 & 4). It should be noted, however, that two species and seven subspecies of primate in East Africa have not been evaluated to determine their category of threat. Neither of the two 'Not Evaluated' species (*Lophocebus ugandae*, *Lophocebus johnstoni*) is expected to be categorized as threatened. Five of the 'Not Evaluated' subspecies are, however, expected to be categorized as 'threatened' (*Colobus angolensis* ssp. nov., *Erythrocebus patas baumstarki*, *Chlorocebus pygerythrus nesiotis*, *Chlorocebus pygerythrus excubitor*, *Cercopithecus hamlyni hamlyni*). As such, the number of threatened subspecies is likely to rise to about 13 (28%).

Two (5%) of East Africa's primate species are 'Critically Endangered' (*Rungwecebus kipunji* and *Galagoides rondoensis*; both endemic to Tanzania). Six (16%) of East Africa's primate species are 'Endangered' (*Gorilla beringei*, *Pan troglodytes*, *Procolobus gordonorum*, *Procolobus kirkii*, *Cercocebus galeritus*, *Cercocebus sanjei*), while two species (5%) are 'Vulnerable' (*Allochrocebus lhoesti*, *Cercopithecus hamlyni*; Tables 2 & 4).

Of the East African countries, Tanzania has the largest number of threatened primate species with six (22% of 27 species; Tables 2 & 5). Rwanda has the highest percentage of threatened primate species with four (27% of 15 species).

**Table 3 - Number and percentage of threatened species in each genus of primate in East Africa (IUCN 2011). The two 'Not Evaluated' species and the seven 'Not Evaluated' subspecies (Table 2) were included when calculating the percentages.**

Genus	Number of species (%)	Number of subspecies (%)
<i>Gorilla</i>	1 (100)	1 (100)
<i>Pan</i>	1 (100)	1 (100)
<i>Homo</i>	0	0
<i>Colobus</i>	0	2 (25)
<i>Procolobus</i>	2 (66)	2 (66)
<i>Cercocebus</i>	2 (100)	0
<i>Lophocebus</i>	0	0
<i>Rungwecebus</i>	1 (100)	0
<i>Papio</i>	0	0
<i>Erythrocebus</i>	0	0
<i>Chlorocebus</i>	0	0
<i>Allochrocebus</i>	1 (100)	0
<i>Cercopithecus</i>	1 (20)	2 (20)
<i>Perodicticus</i>	0	0
<i>Otolemur</i>	0	0
<i>Galago</i>	0	0
<i>Galagoides</i>	1 (14)	0
<b>Total</b>	<b>10 (26)</b>	<b>8 (17)</b>



**Table 4 - Category of threat totals for the species and subspecies of primate in East Africa (IUCN, 2011). The two 'Not Evaluated' species and the seven 'Not Evaluated' subspecies (Table 2) were included when calculating the percentages.**

Taxonomic level	Critically Endangered (%)	Endangered (%)	Vulnerable (%)	Threatened (%)
Species	2 (5)	6 (16)	2 (5)	10 (26)
Subspecies	1 (2)	5 (11)	2 (4)	8 (17)

**Table 5 - Number of threatened primate species and subspecies, by country, in East Africa (IUCN, 2011). The two 'Not Evaluated' species and the seven 'Not Evaluated' subspecies (Table 2) were included when calculating the percentages.**

Country	Species (%)	Subspecies (%)
Burundi	2 (15)	2 (33)
Kenya	1 (5)	3 (13)
Rwanda	4 (27)	4 (44)
Tanzania	6 (22)	3 (11)
Uganda	3 (13)	5 (26)
<b>Total</b>	<b>10 (26)</b>	<b>8 (17)</b>

### *East Africa's extirpated primates*

No recent taxon of East African primate has become extinct and no recent taxon is known to have been extirpated from the region. In East Africa, *Procolobus rufomitratu* *elliotti* is only known from the Semuliki Forest, southwestern Uganda (Haddow, 1952). Struhsaker (1981) suggested that *P. r. elliotti* might have been extirpated from Uganda but T. Davenport (pers. comm.), in 1993, found this subspecies in low numbers in Semuliki National Park.

Uganda appears to have lost one primate species. Rahm (1970) reported *C. hamlyni* for southwestern Uganda. This species is almost certainly no longer in Uganda.

Kenya may have lost one primate subspecies. It is not known which subspecies of *E. patas* occurs (or occurred) in southern Kenya. Given the proximity of this region to *E. p. baumstarki* in northern Tanzania (De Jong *et al.*, 2009), and the absence of geographic barriers, it is likely that *E. patas* of southern Kenya are of this subspecies. There are no records for *E. patas* in southern Kenya since 2006 (De Jong *et al.*, 2008). If *E. patas* of southern Kenya are *E. p.*

*baumstarki*, then it may be that this subspecies has been recently extirpated from Kenya and is now endemic to northern Tanzania (De Jong *et al.*, 2009).

### *Key sites for primate conservation in East Africa*

The seven protected sites listed below are particularly rich in primate species, important for the maintenance of East Africa's primate diversity, and critical to the conservation of those threatened primate taxa that occur in East Africa (Figure 2; Table 6). Note that modern human *Homo sapiens* is included in the total number of primate species for all seven sites.

- Fifteen primate species occur in the area comprised of Nyungwe National Park (986 km<sup>2</sup>), southwestern Rwanda, and the contiguous Kibira National Park (400 km<sup>2</sup>), northwestern Burundi (Storz, 1983; Dowsett & Dowsett-Lemaire, 1990; Offutt *et al.*, 1990). Threatened taxa: *Pan troglodytes schweinfurthii* (EN), *Colobus angolensis ruwenzorii* (VU), *A. lhoesti* (VU), *C. hamlyni* (VU). Endemic taxa: none, but may be the only site in East Africa for *C. hamlyni*. One of only

two sites in East Africa for *Cercopithecus denti*. *Cercopithecus mitis kandti* said to occur (Offutt *et al.*, 1990), but this seems unlikely (A. Plumptre, pers. comm.).

- At least 14 primate species occur in Semuliki National Park (221 km<sup>2</sup>), southwestern Uganda (Kingdon, 1971). Threatened taxa: *P. t. schweinfurthii* (EN). Endemic taxa: none, but only site in East Africa for *P. r. ellioti*, and one of only two sites in East Africa for *C. denti*.
- Fourteen primate species occur in the area comprising the Udzungwa Mountains National Park (1990 km<sup>2</sup>) and the contiguous Kilombero Nature Reserve (1345 km<sup>2</sup>), south-central Tanzania (Rovero *et al.*, 2009). Threatened taxa: *P. gordonorum* (EN), *C. sanjei* (EN), *R. kipunji* (CR). Endemic taxa: *P. gordonorum*, *C. sanjei*. This is one of only two sites for *R. kipunji* (see below).
- Thirteen primate species occur in Kibale National Park (776 km<sup>2</sup>), southwestern Uganda (Butynski, 1990; Off & Gebo, 2005). Threatened taxa: *P. t. schweinfurthii* (EN), *Procolobus rufomitratus tephrosceles* (EN), *A. lhoesti* (VU). Endemic taxa: none.
- Eleven primate species occur in Bwindi Impenetrable National Park (330 km<sup>2</sup>), southwestern Uganda (Butynski, 1985). Threatened taxa: *Gorilla beringei* (EN), *P. t. schweinfurthii* (EN), *A. lhoesti* (VU). Endemic taxa: none, but one of only two sites for *G. beringei* in East Africa.
- Eleven primate species occur in Mahale Mountains National Park (1613 km<sup>2</sup>), western Tanzania (Kano, 1971; Moyer, 2006; Butynski & De Jong, 2009). Threatened taxa: *P. t. schweinfurthii* (EN), *P. r. tephrosceles* (EN). Endemic taxa: *C. angolensis* ssp. nov.
- Nine primate species occur in the Tana River Primate National Reserve (171 km<sup>2</sup>), southeastern Kenya (Butynski & Mwangi, 1995; De Jong & Butynski, 2009). Threatened taxa: *Procolobus rufomitratus rufomitratus* (EN), *C. galeritus* (EN), *Cercopithecus mitis albitorquatus* (VU). Endemic taxa: none but *P. r. rufomitratus* and *C. galeritus* only occur along the Lower Tana River and in the Tana Delta (see below). *Galago gallarum* probably present in the Tana River Primate National Reserve, but this requires confirmation.



Figure 2. Map of East Africa showing those sites that are most important for the conservation of primate diversity, as well as other localities mentioned in the text.

Table 6 - Primates present in seven of the richest sites for primate species in East Africa (Figure 2).

Species	Nyungwe NP/ Kibira NP	Semuliki NP	Udzungwa Mnts. NP/ Kilombero NR	Kibale NP	Bwindi Impenetrable NP	Mahale Mountains NP	Tana River Primate NR
Country	Rwanda/Burundi	Uganda	Tanzania	Uganda	Uganda	Tanzania	Kenya
Area (km <sup>2</sup> )	1386	221	3335	776	330	1613	171
Altitude (m)	1550-2950	670-760	200-2580	1110-1620	1160-2610	780-2520	30-70
Number of species	15	14	14	13	11	11	9
<i>Gorilla beringei</i>	-	-	-	-	+	-	-
<i>Pan troglodytes</i>	+	+	-	+	+	+	-
<i>Homo sapiens</i>	+	+	+	+	+	+	+
<i>Colobus angolensis</i>	+	-	+	-	-	+	-
<i>Colobus guereza</i>	-	+	-	+	+	-	-
<i>Procolobus rufomitratu</i>	-	+	-	+	-	+	+
<i>Procolobus gordonorum</i>	-	-	+	-	-	-	-
<i>Procolobus kirkii</i>	-	-	-	-	-	-	-
<i>Cercocebus galeritus</i>	-	-	-	-	-	-	+
<i>Cercocebus sanjei</i>	-	-	+	-	-	-	-
<i>Lophocebus johnstoni</i>	+	+	-	-	-	-	-
<i>Lophocebus ugandae</i>	-	-	-	+	-	-	-
<i>Rungwecebus kipunji</i>	-	-	+	-	-	-	-
<i>Papio cynocephalus</i>	-	-	+	-	-	+	+
<i>Papio anubis</i>	+	+	-	+	+	-	-
<i>Erythrocebus patas</i>	-	-	-	-	-	-	-
<i>Chlorocebus tantalus</i>	-	+	-	+	-	-	-
<i>Chlorocebus pygerythrus</i>	+	-	+	-	-	+	+
<i>Allochrocebus lhoesti</i>	+	-	-	+	+	-	-
<i>Cercopithecus neglectus</i>	-	+	-	-	-	-	-
<i>Cercopithecus denti</i>	+	+	-	-	-	-	-
<i>Cercopithecus hamlyni</i>	+	-	-	-	-	-	-
<i>Cercopithecus mitis</i>	+	+	+	+	+	+	+
<i>Cercopithecus ascanius</i>	+	+	-	+	+	+	-
<i>Perodicticus potto</i>	+	+	-	+	+	-	-
<i>Otolemur crassicaudatus</i>	+	-	+	-	-	+	-
<i>Otolemur garnettii</i>	-	-	+	-	-	-	+
<i>Galago senegalensis</i>	-	+	+	-	-	+? <sup>1</sup>	+
<i>Galago moholi</i>	-	-	-	-	-	+?	-
<i>Galago gallarum</i>	-	-	-	-	-	-	? <sup>2</sup>
<i>Galago matschiei</i>	+	?	-	+	+	-	-
<i>Galagoides zanzibaricus</i>	-	-	+	-	-	-	-
<i>Galagoides rondoensis</i>	-	-	-	-	-	-	-
<i>Galagoides orinus</i>	-	-	+	-	-	-	-
<i>Galagoides granti</i>	-	-	+	-	-	-	-
<i>Galagoides cocos</i>	-	-	-	-	-	-	+
<i>Galagoides demidovii</i>	+	+	-	?	-	-	-
<i>Galagoides thomasi</i>	?	?	-	+	+	-	-
Unidentified galago	-	-	-	-	-	+	-

<sup>1</sup> *Galago* sp. is present, but not certain if *G. moholi* or *G. senegalensis*.<sup>2</sup> Requires confirmation.

Of the 38 species of primate in East Africa, only five (13%) do not occur in at least one of the above-listed seven 'primate species-rich' protected areas (Table 6). Of these five, three are woodland/bushland species that are widespread and common in Africa (*E. patas*, *Galago moholi*, *G. gallarum*), while two are threatened species (*P. kirkii*, *G. rondoensis*).

Of the 10 threatened primate species and eight threatened primate subspecies in East Africa (Tables 2 & 4), only four taxa (22%) do not occur in at least one of the above-listed seven sites. All four of these threatened taxa are present, however, in at least one protected area. These four taxa, and the protected areas (Figure 2) most critical to their long-term conservation, are:

- *Colobus guereza percivali* (EN): Mathews Range Forest Reserve (940 km<sup>2</sup>), central Kenya. This is also an important site in Kenya for the conservation of *Cercopithecus neglectus* (Mwenja, 2007, 2009; De Jong & Butynski, 2010).
- *Procolobus kirkii* (EN): Jozani Chwaka Bay National Park (50 km<sup>2</sup>), Zanzibar Island, eastern Tanzania (Siex & Struhsaker, 1999). This is also an important site for the conservation of the Zanzibar Island endemic *Galagoides zanzibaricus zanzibaricus* and near endemic *Otolemur garnettii garnettii* (Y. de Jong & T. Butynski, pers. obs.).
- *Cercopithecus mitis kandti* (EN): Virunga Conservation Area (434 km<sup>2</sup>), which is comprised of Mgahinga Gorilla National Park in Uganda, Volcanoes National Park in Rwanda, and Virunga National Park in Democratic Republic of Congo. *Cercopithecus m. kandti* is thought to be endemic to this site, but also may be present in the nearby Gishwati Forest Reserve (15 km<sup>2</sup>; Offutt *et al.*, 1990; R. Chancellor, pers. comm.). This also is a critical site for *G. b. beringei* (Butynski & Kalina, 1998).
- *Galagoides rondoensis* (CR): Kazimzumbwi Forest Reserve (9 km<sup>2</sup>), Zaraninge Forest (20 km<sup>2</sup>) in Sadaani National Park, Pugu Forest Reserve (24 km<sup>2</sup>), and Rondo Forest Reserve (25 km<sup>2</sup>), eastern Tanzania (Honest *et al.*, 2009).

#### **East Africa's most threatened primates**

Three of East Africa's threatened taxa of primate are in particular need of conservation attention at this time.

The world population of *P. r. rufomitratu*s is fewer than 1000 individuals (D. Mbora, pers. comm.), while *C. galeritus* numbers about 2000 individuals (J. Wiecekowsk, pers. comm.). These two sympatric, endemic, 'Endangered'

species live only in the forests of the Lower Tana River where *P. r. rufomitratu*s occupies an area of <13 km<sup>2</sup>, and *C. galeritus* occupies an area of <26 km<sup>2</sup> (Butynski & Mwangi, 1995). The ca. 37 km<sup>2</sup> of closed forest that remains along the Lower Tana River, and the biodiversity that these unique forests support, continue to face serious threats from up-stream dams and other river use, the taking of forest products, and from conversion to agriculture. In addition, there is a rapidly growing human population in this region (Wiecekowsk & Mbora, 2000; Mbora & Butynski, 2009; Hamerlynck *et al.*, 2011).

The survival of *P. r. rufomitratu*s and *C. galeritus* is particularly precarious in that the one protected area in which they occur, the Tana River Primate National Reserve (171 km<sup>2</sup>), is faced with degazettment. In January 2007, the High Court of Kenya ruled that the Tana River Primate National Reserve must be degazetted as its establishment (in 1976) was not in accordance with the law. The Kenya Wildlife Service appealed this ruling and, as of July 2011, Parliament has not formally degazetted the area (Mbora & Butynski, 2009; J. Wiecekowsk & D. Mbora, pers. comm.). Degazettment of the Tana River Primate National Reserve would mean that none of the habitat of *P. r. rufomitratu*s and *C. galeritus* falls within a protected area. Given present circumstances, there can be no doubt that these are the two most threatened primate taxa in East Africa at this time.

Notwithstanding the above, a new (2009) initiative (and approach) to conserve the forests and biodiversity of the Lower Tana River offers some hope. This is the 'Tana Forests People for Conservation and Conservation for People Initiative' (PCCP, 2011). The primary goal of this initiative is to establish an organization that will enable the local people to conserve the remaining forest, rehabilitate degraded areas, and establish sustainable income-generating eco-tourism and other development projects. One outcome of this initiative may be the conversion of the Tana River Primate National Reserve into a community wildlife conservancy.

*Rungwecebus kipunji* is both a 'Critically Endangered' species and the only species in the genus *Rungwecebus*. As such, the top priority for primate conservation in East Africa is to ensure the long-term survival of *R. kipunji*. Only two small populations of *R. kipunji* remain and their extent of occurrence is <18 km<sup>2</sup>. Both populations are in south-central Tanzania. The habitat of the ca. 75 animals in the Ndundulu Forest (250 km<sup>2</sup>) of the Kilombero Nature Reserve (1345 km<sup>2</sup>) is well protected, but the hunting of primates remains a threat (T. Davenport, pers. comm.). The ca. 1042 *R. kipunji* in the Kitulo National Park (413 km<sup>2</sup>) and contiguous Mount Rungwe Nature Reserve (137 km<sup>2</sup>) continue to be subjected to hunting, and habitat degradation, loss and fragmentation (Davenport *et al.*, 2009).

**Biogeographical research priorities for the primates of East Africa**

There remain numerous questions related to the biogeography of the primates of East Africa, the most basic one being, 'Which primate taxa are present in which country?' There are primate taxa reported or suspected to occur in each East African country, but for which confirmation is needed (Table 2). Here is a summary, by country, of which primate taxa require confirmation as to presence:

**Burundi species**

- Cercopithecus hamlyni* (owl-faced monkey) - if present, which subspecies?
- Galago senegalensis* (northern lesser galago) - if present, which subspecies?
- Galago moholi* (southern lesser galago) - if present, which subspecies?
- Galagoides demidovii* (Demidoff's dwarf galago)
- Galagoides thomasi* (Thomas's dwarf galago)

**Burundi subspecies**

- Chlorocebus pygerythrus rufoviridis* (reddish-green vervet)

**Kenya species**

- Galagoides orinus* (mountain dwarf galago)

**Kenya subspecies**

- Colobus guereza caudatus* (Mount Kilimanjaro guereza)
- Papio cynocephalus cynocephalus* (central yellow baboon)
- Erythrocebus patas baumstarki* (southern patas monkey)

**Rwanda species**

- Galago senegalensis* (northern lesser galago) - if present, which subspecies?
- Galago moholi* (southern lesser galago) - if present, which subspecies?
- Galagoides demidovii* (Demidoff's dwarf galago)
- Galagoides thomasi* (Thomas's dwarf galago)

**Rwanda subspecies**

- Chlorocebus pygerythrus rufoviridis* (reddish-green vervet)
- Otolemur crassicaudatus argentatus* (northern silver galago)

**Tanzania species**

- Cercopithecus neglectus* (De Brazza's monkey)
- Perodicticus potto* (potto) - if present, which subspecies?
- Galago matschiei* (spectacled lesser galago)

**Tanzania subspecies**

- Papio cynocephalus ibeanus* (Ibean yellow baboon)

**Uganda species**

- Cercopithecus hamlyni* (owl-faced monkey) - if present, which subspecies?
- Galago moholi* (southern lesser galago) - if present, which subspecies?

**Uganda subspecies**

- Otolemur crassicaudatus monteiri* (miombo silver galago)

There are 24 taxa (15 species, 9 subspecies) in the above list, 12 of which need to be confirmed for the two smallest East African countries (*i.e.*, Burundi and Rwanda). The majority of those taxa (14 of 24, 58%) are galagos. As such, in order to further refine the present country-by-country lists for East Africa (Table 2), research should focus on the galagos of Burundi and Rwanda.

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## APPENDIX

### Photographs of Species Representing the 17 East African Primate Genera

Each of the following species, one from each of the 17 genera of East African primates, are represented in the photographs within this Appendix. Listed here are the taxonomic and common names, age/sex class, and location where the photographer(s) took the image.

1. *Gorilla beringei beringei* (mountain gorilla), adult male, Virunga National Park, eastern Democratic Republic of Congo. Photograph by Karl Ammann.
2. *Pan troglodytes schweinfurthii* (eastern chimpanzee), adult male, Mahale Mountains National Park, western Tanzania. Photograph by Tom Butynski and Yvonne de Jong.
3. *Homo sapiens sapiens* (modern human), juvenile male (left) and juvenile female, Laikipia Plateau, central Kenya. Photograph by Yvonne de Jong.
4. *Colobus guereza kikuyuensis* (Mount Kenya guereza), adult male, Nanyuki, central Kenya. Photograph by Yvonne de Jong and Tom Butynski.
5. *Procolobus rufomitratu tephrosceles* (ashy red colobus), adult male, Mahale Mountains National Park, western Tanzania. Photograph by Tom Butynski and Yvonne de Jong.
6. *Rungwecebus kipunji* (kipunji), adult female and juvenile, Mount Rungwe Nature Reserve, southern Tanzania. Photograph by Tim Davenport.
7. *Papio cynocephalus kindae* (Kinda yellow baboon), adult male, Mahale Mountains National Park, western Tanzania. Photograph by Tom Butynski and Yvonne de Jong.
8. *Cercocebus sanjei* (Sanje mangabey), adult male, Udzungwa Mountains National Park, south-central Tanzania. Photograph by Carolyn L. Ehardt.
9. *Lophocebus ugandae* (Uganda grey-cheeked mangabey), adult male with infant, Kibale National Park, southwestern Uganda. Photograph by Alain Houle.
10. *Cercopithecus mitis albotorquatus* (Pousargues's monkey), adult male, Witu Forest Reserve, north coast of Kenya. Photograph by Yvonne de Jong and Tom Butynski.
11. *Erythrocebus patas baumstarki* (southern patas monkey), adult male, Serengeti National Park, northern Tanzania. Photograph by Richard Hoare and Sian Brown.
12. *Allochrocebus lhoesti* (L'Hoest's monkey), Nyungwe National Park, southwestern Rwanda. Photograph by Simon Camp <[www.thousandhillsphotography.com](http://www.thousandhillsphotography.com)>.
13. *Chlorocebus pygerythrus hilgerti* (Hilgert's vervet), adult male, Lake Manyara, northern Tanzania. Photograph by Yvonne de Jong and Tom Butynski.
14. *Perodicticus potto ibeanus* (eastern potto), Kakamega Forest National Reserve, southwestern Kenya. Photograph by Harald Schuetz.
15. *Galago gallarum* (Somali lesser galago), adult female, Namunyak Conservancy, central Kenya. Photograph by Yvonne de Jong and Tom Butynski.
16. *Galagoides cocos* (Kenya coast dwarf galago), juvenile, Mpeketoni, Lake Kenyatta, north coast of Kenya. Photograph by Yvonne de Jong and Tom Butynski.
17. *Otolemur garnettii garnettii* (Zanzibar small-eared galago), adult male, Ngezi-Vumawimbi Nature Forest Reserve, Pemba Island, eastern Tanzania. Photograph by Yvonne de Jong and Tom Butynski.



1: *Gorilla beringei beringei*



2: *Pan troglodytes schweinfurthii*



3: *Homo sapiens sapiens*

4: *Colobus guereza kikuyuensis*



5: *Procolobus rufomitratu tephrosceles*

6: *Rungwecebus kipunjii*



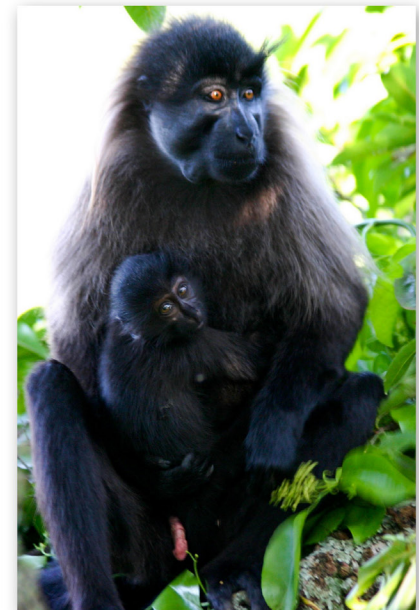
7: *Papio cynocephalus kindae*



8: *Cercocebus sanjei*



9: *Lophocebus ugandae*



10: *Cercopithecus mitis albotorquatus*



11: *Erythrocebus patas baumstarki*

12: *Allochrocebus lhoesti*



13: *Chlorocebus pygerythrus hilgerti*

14: *Perodicticus potto ibeanus*



16: *Galagoïdes cocos*



15: *Galago gallarum*



17: *Otolemur garnettii garnettii*