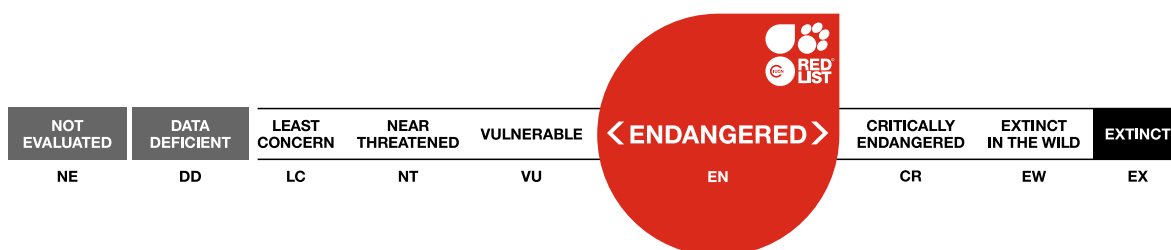




Chlorocebus djamdjamensis ssp. *djamdjamensis*, Djam-djam Monkey

Assessment by: De Jong, Y.A., Mekonnen, A. & Butynski, T.M.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Primates	Cercopithecidae

Scientific Name: *Chlorocebus djamdjamensis* ssp. *djamdjamensis* (Neumann, 1902)

Parent Species: See [Chlorocebus djamdjamensis](#)

Common Name(s):

- English: Djam-djam Monkey

Taxonomic Notes:

Due to on-going hybridization in contact zones between various *Chlorocebus* taxa in Ethiopia (Haus 2013, Haus *et al.* 2013b), *Chlorocebus* taxonomy in Ethiopia is under debate. *Chlorocebus djamdjamensis* was long considered to be monotypic. The taxonomic history of *C. djamdjamensis* is reviewed in Butynski *et al.* (2013). Kingdon (1997) suggests that hybridization between *C. djamdjamensis* and other *Chlorocebus* taxa might occur. Mekonnen *et al.* (2012) indicate hybridization between *C. djamdjamensis* and grivet monkey *C. aethiops* based on the pelage colouration of some individuals. Haus (2013) and Haus *et al.* (2013a, b) confirm on-going hybridization between *C. djamdjamensis* and *C. aethiops* based on molecular evidence. These authors indicate the possibility that the holotype of *C. djamdjamensis* (close to Bubbe Kersa and Gossa in Gujji) represents a hybrid between *C. djamdjamensis* and *C. aethiops*, and that hybridization is not only on-going but began more than 100 years ago.

Mekonnen *et al.* (2018c) found two distinct mitochondrial DNA clusters within *C. djamdjamensis*, one in the Bale Mountains and one in forests fragments in the Sidamo Highlands, central southern Ethiopia. These authors confirm hybridization with *C. aethiops* and report one phenotypic *C. djamdjamensis* x vervet *Chlorocebus pygerythrus* hybrid. They also indicate that gene flow between *C. djamdjamensis* in the Bale Mountains and in the Sidamo Highlands is uncommon.

In 2020, Gippoliti proposed the name '*C. djamdjamensis harenaensis*' for the form in Harena Forest, Bale Mountains. As the Bale Mountains and Sidamo Highland populations demonstrate strong genetic differentiation (Mekonnen *et al.* 2018c), and differ phenotypically (Mekonnen *et al.* 2012), ecologically, behaviourally (Mekonnen *et al.* 2017, 2018a,b), and in gut microbiota (Trosvik *et al.* 2018), we provisionally recognize *C. d. djamdjamensis* and *C. d. harenaensis*. Further studies are required to better understand the genetic and morphological diversity, phylogenetics, and evolutionary history within *C. djamdjamensis*.

Assessment Information

Red List Category & Criteria: Endangered C2a(i) [ver 3.1](#)

Year Published: 2022

Date Assessed: February 27, 2022

Justification:

Chlorocebus djamdjamensis djamdjamensis is assessed as Endangered. This endemic subspecies has a highly fragmented geographic range with an extent of occurrence (EOO) of about 7,000 km². The population was estimated to be fewer than 725 individuals in 2010, of which *ca* 360 were mature individuals. In 2010, this subspecies occupied 26 highly degraded and isolated, human-dominated, forest patches (with areas ranging between <1 km² and 10 km²); the population is severely fragmented. The largest number of individuals in a subpopulation was 50 (Mekonnen *et al.* 2012). Ongoing habitat loss, degradation and fragmentation, due to a dense and rapidly growing human population, is threatening the long-term survival of this subspecies. Another threat is hybridization with *C. aethiops* in the western part of its range and with *C. pygerythrus* in the northwest. Local extirpations were reported in 2012. A field survey is urgently needed to determine geographic distribution, abundance, threats, and conservation priorities.

Geographic Range

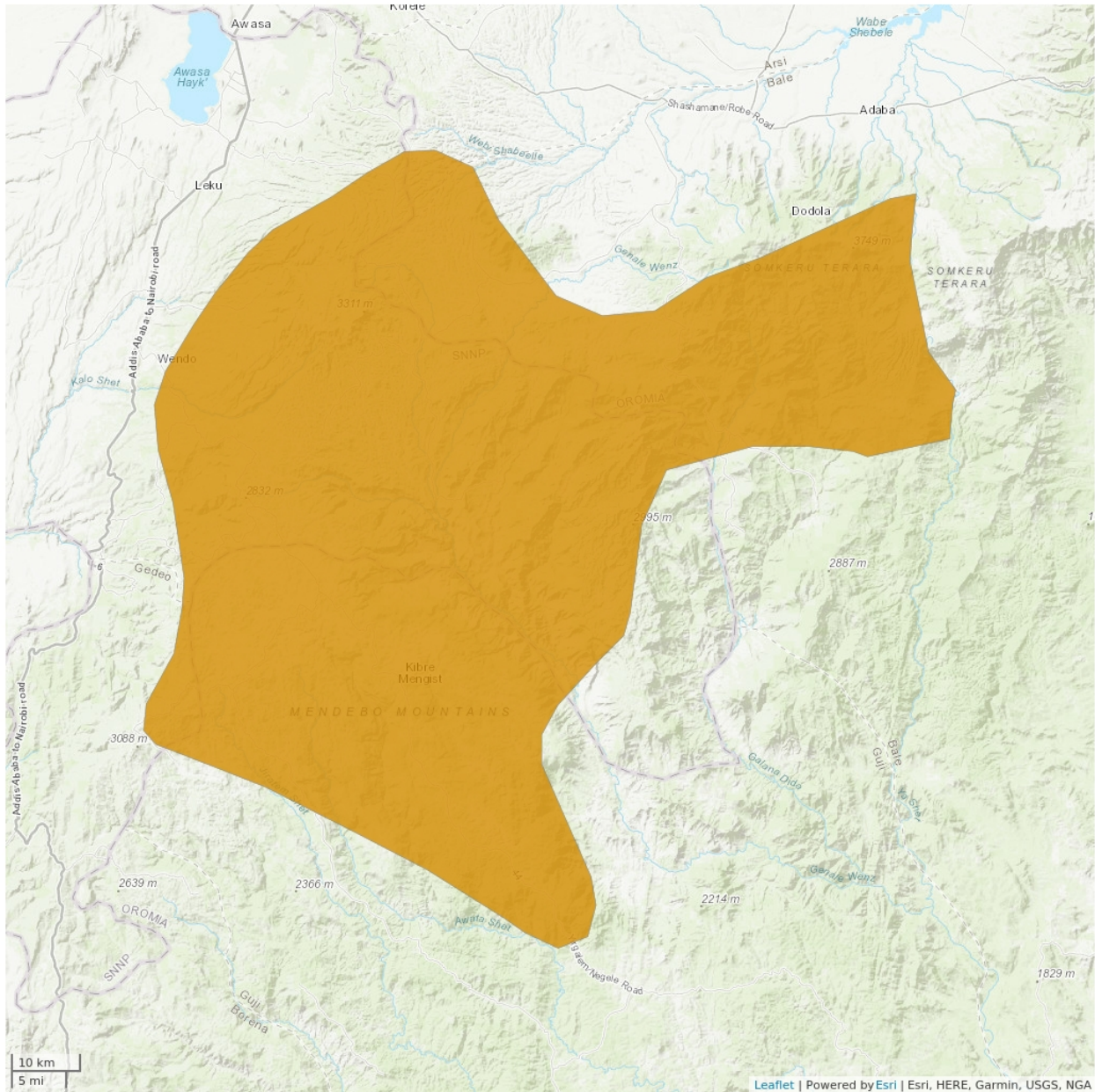
Range Description:

Chlorocebus djamdjamensis djamdjamensis is endemic to the Sidamo Highlands of central southern Ethiopia, east of the Eastern (Gregory) Rift Valley (Mekonnen *et al.* 2012, 2018c). This subspecies has an altitude range of 2,355–3,200 m asl (Mekonnen *et al.* 2012). Its area of occupancy (AOO) and extent of occurrence (EOO) are inferred to be declining due to ongoing habitat destruction, degradation, and fragmentation.

Country Occurrence:

Native, Extant (resident): Ethiopia

Distribution Map

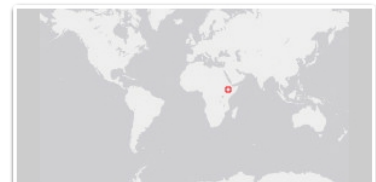


Legend

EXTANT (RESIDENT)

Compiled by:

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The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

Population has been declining in the Sidamo Highlands where fewer than 725 individuals were recorded during surveys from January 2010 through May 2011 in 26 small (<1 km² to 10 km²), isolated, human-dominated, forest fragments (Mekonnen *et al.* 2012). Assuming that the remaining population has a total of *ca* 725 individuals, it is estimated that there are *ca* 360 mature individuals left in the wild. The largest number of individuals in a forest subpopulation was 50 individuals (Mekonnen *et al.* 2012). Residents reported the extirpation of *C. d. djamdjamensis* from two regions due to forest loss and hunting in response of crop raiding (Mekonnen *et al.* 2012). New surveys are urgently required to assess the remaining number of *C. d. djamdjamensis* and their locations.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Chlorocebus d. djamdjamensis is a semi-terrestrial, bamboo-eating (*Arundinaria alpina*) primate (Mekonnen *et al.* 2010a, 2021). During the day-light hours, this monkey spends about 36% of the time on the ground (Mekonnen *et al.* 2018b). Occupies the bamboo forest zone of the Sidamo Highlands but is currently restricted to heavily degraded, human-dominated, isolated forest fragments. Appears to rely less on bamboo than does *C. d. harennensis* as Mekonnen *et al.* (2012) report groups in forest where bamboo is highly degraded or nearly absent (17 of 26 forest fragments contained some bamboo). Large areas of bamboo habitat have been destroyed for settlements, agriculture, and livestock grazing.

Mekonnen *et al.* (2012) report that group size ranges from 9 to 29 individuals (mean = 19.5, n = 37). Mean group size of two study groups was 25.5 individuals (Mekonnen *et al.* 2017).

The diet of *C. d. djamdjamensis* is comprised of more species (in forest fragments this included 61 species, including mushrooms and insects) than that of *C. d. harennensis* (in continuous forest, diets included 12 species), although food was less abundant (Mekonnen *et al.* 2018a). In continuous forest, *Chlorocebus d. harennensis* spent significantly more time feeding on young leaves of bamboo (61%) compared to *C. d. djamdjamensis* in forest fragments (8%; Mekonnen *et al.* 2018a). *Chlorocebus d. djamdjamensis* in forest fragments fed more on fruits, stems, petioles, insects, and leaves of plants other than bamboo, compared to *C. d. harennensis* in continuous forest (Mekonnen *et al.* 2018a). As much as 10% of the diet of some groups consisted of crops, of which barley (*Hordeum vulgare*) and bamboo planted near houses were the most eaten (Mekonnen *et al.* 2020).

As a semi-terrestrial bamboo specialist, *C. djamdjamensis* is unique within *Chlorocebus* as all other species are semi-terrestrial generalists. Now that it is restricted to degraded forest fragments, however, *C. d. djamdjamensis* has assumed a diverse diet similar to *C. aethiops* and *C. pygerythrus* (Mekonnen *et al.* 2018a). These authors provide two explanations for the dietary flexibility of *C. d. djamdjamensis*: (1) retention of the ancestral ecological flexibility that is characteristic of *Chlorocebus*, and/or (2) hybridization with parapatric *C. aethiops* and *C. pygerythrus* has enabled this dietary change. Mekonnen *et al.* (2018c) found introgression from other *Chlorocebus* species in *C. d. djamdjamensis*. It seems likely, therefore, that anthropogenic habitat modification (i.e., bamboo forest converted to open woodland) has enhanced hybridization with *C. aethiops* and *C. pygerythrus*, both of which are generalist that live in woodlands.

Main predators include humans, domestic dogs, spotted hyenas (*Crocuta crocuta*), African wolves (*Canis lupaster*), and large birds of prey (Mekonnen *et al.* 2020, 2021).

Mekonnen *et al.* (2010a,b; 2012; 2016; 2018a,b,c) and Butynski *et al.* (2013) summarise the current state of knowledge of *C. d. djamdjamensis*.

This monkey often forms polyspecific associations with Black-and-white Colobus Monkeys (*Colobus guereza*, Mekonnen *et al.* 2012). It is also parapatric with *C. aethiops*, which occupies the lower altitude regions west and north of *C. d. djamdjamensis*' range. Sympatry between these two taxa has not been reported (Mekonnen *et al.* 2012).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

This species is persecuted for crop raiding. It is hunted with traps, spears and dogs (Mekonnen *et al.* 2012, 2020).

Threats (see Appendix for additional information)

Main threats to *C. d. djamdjamensis* are ongoing habitat loss, degradation and fragmentation, hunting, and, perhaps, hybridization (Mekonnen *et al.* 2012). Occupies small, isolated, human-dominated forest fragments. There is intense human-monkey conflict (as *C. d. djamdjamensis* is reported to raid crops at all 26 forest fragments where it is known to occur). People deter raiding monkeys by throwing rocks, placing scarecrows, chasing with dogs, and hunting them with traps, spears, and dogs (Mekonnen *et al.* 2012, 2018a, 2020). Guarding crops appears the most effective deterrent (Mekonnen *et al.* 2020).

Grazing, harvesting of bamboo, and collection of fuelwood are legal in most sites where *C. d. djamdjamensis* lives. These activities, at present levels of off-take, are having a negative impact on this monkey. Making the removal of these products sustainable and restoration of the forest fragments on which *C. d. djamdjamensis* relies (through the planting and care of bamboo, food-trees, and sleeping trees) are the two priority conservation actions (Mekonnen *et al.* 2018a, 2021, 2022).

Recent morphological and genetic studies suggest hybridization between *C. d. djamdjamensis* and *C. aethiops* (e.g., Ekuma Mountain, Kulla Mountain, and Wotiye; Mekonnen *et al.* 2012, Haus *et al.* 2013b). Monkeys at these sites exhibit intermediate pelage colouration, tail length, and whisker length (Mekonnen *et al.* 2012). As *C. d. djamdjamensis* has not yet been found in sympatry with other *Chlorocebus* taxa, hybridization at these sites might have occurred more than a century ago. Mekonnen *et al.* (2012), however, report *C. aethiops* as close as 12 km to *C. d. djamdjamensis*. Haus *et al.* (2013a) indicate that hybridization between *C. aethiops* and *C. d. djamdjamensis* began at least 100 years ago and is on-going. Hybridization is assumed to be a threat for the long-term survival of *C. d. djamdjamensis* (Kingdon 1997, Mekonnen *et al.* 2012, Haus *et al.* 2013a).

All threats are related to the rapid growth of the human population in the Ethiopian Highlands. The human population of Ethiopia is one of the fastest growing in the world with a 3.02% annual growth rate. At this rate, Ethiopia's population will double in 30 years (WPP 2021). 'Rate of Natural Increase' of this population is 2.6%, compared to a worldwide rate of 1.1% (PRB 2021).

Conservation Actions (see Appendix for additional information)

Chlorocebus djamdjamensis is listed on Appendix II of CITES and on Class B of the African Convention on the Conservation of Nature and Natural Resources. Does not occur in any protected areas.

To ensure the long-term survival of *C. d. djamdjamensis*, it is important that its taxonomic status be resolved, and that population size, geographic distribution, natural history, threats, and conservation status be assessed.

Currently, *C. d. djamdjamensis* is most abundant on public land (e.g., Bodie Mountain, Felada Mountain, Geramba Mountain, and Sucha Mountain). At this time, this monkey, as well as the bamboo forests, are best protected on privately owned land (e.g., Guticha, Womma Shella; Mekonnen *et al.* 2012).

Bamboo forest within and between forest fragments needs to be restored to expand habitat for *C. d. djamdjamensis* and to establish corridors among forest fragments to enhance gene flow (Mekonnen *et al.* 2012, 2018c, 2022).

Grazing, harvesting of bamboo, logging, and collection of fuelwood are legal in most sites where *C. d. djamdjamensis* lives. These activities, at present levels of off-take, are having a negative impact on this monkey. Making the removal of these products sustainable and restoration of the forest fragments on which *C. d. djamdjamensis* relies (through the planting and care of bamboo, food-trees, and sleeping trees) are the two priority conservation actions (Mekonnen *et al.* 2018a, 2021, 2022).

Surveys throughout the geographic range are required to better understand this subspecies' present distribution, abundance, threats, and conservation status, and to establish priorities for its long-term conservation. In addition, it is important to put into place conservation action, research, and monitoring activities that focus on *C. d. djamdjamensis*. Bringing the plight of *C. d. djamdjamensis* to wide national and international attention is required in order to fund and implement priority conservation actions.

Credits

Assessor(s): De Jong, Y.A., Mekonnen, A. & Butynski, T.M.

Reviewer(s): Reuter, K.E.

Authority/Authorities: IUCN SSC Primate Specialist Group

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Appendix

Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	Yes

Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	-	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.2. Small-holder farming	Ongoing	-	-	Low impact: 3
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.2. Small-holder grazing, ranching or farming	Ongoing	-	-	Low impact: 3
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.3. Persecution/control	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects		

Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: No
Occurs in at least one protected area: No
In-place education
Included in international legislation: Yes
Subject to any international management / trade controls: Yes

Conservation Actions Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Action Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection
2. Land/water management -> 2.1. Site/area management
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.3. Sub-national level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level

Research Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Research Needed
1. Research -> 1.1. Taxonomy
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.4. Harvest, use & livelihoods
1. Research -> 1.5. Threats
1. Research -> 1.6. Actions
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
2. Conservation Planning -> 2.2. Area-based Management Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Continuing decline in area of occupancy (AOO): Yes
Estimated extent of occurrence (EOO) (km ²): 7000
Continuing decline in extent of occurrence (EOO): Yes
Continuing decline in number of locations: Yes
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 2,355

Distribution
Upper elevation limit (m): 3,200
Population
Number of mature individuals: 360
Continuing decline of mature individuals: Yes
Population severely fragmented: Yes
No. of subpopulations: 26
Extreme fluctuations in subpopulations: Unknown
All individuals in one subpopulation: No
No. of individuals in largest subpopulation: 50
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Movement patterns: Not a Migrant

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