

Country Profile

Republic of Kenya



Giraffe Conservation Status Report

September 2023

General statistics

Size of country: 582,650 km²

Size of protected areas / percentage protected area coverage: 46,612 km² (8%)

Species and subspecies

In 2016, the International Union for the Conservation of Nature (IUCN) completed the first detailed assessment of the conservation status of giraffe, revealing that their numbers are in peril. The IUCN currently recognises one species (*Giraffa camelopardalis*) and nine subspecies of giraffe (Muller *et al.* 2018) historically based on outdated assessments of their morphological features and geographic ranges. The nine subspecies are: Angolan giraffe (*G. c. angolensis*), Kordofan giraffe (*G. c. antiquorum*), Masai giraffe (*G. c. tippelskirchi*), Nubian giraffe (*G. c. camelopardalis*), reticulated giraffe (*G. c. reticulata*), Rothschild's giraffe (*G. c. rothschildi*), South African giraffe (*G. c. giraffa*), Thornicroft's giraffe (*G. c. thornicrofti*) and West African giraffe (*G. c. peralta*). The decline in giraffe range and numbers was further emphasised when most of the IUCN-recognised subspecies were assessed in 2018, some of these as *Critically Endangered* and *Endangered*. While this update further confirms the real threat to one of Africa's most charismatic megafaunas, it also highlights a rather confusing aspect of giraffe conservation: how many species and subspecies of giraffe are there?

The Giraffe Conservation Foundation (GCF) together with our partner Senckenberg Biodiversity and Climate Research Centre (BiK-F) conducted a comprehensive DNA sampling and analysis (genomic, nuclear, and mitochondrial) of major natural populations of giraffe throughout their range in Africa. As a result, an updated giraffe taxonomy now exists with four distinct species of giraffe and seven subspecies (Fennessy *et al.* 2016). The four species are Masai (*G. tippelskirchi*), northern (*G. camelopardalis*), reticulated (*G. reticulata*) and southern giraffe (*G. giraffa*). The Masai giraffe has two subspecies: Luangwa (*G. t. thornicrofti*) and Masai giraffe (*G. t. tippelskirchi*). The northern giraffe has three subspecies: Nubian, Kordofan, and West African giraffe. The southern giraffe has two subspecies: Angolan (*G. g. angolensis*) and South African giraffe (*G. g. giraffa*). The Rothschild's giraffe is genetically and morphologically identical to the Nubian giraffe, and thus subsumed into Nubian giraffe.

Findings from different studies which are consistent with several criteria used in species definition have subsequently supported the classification of the genus *Giraffa* into four distinct lineages (Muneza *et al.* 2023). Whole-genome analysis by Winter *et al.* (2018) and Coimbra *et al.* (2021), reinforces the classification of giraffe into four distinct, independently evolving lineages, which constitutes a fundamental criterion common to all species concepts, as defined by the unified species concept (De Queiroz 2007). Phylogenetic/phylogenomic analyses, as highlighted by Winter *et al.* (2018), indicate that the four giraffe species are characterised by synapomorphic Single Nucleotide Polymorphisms (SNPs), defining an evolutionary pattern of ancestry and descent, consistent with the phylogenetic species concept posited by Agapow *et al.* (2004). Additionally, these four giraffe species demonstrate ancestral-descendant populations

that have evolved in spatial and temporal isolation for over 200 ka, consistent with the evolutionary species concept proposed by De Queiroz (2005). They also form exclusive genealogical groups, substantiated by multiple lines of evidence and analyses as reported by Fennessy *et al.* (2016) and Coimbra *et al.* (2021), aligning with the genealogical species concept as articulated by Balakrishnan (2005). Recent studies have revealed reproductive isolation and minimal or no gene flow among the four giraffe lineages, indicating genetic isolation (Coimbra *et al.* 2021; Coimbra *et al.* 2023), a cornerstone for both the biological species concept and genetic species concept as proposed by Baker and Bradley (2006) and De Queiroz (2007).

Although not a taxonomic authority, an updated review of giraffe conservation status by IUCN using the taxonomic classification of four species is overdue, to align with that of the Catalogue of Life and International Taxonomic Information System (Banki *et al.* 2023; ITIS 2023). Therefore, based on this growing body of evidence, coupled with the acceptance of the four giraffe species taxonomy, GCF refers to the updated giraffe taxonomy of four species in all publications.

The following species and subspecies of giraffe occur in Kenya:

- Species:**
- Masai giraffe (*Giraffa tippelskirchi*)
 - Northern giraffe (*Giraffe camelopardalis*)
 - Reticulated giraffe (*Giraffa reticulata*)
- Subspecies:**
- Nubian giraffe (*Giraffa camelopardalis camelopardalis*)

Conservation Status

IUCN Red List (IUCN 2018):

<i>Giraffa camelopardalis</i> (as a species)	Vulnerable (Muller <i>et al.</i> 2018)
<i>Giraffa tippelskirchi</i>	Endangered (Bolger <i>et al.</i> 2019)
<i>Giraffa reticulata</i>	Endangered (Muneza <i>et al.</i> 2018)
<i>Giraffa c. camelopardalis</i>	Critically Endangered (Wube <i>et al.</i> 2018)

CITES:

Giraffe were listed in 2019 under Appendix II, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2019).

CMS:

Giraffe were listed in 2019 under Appendix II, Convention on the Conservation of Migratory Species of Wild Animals (CMS 2020).

In the Republic of Kenya:

In the Republic of Kenya (referred to as Kenya henceforth), Masai, Nubian (Rothschild's) and reticulated giraffe are accorded full protection under the Wildlife Conservation and Management Act, 2013 (No. 47) (KWS 2018). In the Sixth Schedule of the Wildlife Conservation and Management Act, 2013 section No. 47, Nubian (Rothschild's) giraffe are listed as 'Endangered' while the other two species are not categorised in any listing but the hunting or killing of any species of giraffe is illegal in the country. In addition, any person that commits an offence, for example poaching any endangered or threatened species will be penalised a fine of not less than Ksh 20 million or life imprisonment, or both.



Conservation challenges

Kenya is home to three giraffe species, all of which vary in abundance and distribution and face their own set of conservation challenges and threats. A degree of uncertainty surrounds the exact geographic and taxonomic limits of giraffe in Kenya, yet ongoing efforts are underway to better understand these (Brown *et al.* 2021; Coimbra *et al.* 2021).

Although many parts of East Africa remain unrivalled in diversity and abundance of wildlife, conservation efforts in the region face several challenges (Ogutu *et al.* 2011a). Kenya's human population has grown exponentially in recent decades, with an estimated population density of 82 people per km², which not only places intense pressure on the land but also increases habitat encroachment and human-wildlife conflict (Kenya National Bureau of Statistics 2019; Mukenka *et al.* 2019). In addition, habitat fragmentation and degradation, illegal hunting, unsustainable land use practices, climate change, and the impacts of tourism market volatility all pose serious threats to the survival of giraffe in Kenya (Muthiani 2001; Mizutani *et al.* 2003; Wanjala 2005; Githiru *et al.* 2007; Fennessy and Brown 2008; Ogutu *et al.* 2011a). Moreover, as the country builds infrastructure to enable transport connectivity and economic development, it often comes at the expense of areas of rich biodiversity, including important wildlife habitat (Nyumba *et al.* 2021; Sang *et al.* 2022). Of Kenya's total giraffe population, approximately 70% is found outside of government-protected areas on communal grazing lands and/or group ranches (Wanjala 2005; Githiru *et al.* 2007; O'Connor *et al.* 2019). For context, most of Kenya's wildlife (65-70%) is found on communal and privately protected land, necessitating the need for people, livestock, and wildlife to co-exist and share the same natural resources (Wanjala 2005; Githiru *et al.* 2007; Ogutu *et al.* 2017; Waweru *et al.* 2021).

Kenya's rainfall follows a bimodal pattern with the 'long rains' occurring in March, April, and May (MAM) and the 'short rains' occurring in October, November, and December (OND, Kenya Meteorological Department 2020). In 2022, the East African region experienced a severe drought caused by a sequence of four consecutive unsuccessful rainfall seasons that started in OND 2020 (Intergovernmental Authority on Development 2022). The drought resulted in wildlife mortalities across the landscape, highlighted by the Wildlife Research and Training Institute (WRTI) which reported on the effect of the drought on wildlife in Kenya's protected areas and the surrounding areas between February and October 2022. The drought mostly impacted grazers, although several giraffe deaths resulted (Mwui *et al.* 2022). Drought can cause a significant loss of animal life, particularly water-dependent species, however, giraffe have evolved ecological adaptations that allow them to sustain themselves without the need to drink (Fennessy 2004; Okello *et al.* 2015).

Masai giraffe

Masai giraffe are the most abundant giraffe species in East Africa (Brown *et al.* 2021; GCF 2023a). However, the proliferation of the species in the southern parts of Kenya is threatened by wholesale changes in land use and tenure, particularly the introduction of crop farming, logging, charcoal burning, and development of urban centres that fragment habitats and disrupt wildlife movements, as well as illegal hunting for bushmeat (own use and small-scale business) (Okello *et al.* 2015; Ogutu *et al.* 2016; Bolger *et al.* 2019).

For instance, in the Masai Mara ecosystem, the decline of Masai giraffe has been attributed to habitat fragmentation and loss of wildlife dispersal areas, illegal hunting, as well as an increase in human settlements and land use changes (Hofer *et al.* 1996; Ottichilo *et al.* 2000; Ogutu *et al.* 2009, 2011a). The presence of livestock and increasing human activities have also negatively influenced the distribution of giraffe populations within the Masai Mara ecosystem (de Leeuw *et al.* 2001). Competition between livestock and wildlife will continue to intensify due to the rising number and the expanding distribution of shoats in the Mara ranches (Ogutu *et al.* 2011a). Additionally, the expansion of pastoral settlements has been shown to depress the birth rate of giraffe (Ogutu *et al.* 2011b). An emerging cultural change within the Masai



community and/or influx of immigrants into Masai land, marked by changes in historical practices e.g., fencing of grazing areas, further exclude wildlife and disrupt their movement (KWS and TAWIRI 2010; Sakimba *et al.* 2016). Moreover, such barriers can lead to fence entanglements (Løvschal *et al.* 2017) and the likelihood of subsequent giraffe fatalities. It is important to document the ongoing changes within giraffe habitat range and analyse impacts to help in policymaking for future giraffe conservation and management.

Land use changes in the Athi-Kapiti Plains ecosystem have been accelerated by its proximity to the capital city of Nairobi and increased demand for residential and urban development areas (Obari 2008). Irrigated farmland rapidly encroaches into the wildlife dispersal areas of the Amboseli ecosystem leading to habitat loss and fragmentation and associated human-wildlife conflicts such as crop raiding by wildlife (KWS and TAWIRI 2010). Charcoal burning poses serious concerns as mature trees, which are key browse forage for giraffe, are targeted, resulting in loss of browse species and habitat degradation (KWS and TAWIRI 2010). To mitigate these threats, increased education and awareness on conserving habitats should be shared in local communities, and where possible, local communities involved in conservation efforts.

Linear infrastructure is also an emerging concern, limiting connectivity for Masai giraffe. In 2017, Kenya completed the construction of the standard gauge railway (SGR) from Nairobi to Mombasa, ~133 km of it bisecting the Tsavo East and West National Parks. Wildlife crossing structures (bridges and culverts) of varying dimensions were constructed to facilitate wildlife movement and mitigate train-wildlife collisions (Koskei *et al.* 2022). In a recent study, Lala *et al.* (2022) documented low propensity in usage of these wildlife crossing structures by the Masai giraffe, probably because of their height and perceive the bridges as obstacles, and the culverts (low heights of 3-4 m) are inaccessible. These two studies underpin the importance of understanding the factors that influence usage of wildlife crossing structures thereby informing the design of the same in the future or probably retrofitting the existing ones.

Giraffe Skin Disease (GSD), an emerging disease of giraffe characterised by grey-scaly lesions on the giraffe's limbs, neck, and shoulders, is another potential threat to giraffe (Muneza *et al.* 2016). GSD in Masai giraffe is more prevalent in Tanzania with few cases in Kenya (Muneza *et al.* 2016). In Kenya, a photographic mark-recapture study in the Masai Mara ecosystem performed by GCF identified a few potential cases of GSD infections in Masai giraffe in Isaaten (4), Siana (8) and Olderkesi (6) conservancies. Severe forms of GSD could potentially lead to increased vulnerability to lion predation of giraffe given that GSD lesions in Masai giraffe manifest on the forelimbs and may influence the movement of affected individuals (Muneza *et al.* 2017a). As such, there is a need to undertake detailed studies, however monitoring GSD to understand any long-term effects of the disease is recommended.

Reticulated giraffe

Reticulated giraffe were intensely hunted by the local population and colonists for their hides (Sidney 1965; East 1999). A review of giraffe history in East Africa reported that reticulated giraffe were killed for food during World War I (Sidney 1965). Large parts of the reticulated giraffe range in the north of the country were virtually unprotected (East 1999). Armed conflicts have plagued northern Kenya for decades, with civil unrest and terrorist activities originating from southern Ethiopia and Somalia further adversely affecting the species' range (Mizutani *et al.* 2003; Fennessy and Brown 2008). After the fall of the Republic of Somalia in the early 1990s, there was a large influx of refugees into northern Kenya, which led to the loss of wildlife habitat, an increase in consumption of bushmeat, and an upsurge of illegal hunting, exacerbated by the widespread availability of firearms in northern Kenya (de Leeuw 2001; Githiru *et al.* 2007). Wildlife hunting was a common subsistence activity in Turkana in the late 1980s (du Leeuw 2001). Still, the issue of illegal hunting for medicinal purposes, meat, and skins continues to be a concern (Muller 2021).



Between 1993 and 1997, East Africa experienced a severe epidemic of rinderpest, which had a significant impact primarily on wild ruminant populations in the region (Kock *et al.* 1999). In general, the estimated counts indicated a substantial decrease in the population of ruminant species, with estimates suggesting a decline of up to 80 percent between 1991 and 1997; the same trend was recorded for giraffe (Kock *et al.* 1999). The last known case of rinderpest in Kenya was in 2001 and was later declared globally eradicated in 2011 (Mariner *et al.* 2012).

In 1998, the Kenya Wildlife Services (KWS) indicated that the bushmeat industry intensified following an earlier rise in the price of domestic meat (du Leeuw 2001). Subsequently, reticulated giraffe populations outside of protected areas were under increasing pressure from illegal hunting, increased settlements/expanding farmlands, and other anthropogenic activities such as charcoal burning, wood cutting, and sand harvesting (Ottichilo *et al.* 2000; Mizutani *et al.* 2003; Dahiye 2005; Githiru *et al.* 2007; Wildlife Direct 2013). Moreover, human settlements in areas such as Laikipia County have blocked wildlife migratory corridors, leading to intense human-wildlife conflict (Litoroh *et al.* 2010; Kinnaird *et al.* 2012).

The Lamu Port-South Sudan-Ethiopia-Transport (LAPSSET) corridor in northern Kenya is one of the over 53,000 km development corridors proposed in sub-Saharan Africa, bisecting areas with a high abundance of wildlife (Bastille-Rousseau *et al.* 2018). A recent study by Omenge *et al.* (2022) alluded to the failure to implement wildlife corridors along the development corridor that were supposed to be put in place as safeguards to wildlife movement. The implementation of such corridors would mitigate the adverse effects on wildlife and preserve a certain level of animal connectivity.

Military exercises in northern Kenya conducted by the Kenya Defence Forces and the British Army Training Unit Kenya (BATUK) have also impacted the reticulated giraffe population. These exercises, centred on defence industry collaboration, training support, and student exchange, take place in training areas located in Laikipia and Samburu County (Departmental Committee on Defence Intelligence and Foreign Relations 2023). Unfortunately, giraffe and other mega-fauna in these areas are displaced as the training areas are prepared for the exercises (Awuor 2012).

Nubian giraffe

Nubian giraffe have largely diminished and been pushed out of their natural range by illegal hunting, agricultural development, human encroachment, and habitat destruction and fragmentation (Sidney 1965; Brenneman *et al.* 2009; Muller 2018). This resulted in the local extirpation of almost all known wild natural populations of Nubian giraffe in Kenya (Fennessy & Brenneman 2010; Muller 2011; GCF 2019). Countrywide extra-limital translocations of Nubian giraffe occurred in the 1960s and 1970s. Most of these introductions were into private fenced wildlife areas (Brenneman *et al.* 2009). Introduction into confined areas has resulted in habitat-specific threats common for small, isolated populations which could result in further population decline (Brenneman *et al.* 2009).

Specifically, in Lake Nakuru National Park (NP), there were possible dietary complications reported in some of the young Nubian giraffe resulting in overconsumption and declining numbers of preferred *Acacia/Vachellia* trees, which resulted in highly concentrated tannin levels occurring in the remaining forage (Brenneman *et al.* 2009). This likely compromised the giraffe's nutrition, causing them to be weakened and easier prey for the park's lion population (Brenneman *et al.* 2009). To compound this, there have been recent rising water levels in Rift Valley's lakes (Government of Kenya and United Nations Development Program 2021), and the giraffe habitat in Lake Nakuru NP is decreasing (Osio *et al.* 2020).

Disease outbreaks in Nubian giraffe have resulted in some declining populations over the past few decades. In 2011 in Mwea National Reserve (NR), an anthrax outbreak resulted in the loss of at least 11 giraffe (Kaitho *et al.* 2013). Additionally, although poorly documented in wildlife, suspected cases of congenital deformities



and cranial neoplasia have been opportunistically observed in the Nubian giraffe (Ferguson *et al.* 2023). This highlights the need to record wildlife abnormalities as these could be potential indicators of an ecosystem's health (Ferguson *et al.* 2023).

The Nubian giraffe has been documented to falling victim to the indiscriminate nature of snares set up targeting small mammals, resulting in fatalities as well as the morbidity and possible mobility impairments linked to injuries sustained from such traps (Bernstein-Kurtycz *et al.* 2023). Poor design of development infrastructure also plays a role in giraffe mortality. The loss of Nubian giraffe in Soysambu Conservancy by electrocution from low-hanging power lines is an exemplar case (Kavutha *et al.* 2023), with the most recent one being the loss of three giraffe in 2021. Additionally, like the Masai giraffe, the Nubian giraffe has been negatively affected by the rising water levels in Lake Nakuru NP and Lake Baringo.

Genetic inbreeding and/or reduced genetic diversity is a concern for the Nubian giraffe population although this has not been recorded in any of the giraffe populations. However, monitoring and research efforts should be undertaken, especially to assess if such an issue manifests in giraffe as reported for other species.

Estimate population abundance and trends

Historic

Masai giraffe

Giraffe formerly occurred widely throughout Kenya, with Masai giraffe occurring mainly along the border of Tanzania, formerly known as Tanganyika (Dagg 1962). In 1958, there were an estimated 750 Masai giraffe on the Mara Plains and in the surrounding hills (Darling 1960). In the late 1970s, they numbered more than 6,500 in the Masai Mara ecosystem (including the Masai Mara NR and adjoining group ranches) (Ottichilo *et al.* 2000). However, by 1994, there were only an estimated 340 giraffe in the Masai Mara NR and 1,370 individuals on the adjoining ranches (East, 1999). Giraffe numbers in the Masai Mara ecosystem declined by 79% in the 20 years between 1977 and 1997 (Ottichilo *et al.* 2000). Two total ground counts of the Masai Mara ecosystem were conducted in 1999 and 2002, with the former including the central portion of the reserve, the western part of Koyiaki Group Ranch, the western part of Lemek Group Ranch and the south-western half of Ol Chorro Oirowua (Reid *et al.* 2003). A total of 583 giraffe were recorded for the entire study area, including 384 on the group ranches, and 199 in the reserve (Reid *et al.* 2003). The 2002 survey was expanded to include the Mara Triangle, the entire Koyiaki Group Ranch, the western corner of Siana Group Ranch, the south-western of Ol Kinyei Group Ranch, and the entire reserve except for the densely vegetated south-eastern corner (Reid *et al.* 2003). A total of 880 giraffe were recorded for the entire study area, including 566 on the group ranches and 314 in the reserve (Reid *et al.* 2003). When only comparing the overlapping area for the 1999 and 2002 counts, a slight increase – possibly from local migration – from 583 to 621 giraffe was observed between the years (Reid *et al.* 2003). However, by 2003 the giraffe numbers dropped by more than 50% in the greater Masai Mara ecosystem, attributed to the reduced rainfall and rising temperature resulting in inadequate forage (Ogutu *et al.* 2008). Giraffe remained more abundant on the adjoining pastoral ranches than inside the Masai Mara National Reserve (Reid *et al.* 2003; Ogutu *et al.* 2011a).

Game census estimates of Masai giraffe in the Nairobi NP between 1960-1963 ranged from 66 to 124, with a mean of 83 (Foster 1966). During a three-year study of giraffe in the park (1965 to 1968), 250 individuals were individually identified (Foster and Dagg 1972). The southern boundary of Nairobi NP is unfenced and open to the Kitengela Conservation Area and the Athi-Kapiti Plains. Although a total of 250 individual giraffe were documented, approximately 70 to 125 were observed at any given moment (Foster and Dagg 1972). In 1994, an estimated 100 giraffe were present in the park (Foster and Dagg 1972; East 1999).

Road strip and aerial sample counts estimated 750 Masai giraffe in the Tsavo East NP in the early 1970s (Leuthold and Leuthold 1978). Aerial surveys and field observation data between 1991 and 1994, covering



an extensive area between Shimba Hills NR and the surrounding coastal rangelands, estimated 1,930 giraffe (East 1999).

Combined, the Masai giraffe population in Kenya was estimated at ~32,000 countrywide in 1977 (Bolger *et al.* 2018). The population declined to 31,611 between 1977 and 1980 (Bolger *et al.* 2018). In 1999, Masai giraffe still occurred widely in protected areas and unprotected rangelands in southern and eastern Kenya, with an estimated total population of 17,330 individuals (East 1999). Of these, an estimated 2,530 giraffe occurred in protected and 14,800 outside of protected areas (East 1999).

Reticulated giraffe

Reticulated giraffe occurred across the north and east of Kenya, including the arid parts of the northern regions (Dagg 1962). Laikipia County comprises private wildlife conservancies, commercial cattle ranches, and traditional pastoralist communities, and forms part of the Greater Ewaso ecosystem (Kinnaird *et al.* 2012). Aerial surveys of the Ewaso Nyiro Basin in Laikipia County estimated 6,398 reticulated giraffe in 1977 (Muchoki 2000). In 1990, this giraffe population declined to an estimated 5,410 individuals and further down to 2,118 individuals in 1994 (Muchoki 2000; Shorrocks and Croft 2009). However, in 1997, the population was reported to have increased to 2,903 individuals (Muchoki 2000). Over 20 years, between 1977 and 1997, the population declined by more than 50% (Muchoki 2000; Shorrocks and Croft 2009). The giraffe population in Laikipia County was estimated at 1,856 individuals in 1998 and 1,498 in 1999 (Georgiadis 2007b). Approximately 1,543 reticulated giraffe occurred in Laikipia County in 2000 and dropped to an estimated 1,433 in 2001 (Georgiadis *et al.* 2007b; Kinnaird *et al.* 2012).

In 1991, some 30 reticulated giraffe found a refuge along the Tana River, close to the town of Garissa in Garissa County (Githiru *et al.* 2007). The Garissa Community Giraffe Sanctuary (also known as Bour Algi Giraffe Sanctuary) was established in 1999 to protect reticulated giraffe in the area (Dahiye 2005). The Garissa Community Giraffe Sanctuary has improved security for reticulated giraffe in Garissa County in northeastern Kenya. Since its establishment in 1999, more giraffe have immigrated into the sanctuary from other parts of the county where illegal hunting was rampant (Githiru *et al.* 2007; Hussein 2009). By 2003, the giraffe population had increased to over 300 individuals (Dahiye 2005; Wildlife Direct 2013).

In 1995, more than 300 reticulated giraffe were estimated to occur in Marsabit NP in Marsabit County in northern Kenya (East 1999). At the same time, Meru NP, together with the adjacent Kora NP and Rahole and Bisanadi NRs, were home to an estimated 200 reticulated giraffe (East 1999).

In 2001, a wildlife survey of the Greater Ewaso ecosystem in northern Kenya estimated the reticulated giraffe population at 966 individuals (Kinnaird *et al.* 2010). The Greater Ewaso ecosystem is bounded by the Rift Valley in the west, Mount Kenya, and the Aberdare Highlands in the south, and comprises Laikipia County, a large part of Samburu County, and a small portion of Isiolo County. However, for this count, the Laikipia County and the Lewa and Lorogi areas were excluded (Kinnaird *et al.* 2010).

Several total counts of wildlife in the privately owned Lewa Wildlife Sanctuary (also known as Lewa Downs) in northern Kenya have been conducted since the 1970s. In 1977, 190 reticulated giraffe were counted, while annual counts conducted between 1990 and 1999 showed the population fluctuating between 186 and 588 individuals, although an overall decline was noted (Fig 2).

By the late 1990s, reticulated giraffe still occurred widely in northern Kenya, north of the Tana River and east of the Rift Valley (East 1999). Most of the reticulated giraffe population occurred on unprotected rangeland, particularly in the Wajir, Garissa, and Marsabit Counties, with relatively small numbers occurring in protected areas (East 1999). More than 575 reticulated giraffe occurred in protected areas, while an estimated 26,970 individuals occurred outside of protected areas, equating to a total estimate of 27,540 reticulated giraffe in the country (East 1999).



In summary, in 1977, the countrywide reticulated giraffe population was estimated at approximately 40,910 (Ogutu *et al.* 2016). The population was reported to have declined to 26,206 in 1990 and a slight increase to 28,115 in 2000 (Ogutu *et al.* 2016; Muneza *et al.* 2018). The population decrease is likely a result of illegal hunting and habitat loss during this period (Ogutu *et al.* 2016).

Nubian giraffe

Nubian giraffe are one of the most imperilled extant giraffe subspecies (Fennessy and Brenneman 2010). Nubian giraffe inhabited the region from the Rift Valley of west-central Kenya across Uganda to the Nile River and (possibly) northward into southern Sudan (Dagg and Foster 1976; Lydekker 1903). Their numbers declined so drastically that only a few hundred individuals remained by the 1960s (Fennessy and Brenneman 2010). The subspecies was effectively saved from local extirpation in Kenya by several conservation translocation efforts implemented in the 1970s, which resulted in the establishment of new extralimital populations in enclosed, protected areas (Fennessy and Brenneman 2010). In Kenya between the mid-1970s and 1990s, the subspecies was introduced into Lake Nakuru NP (n=17), Ruma NP (n=27), Yodder Farm (n=6), Soysambu Conservancy (n=2), and Giraffe Centre (n=2) (Giraffe Centre and KWS pers. comm. 2019; Fennessy and Brenneman, 2010). More recently, the subspecies was re-introduced into Mount Elgon (n=21), Kitale Farm, Nasalot NR, Sergoit Kruger Farm (n=10) and Ruko Conservancy (n=8).

In the late 1980s, 17 Nubian giraffe were translocated from Soi Ranch to Lake Nakuru NP (Awange *et al.* 2004). In 1994, the estimated (extralimital) Nubian giraffe population in Lake Nakuru NP was 153 individuals (Brenneman *et al.* 2009). It subsequently declined to 62 individuals in 2002 – a failure in the recruitment of offspring into the gene pool (Brenneman *et al.* 2009). This decline could have been caused by drought due to the 1994 El Nino leading to low forage browse (Brenneman *et al.* 2009). Diet complications due to over browsing resulting in high concentrations of tannin levels could have also contributed to giraffe decline.

In the 1980s, six giraffe were translocated to Yodder Farm in Embu County from Soi Ranch (KWS pers. comm. 2019). By the mid-1990s, the population of Yodder Farm had bred over and grown to 24 individuals (Giraffe Centre and KWS pers. comm 2019.). In 1983, 27 Nubian giraffe were translocated from Soi Ranch in Kenya's Rift Valley to Ruma NP (Awange *et al.* 2004). The population increased to approximately 40 individuals in 1994 (East, 1999) and was estimated to number 69 individuals by 1999 (Awange *et al.* 2004). Three giraffe were translocated from Lake Nakuru NP to Kidepo Valley NP in 1997 to facilitate the recovery of the giraffe population (East 1999).

In summary, the countrywide Nubian giraffe population in Kenya was estimated at 130 in the 1970s and only found in Soi Ranch (Fennessy and Brenneman 2010). Due to land fragmentation and the conversion of giraffe habitat to human settlements, giraffe from Soi Ranch were translocated successfully to different habitats across the country. By early 2000, the Nubian giraffe population had increased to approximately 450 individuals.

Current

Masai giraffe

The population of Masai giraffe in the Masai Mara Ecosystem in 2007 was estimated to be 961, increasing to 1,619 by 2010 and then to 2,607 individuals by 2017 (see Fig 1; KWS 2018). During the 2017 KWS census, most of the giraffe populations were found in the community conservancies and dispersal areas: 1,682 (64.5%) and 490 (18.8%) respectively (Kenya Wildlife Service 2017). Masai Mara NR and Mara Triangle had the smallest population 292 (11.2%) and 143 (5.4%), respectively (Kenya Wildlife Service 2017). A recent GCF photographic mark-recapture survey conducted in the Masai Mara ecosystem between 2018 and 2021 estimated a minimum of 3,290 individuals (GCF 2023b). These findings further support previous studies



showing there are more giraffe in the conservancies compared to Masai Mara NR and Mara Triangle, and overall increasing in number since the 2017 survey by 26%.

Annual counts of Masai giraffe in Nairobi NP conducted between 2000 and 2008 showed population fluctuations between 58 and 104 individuals (Obari 2008). These oscillatory changes in giraffe numbers were likely a result of both immigration and emigration between Nairobi NP and the communal ranches south in the Athi-Kapiti Plains (Obari 2008). This is consistent with the giraffe population trends previously in the park and suggests they have remained stable. A survey of Nairobi NP in 2012 estimated the population at 80 individuals (FONNAP 2013). While little data on giraffe numbers across this ecosystem is limited, some 300 giraffe reportedly occur in the Machakos Ranches (KWS 2018). In 2018, it was estimated that there are 112 giraffe in the park, 303 giraffe in Athi-Kapiti and Machakos ranches, and 47 giraffe in Maanzoni-Malinda and Mwalimu Ranches (KWS 2018). In 2020, an aerial survey conducted in the Machakos Ranches and Athi-Kapiti Plain in Machakos and Kajiado counties observed 317 giraffe (Mukeka *et al.* 2021). Similarly, the 2021 KWS aerial survey estimated the number of giraffe at 535 individuals (Waweru *et al.* 2021).

Cross-border aerial total counts of the Amboseli NP and Namanga-Magadi areas (including five surrounding group ranches: Kimana/Tikondo, Olgulului/Olararashi, Selengei, Mbirikani, and Kuku) in southern Kenya, and West Kilimanjaro and Natron landscape in northern Tanzania, were conducted in 2010 (KWS and TAWIRI 2010). An estimated 4,164 Masai giraffe were observed in the entire area, of which 3,063 were in Kenya (KWS and TAWIRI 2010). It is important to note wildlife does move within the entire area and across the border into

Tanzania depending on seasonality and forage availability (KWS and TAWIRI 2010). A previous total aerial count of large mammals of the Amboseli ecosystem conducted in 2007 reported the occurrence of 1,458 Masai giraffe (Ngoru and Mwangi 2007; KWS and TAWIRI 2010). In comparison to this, 1,991 were counted in the same area during 2010 (KWS and TAWIRI 2010). In 2013, KWS counted 1,577 giraffe in the Namanga-Magadi ecosystems and 3,470 in the Amboseli ecosystem (KWS 2018). In 2018, an aerial survey study reported that the population of giraffe in Amboseli had increased to 3,784, while in the Namanga-Magadi ecosystem, the population had declined to 1,329 (Muteti *et al.* 2018). Both Amboseli and Namanga-Magadi were surveyed in 2021, as one census block, reporting 6,425 giraffe (Waweru *et al.* 2021).

Total aerial counts of the Tsavo-Mkomazi ecosystem, comprising Kenya's Tsavo East, Tsavo West and Chyulu Hills NPs and surrounding private ranches, as well as the Mkomazi NP in Tanzania, were conducted in 2005 with a total of 1,584 Masai giraffe counted, of which 1,522 occurred in Kenya (Omondi and Bitok 2005). Of these, 542 were counted in Tsavo East NP, 568 in Tsavo West NP, 153 in Galana, 148 in Taita, and 111 in other blocks (Omondi and Bitok 2005). In 2008, total aerial counts of the same area were conducted and counted a total of 2,450 Masai giraffe, of which 2,379 occurred in Kenya (Omondi *et al.* 2008). Of these, 681 were counted in Tsavo East NP, 678 in Tsavo West NP, 534 in Chyulu Hills NP, 95 in Galana, 193 in Taita, and 150 in other blocks (Omondi *et al.* 2008). In 2011, total aerial counts in the Tsavo-Mkomazi ecosystem were conducted (Ngene *et al.* 2011). An estimated 2,055 Masai giraffe were counted, of which 1,935 occurred in Kenya (Ngene *et al.* 2011). Of these, 392 giraffe were counted in Tsavo East NP, 691 in Tsavo West NP, 292 in Chyulu Hills NP, six in South Kitui NR, 93 in Galana, 282 in Taita, and 179 in other blocks (Ngene *et al.* 2011). Comparatively, the larger ecosystem's giraffe population increased by 55% from an estimated 1,148 animals in 1999 to 2,055 in 2011 (Ngene *et al.* 2011). An aerial survey in 2017 by KWS estimated there are 4,323 individuals in Tsavo-Mkomazi ecosystem, of which 4,068 occurred in Kenya – a significant increase from 2,891 in 2014 (KWS 2018). From the survey, 889 giraffe were found in Tsavo East NP, 1,389 in Tsavo West NP, 48 in Chyulu NP, four in South Kitui NP, 84 in Galana, 510 in Taita, 321 in Rombo, and 321 in other blocks (Ngene *et al.* 2017). The most recent survey conducted by KWS estimated the population in the Tsavo ecosystem at 4,314 giraffe (Waweru *et al.* 2021).



An estimated 620 Masai giraffe resided across Nakuru County in 2013 (KWS 2018). Of these, an estimated 40 individuals occur in the Nakuru Wildlife Conservancy, 225 in the Oserian Wildlife Conservancy, and 61 in Hell’s Gate NP, and the remaining 294 mostly on surrounding private ranches (KWS 2018). In 2017, the population of in Nakuru-Naivasha ecosystem was 529, a slight decline from the previous estimates in 2013 (KWS 2018). 2022 photographic capture-mark-recapture surveys in the ecosystem by GCF documented 447 individuals (KWS 2023).

The current population estimate for Masai giraffe is 15,158, much of which occurred in the Amboseli (n=6,425) and Tsavo (n=4,314) ecosystems (KWS 2023). In comparison to the population estimates in 1978-80 (n=31,331) (Bolger *et al.* 2019), this represents a 52% decrease, despite the recent intercensal increase in population estimates.

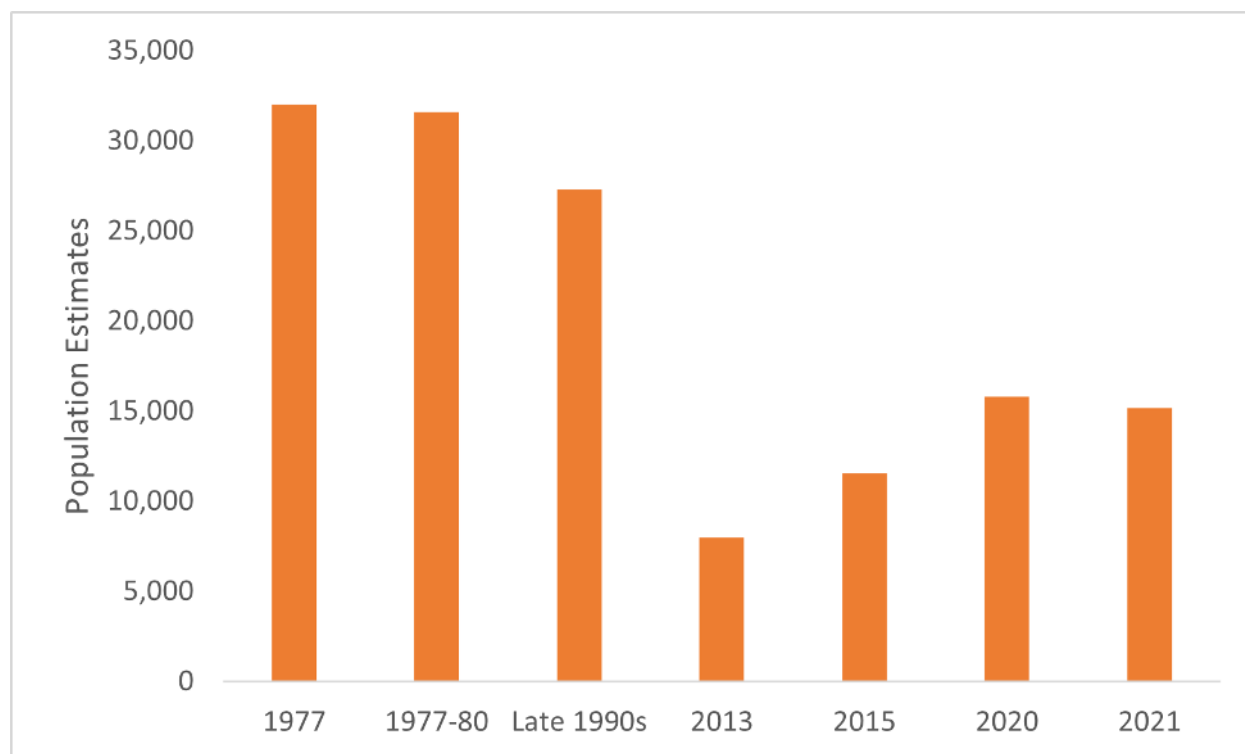


Fig 1. Estimated population numbers for Masai giraffe between 1977-2021 in Kenya.

Reticulated giraffe

In 2002, an estimated 1,720 reticulated giraffe occurred in Laikipia County, marginally decreasing to 1,597 individuals in 2003 (Georgiadis *et al.* 2007b). In 2008, aerial counts estimated Laikipia’s reticulated giraffe population at 1,931 individuals (Kinnaird and Ojwang’ 2008), and at 1,432 in 2010 (Kinnaird *et al.* 2010). At the same time, a total of 2,366 individuals were estimated for the Greater Ewaso ecosystem – although three times smaller in area, Laikipia holds a larger population of giraffe than the rest of the Ewaso ecosystem (Kinnaird *et al.* 2010). The 2012 aerial count of Laikipia County estimated 1,105 individuals, a population decline of 36% from the 2001 count (Kinnaird *et al.* 2012).

In 2011, aerial total counts of Ijara and parts of Fafi, Lamu, and Garissa Counties in Kenya’s Northeastern Province, estimated 1,666 reticulated giraffe in the area (King *et al.* 2011). Of these, an estimated 400 resided in the Garissa Community Giraffe Sanctuary (Hussein 2009; Wildlife Direct 2013). In 2015, the number increased to 1,974 in Lamu, and 2016 to 4,356 individuals in Garissa (KWS 2018). Anecdotal information suggests that there are more than 500 reticulated giraffe in Wajir County, with less than 400 in Mandera County in 2013 (KWS 2018). The 2021 aerial survey revealed that the most reticulated giraffe were found in Wajir (n=6,120), Garissa (n=4,830) and Lamu counties (n=3,919); Mandera recorded 91 individuals (Waweru *et al.* 2021).



In 2002, 150 reticulated giraffe occurred in the Sweetwaters Game Reserve near Mount Kenya (Birkett 2002). The Sweetwaters Game Reserve was later extended to create the OI Pejeta Conservancy and aerial surveys of the conservancy between 2005 and 2011 estimated a range of 132 to 178 giraffe, increasing to 277 in 2017 (OI Pejeta Conservancy pers. comm. 2019). Annual total counts of wildlife species in the Lewa Wildlife Conservancy conducted in 2013 estimated the reticulated population at 204 individuals (OI Pejeta Conservancy 2011).

Aerial total counts of wildlife in the southeastern part of Samburu County were conducted in 2005 and comprised Samburu, Shaba, and Buffalo Springs NRs among other communal areas (Ihwagi and Douglas-Hamilton 2005). A total of 317 reticulated giraffe were recorded, 33 occurred in Shaba NR, 40 in Samburu NR, 44 in Buffalo Springs NR, and 108 in the Namunyak Community Wildlife Conservancy. The remainder were scattered throughout Kalama, Sera, Westgate, Kipsing, and Lekuruki community wildlife conservancies and surrounding areas (Ihwagi and Douglas-Hamilton 2005). Subsequently, total aerial counts of the Samburu-Laikipia ecosystem and parts of the Marsabit County were conducted in 2008 (Litoroh *et al.* 2010). The census area comprised the Isiolo, Laikipia, Imenti, Meru North and Samburu Counties, Samburu, Shaba, and Buffalo Springs NRs, several community conservation areas (Namunyak, Kalama, Meibae, and Il Ngwesi), government-owned trust land, forest reserves, private ranches and sanctuaries, and agricultural settlements (Litoroh *et al.* 2010). A total of 2,557 reticulated giraffe were estimated (Litoroh *et al.* 2010). The Laikipia-Isiolo-Samburu-Meru census block during the 2021 aerial census recorded an estimated 4,691 giraffe (KWS 2023).

In 2011, approximately 5,528 reticulated giraffe were estimated in Kenya, increasing to 6,500 by 2013, and 8,561 in 2015 (KWS 2018; Muneza *et al.* 2018). The population has since been estimated at approximately 15,807 giraffe (KWS 2018). The population increase in recent years is attributed to better surveys and monitoring, and previous lack of reporting and undercounts. The increased awareness, education, and communication about reticulated giraffe amongst key stakeholders in their range has contributed to increased tolerance and conservation support.

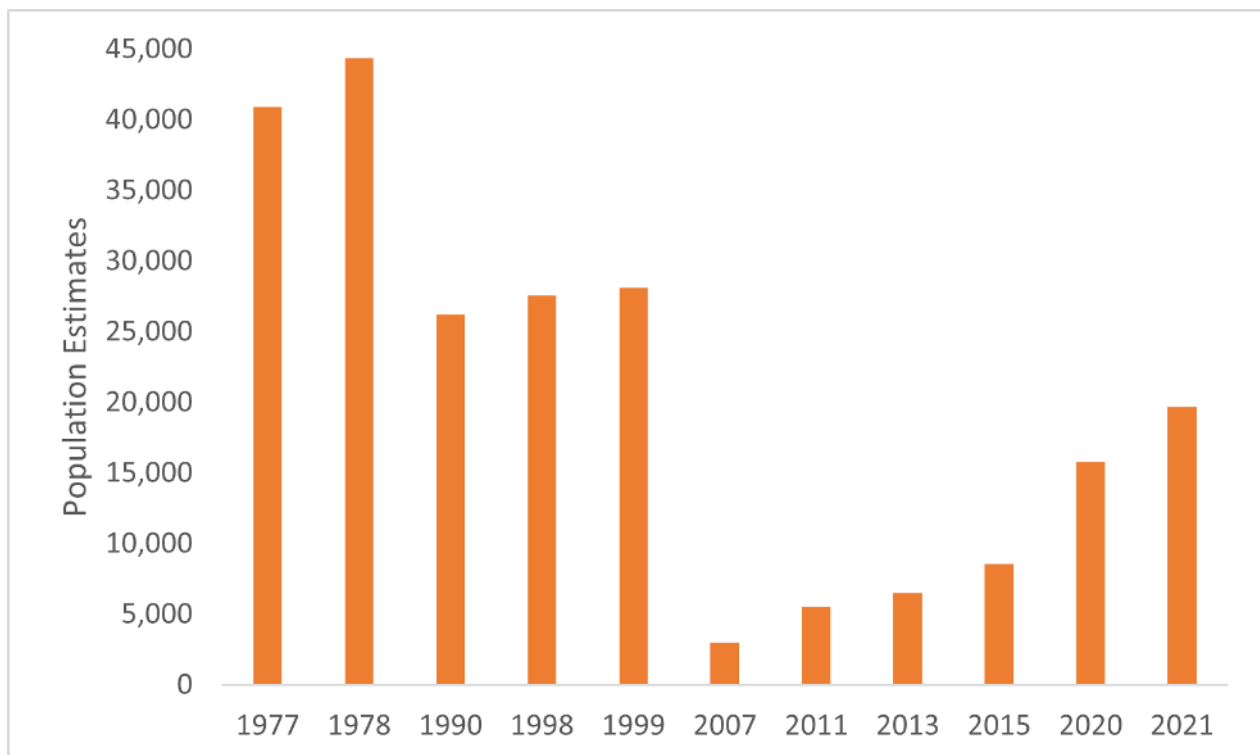


Fig 2. Estimated population numbers for reticulated giraffe between 1977-2021 in Kenya.



The latest estimated total population of the reticulated giraffe is ~19,659, with the majority observed in Wajir, Garissa, and Lamu Counties (KWS 2023). Despite the recent increase, the reticulated giraffe population has overall declined by 56% from an estimated 44,345 in 1978. The general population decrease over the years has been attributed to habitat loss (due to changes in land use in the giraffe range) and quality of the habitat deteriorating, and illegal killing (Muneza *et al.* 2018). The current range of reticulated giraffe extends from central Kenya northwards into Ethiopia and Somalia (O'Connor *et al.* 2019; Brown *et al.* 2021).

Nubian giraffe

In Ruma NP, 75 Nubian giraffe were estimated in 2002, increasing to 130 individuals in 2011 (Awange *et al.* 2004; Muller 2011). A KWS road count estimated approximately 176 individuals in 2016 (Muneza and Muruana, 2017), and in 2018 275 individuals were identified from a photographic mark-recapture survey conducted by GCF partnering with African Fund for Endangered Wildlife (AFEW) (Muneza *et al.* 2017b).

As Yodder Farm could not sustain the rapidly growing giraffe population due to its small size and a growing human-wildlife conflict with the adjacent community, 18 giraffe were translocated to Mwea NR over two periods, 2000 and 2004 (KWS pers. comm. 2019). At the time of the latter translocation, six giraffe remained on the farm (Giraffe Centre and KWS pers. comm. 2019).

Originally estimated at 44 individuals in Mwea NR, an anthrax outbreak in 2011 led to the deaths of 11 Nubian giraffe, prompting the rapid incineration of all carcasses and vaccination of 20 out of the remaining 33 giraffe against anthrax and black quarter to prevent further losses and ensure sufficient herd immunity (Kaitho *et al.* 2013). In 2014 the population was estimated at 34 individuals, increasing to an estimated 51 individuals in 2017 following a photographic mark-recapture survey of the GCF and AFEW (Muneza *et al.* 2017b). The population has since grown to 79 individuals as of 2021 (KWS 2023).

In 2020, a targeted photographic mark-recapture survey conducted by GCF in Lake Nakuru NP counted 109 individuals (KWS 2023). In a 2009 survey, Soysambu Wildlife Conservancy counted 63 Nubian giraffe (Soysambu Conservancy 2009), increasing to an estimated 70 individuals in 2010 (Soysambu Conservancy 2010). In 2012, the population increased to an estimated 80 individuals (Soysambu Conservancy 2012), and by 2015 an estimated 109 individuals (Fennessy *et al.* 2016). There is an estimated 162 individuals as of 2022 (KWS 2023).

In Ruko Community Conservancy, Baringo County, eight Nubian giraffe were re-introduced in 2011 after an absence of over 40 years ago. These giraffe were translocated from Soysambu Conservancy, the latest survey conducted in 2022 estimates the population at 14 individuals (Soysambu Conservancy 2011; KWS 2023).

In 2011, an estimated 32 Nubian giraffe resided in the Kigio Wildlife Conservancy, and less than 20 giraffe each on Giraffe Manor, Mt Elgon NP, Murgor Farm, and Sergoit-Kruger Farm (Muller, 2011). Additionally, less than ten giraffe were estimated each on Kitale Area Farm and Nasalot NR (Muller, 2011). From the most recent surveys conducted, Kigio Wildlife Conservancy is estimated to host 46 Nubian giraffe, while the Giraffe Centre in Nairobi is reported to have 11 individuals (KWS 2023). However, there have been no giraffe sightings in Mt. Elgon NP suggesting the likelihood of local extinction within the area (KWS 2023). In October 2020, two Nubian giraffe were translocated to Tindress Farm (in Nakuru County) from Soysambu Wildlife Conservancy (Soysambu pers. comm. 2020), the 2022 counts by GCF estimated the population at 12 (KWS 2023). Individuals counted in Bora Bora Wildlife Park were five (KWS 2018) while those in Sergoit-Kruger Farm stood at 12 (KWS 2023). A further five giraffe were translocated to Rimoi NR from the Giraffe Centre, three in 2021 and two in 2022 (E. Ngumbi pers. comm. 2022), a recent count estimated population at 20 (KWS 2023). The population estimates in Haller Park were eight, and ten for Nasalot NR (KWS 2023).



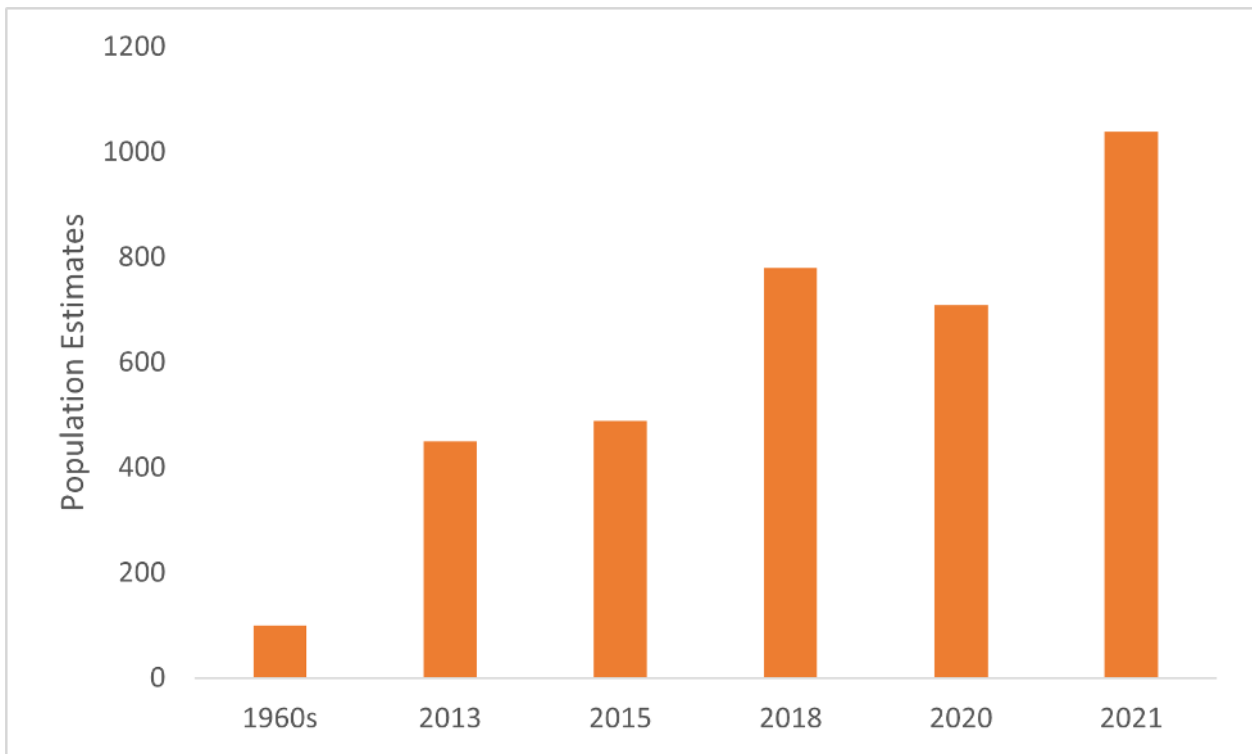


Fig 3. Estimated population numbers for Nubian giraffe between 1960-2021 in Kenya.

The current total Nubian giraffe population in Kenya is estimated at 1,039 individuals (KWS 2023). Compared to the population in the 1970s (n~130), this represents a 699% increase. Ruma NP accounted for more than half – 53% (n=550) – of the Nubian giraffe in Kenya. The increase is a result of improved conservation management efforts including translocations and high security of populations in enclosed areas. Additionally, targeted photographic mark-recapture surveys have resulted in better estimation of population numbers.

In summary, the total Kenyan giraffe population estimate is 35,856: Masai giraffe (n=15,158), Reticulated giraffe (n=19,659) and Nubian giraffe (n=1039). This accounts for approximately 30% of all giraffe in Africa. Despite an overall decline in giraffe numbers in Kenya from ~45,000 individuals in 1998, the recent upward trends show some positive signs for the successful steps taken in giraffe conservation across the country.

Future Conservation Management

Kenya National Recovery and Action Plan for Giraffe (2018-2022)

In November 2018, KWS launched the National Recovery and Action Plan for Giraffe in Kenya 2018-2022. This was the first ever giraffe action plan in the country. The objective of the giraffe recovery plan was to ensure a sustainable future for all three giraffe species in Kenya. One of the objectives of the plan was to hold giraffe range committee meetings to share and develop giraffe conservation initiatives. The first Nubian giraffe range committee meeting was held in May 2017, and the first Masai giraffe range committee meeting the first reticulated giraffe range committee meeting were held in February 2018 and in January 2019 respectively. The latter meeting included drafting a specific action plan. Subsequently, the second Masai and Nubian giraffe range committee meetings were conducted in 2019 where specific species action plans were drafted with stakeholders. The range committee meetings successfully brought stakeholders together to evaluate conservation threats, determine priority action plans, and identify future research studies for giraffe in Kenya.



Kenya National Recovery and Action Plan for Giraffe (2023-2027)

In January 2023, a national workshop was convened with the primary objective of incorporating the progress made since the launch of the first edition into the National Recovery and Action Plan for Giraffe in Kenya (2023-2027). The workshop aimed to address challenges encountered during the implementation of the first plan as well as to shed light on both persistent and emerging threats that giraffe continue to face in the country. Subsequently, the Recovery and Action Plan (2023-2027) was developed to consolidate efforts and continue the progress made. The second Plan lists the following six strategic objectives:

1. Enhance protection of giraffe to mitigate current and emerging threats.
2. Secure and improve giraffe habitats to ensure long-term survival of populations.
3. Ensure effective management of enclosed populations to secure their long-term conservation.
4. Ensure coordinated research and monitoring of giraffe populations.
5. Enhance community and stakeholder involvement in giraffe conservation to facilitate information exchange, education, and public awareness.
6. Ensure infrastructural developments in giraffe ranges are friendly and compatible with their conservation.

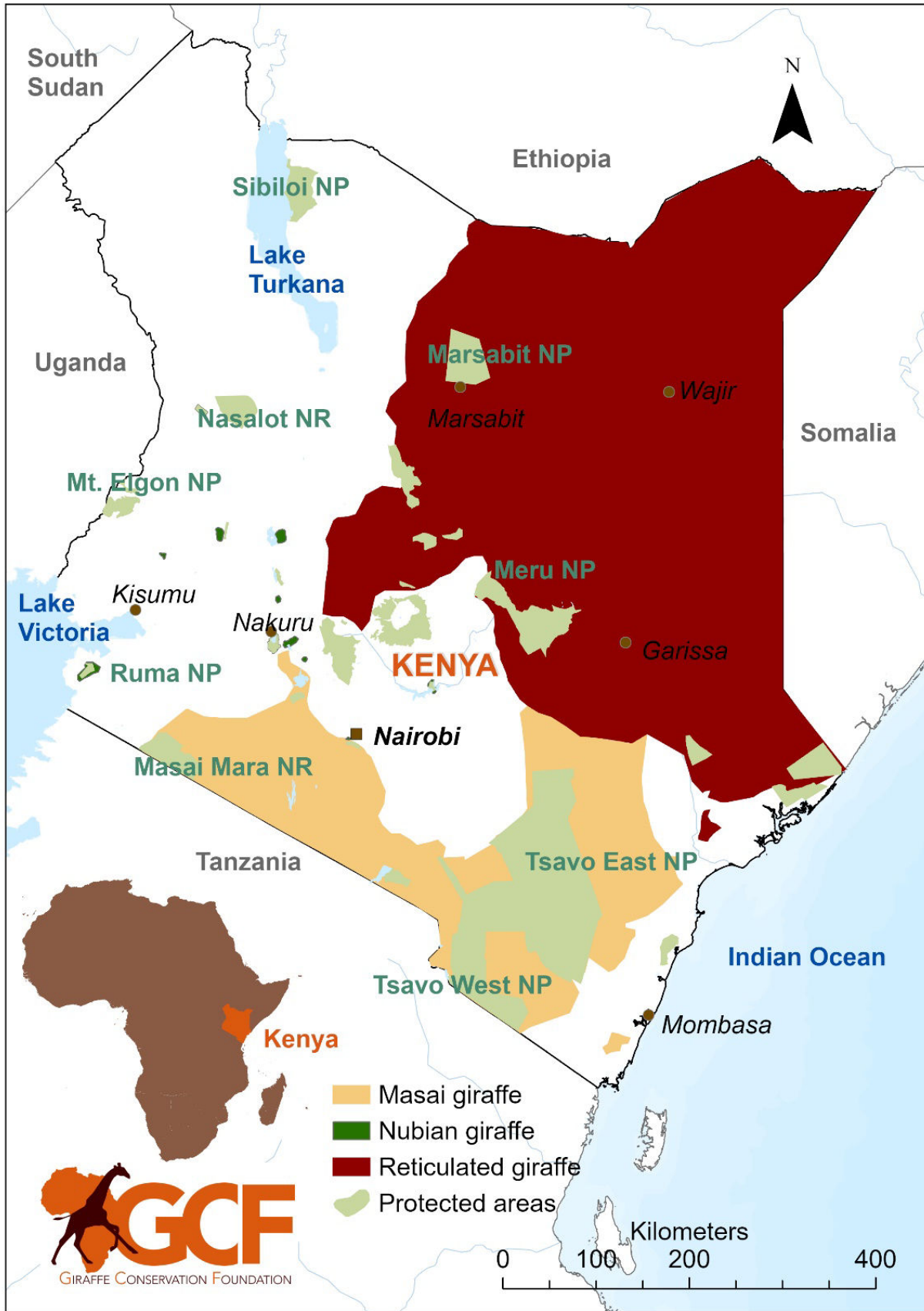
A monitoring and evaluation framework for the national-level actions has also been introduced into the second edition of the plan to facilitate tracking progress and assessment of implementation. Review of this would be valuable to feedback into implementation of the plan, and subsequent mid-term and end-of-plan reviews. Further, the three Range Committees established in the first plan will be meeting every two years to review its implementation progress and promote data sharing.

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Map



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