

Country Profile

Republic of Kenya

Giraffe Conservation Status Report

March 2021



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one species (*Giraffa camelopardalis*) and nine subspecies of giraffe (Muller *et al.* 2018) historically based on outdated assessments of their morphological features and geographic ranges.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 subspecies are thus divided: 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 as *Critically Endangered*. While this update further confirms the real threat to one of Africa's most charismatic megafauna, it also highlights a rather confusing aspect of giraffe conservation: how many species/subspecies of giraffe are there?

The Giraffe Conservation Foundation (GCF) together with their partner Senckenberg Biodiversity and Climate Research Centre (BiK-F) have performed the first-ever comprehensive DNA sampling and analysis (genomic, nuclear and mitochondrial) of major natural populations of giraffe throughout their range in Africa. As a result, an update of the traditional taxonomy now exists. This study revealed that there are four species of giraffe and likely six subspecies (Fennessy *et al.* 2016; Winter *et al.* 2018). The four species are Masai giraffe (*G. tippelskirchi*), northern giraffe (*G. camelopardalis*), reticulated giraffe (*G. reticulata*) and southern giraffe (*G. giraffa*). The northern giraffe has three subspecies: Nubian giraffe (*G. c. camelopardalis*), Kordofan giraffe (*G. c. antiquorum*), and West African giraffe (*G. c. peralta*). The southern giraffe has two subspecies: Angolan giraffe (*G. g. angolensis*) and South African giraffe (*G. g. giraffa*). Two of the former subspecies have been subsumed within other taxa as data support that they are genetically identical: the Rothschild's giraffe is synonymous with the Nubian giraffe and as such, in all GCF publications, we use Nubian giraffe to refer to Rothschild's giraffe populations as well. The Luangwa (or Thornicroft's) giraffe are genetically similar to Masai giraffe though additional research is needed to determine whether to completely subsume populations or consider them subspecies of Masai giraffe (Fennessy *et al.* 2016; Winter *et al.* 2018). Based on this research, GCF refers to the updated giraffe taxonomy of four species in all publications, while a taxonomy review by the IUCN is ongoing.

The following species and subspecies of giraffe occur in Kenya:

Species: Northern giraffe (*Giraffe camelopardalis*)

Masai giraffe (*Giraffa tippelskirchi*)

Reticulated giraffe (*Giraffa reticulata*)

Subspecies: Nubian giraffe (*Giraffa camelopardalis camelopardalis*)

Conservation Status

IUCN Red List:

Giraffa camelopardalis (as a species) – Vulnerable (Muller *et al.* 2018)

Giraffa tippelskirchi – Endangered (Bolger *et al.* 2019); as a subspecies

Giraffa reticulata – Endangered (Muneza *et al.* 2018); as a subspecies

Giraffa camelopardalis camelopardalis – Critically Endangered (Wube *et al.* 2018); as a subspecies

In the Republic of Kenya:

In the Republic of Kenya (referred to as Kenya henceforth), Masai, reticulated and Nubian (Rothschild's) 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 not less than 20 million Kenya shillings or a life imprisonment or both penalties. Kenya was among the countries that pushed for giraffe to be listed in the Convention on International Trade of Endangered Species (CITES), with giraffe now listed as *CITES Appendix II* (CITES 2019). This means that species listed in *CITES Appendix II* are protected from any form of uncontrolled trade which could threaten their survival (CITES 2019). Additionally, giraffe are also protected by the Convention of Migratory Species (CMS) under *Appendix II* (KWS 2018). Species listed in *CMS Appendix II* are migratory species that move across international borders and require international agreements between the range states on their conservation and management. Kenya is actively involved developing additional international agreements in conserving giraffe as agreed in *Appendix II*, participate in tri-annual Convention of Parties meetings, and financially support the CMS secretariat (Hensz & Soberon 2018).

Issues/threats

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 (Brown *et al.* 2007; Hassanin *et al.* 2007). Recent phylogenetic studies determined independently that the three giraffe species are separate and distinct from each other. Northern and reticulated giraffe evolved with the northern phylogenetic clade, whereas Masai giraffe evolved with the southern clade (Winter *et al.* 2018). These lineages appear to be maintained in the absence of historical barriers



to gene flow. Several cryptic mechanisms for maintaining what appears to be a long history of reproductive isolation have been suggested, however, this remains poorly understood (Brown *et al.* 2007). In Kenya, for example, the three species are found within different geographical ranges with natural barriers such as mountains and rivers, and artificial barriers such as fences preventing gene flow. However, recent studies by GCF and Senckenberg Biodiversity and Climate Research Centre (BiK-F) have revealed very low level and historic gene flow between Nubian and reticulated giraffe in some parts of northern Kenya.

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 over the last century, with an estimated population density of 94 people per km², which not only places intense pressure on the land, but also increases habitat encroachment and human wildlife conflict (AWF 2013; KWS 2019; Worldometer 2019). In addition, habitat fragmentation and degradation, illegal hunting, unsustainable land use practices, climate change, and tourism market volatility all pose serious threats to the survival of giraffe in Kenya (Muthiani 2001; Mizutani *et al.* 2003; Wanala 2005; Githiru *et al.* 2007; Fennessy & Brown 2008; Ogutu *et al.* 2011a; KWS 2019).

Of Kenya's total giraffe population, 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). In fact, 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). While poverty has been reduced in Kenya over the past ten years, it remains widespread across the country and is especially high in rangelands where the majority of Kenya's human population comprises of pastoralist groups relying on subsistence agriculture (AWF 2013; Pape & Mejia-Mantilla 2019). Farming often overlaps with critical wildlife habitat, degrading land and putting humans and wildlife at odds (AWF 2013). Additionally, as the country tries to build an infrastructure to support its growing population, it often comes at the expense of areas of rich biodiversity, including important wildlife habitat (AWF 2013).

Masai giraffe

Masai giraffe are the most abundant giraffe species in East Africa (GCF 2019). 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, development of urban centres that fragment habitats and disrupt wildlife movements, as well as illegal hunting for bushmeat (Ngene *et al.* 2001; KWS & TAWIRI 2010; Ogutu *et al.* 2011a).

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 of human settlements and land use changes (Hofer *et al.* 1996; Ottichilo *et al.* 2000; Ogutu *et al.* 2008, 2009, 2011a). The presence of livestock and increasing human activities has 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, expansion of pastoral settlements has been shown to depress the birth rate of giraffe (Ogutu *et al.* 2011a). An emerging culture 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 & TAWIRI 2010; Sakimba *et al.* 2016). It is important to document the ongoing changes within giraffe habitat range and help in policy making 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 & 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 & TAWIRI 2010). To mitigate these threats, local communities should be involved in giraffe conservation and create the awareness on conserving habitats and forage.

Giraffe Skin Disease (GSD), an emerging disease of giraffe categorized 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 on 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 movement of affected individuals (Muneza *et al.* 2017). As such, there is need to further study GSD to understand long-term population effects of the disease.

Reticulated giraffe

A review of giraffe history in East Africa reported that reticulated giraffe were killed for food during the Great War (Sidney 1965). Reticulated giraffe were also intensely hunted by the local population and Dutch colonists for their hides (Sidney 1965; East 1999). 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 & Brown 2008). After the fall of the Republic of Somalia in the early 1990s, there was a large influx of refugees into northern Kenya, that led to 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.

In 1998, the Director of the Kenya Wildlife Services (KWS) suggested that the bushmeat industry intensified following an earlier rise in the price of domestic meat (de 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). 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).

Nubian giraffe

Nubian giraffe have largely been diminished and pushed out of their natural range by illegal hunting, agricultural development, human encroachment and habitat destruction and fragmentation (Sidney 1965; Brenneman *et al.* 2009). This resulted in the eradication 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, there were possible dietary complications reported in some of the young Nubian giraffe (Brenneman *et al.* 2009). Their introduction to and confinement within Lake Nakuru National Park resulted in overconsumption and declining numbers of preferred acacia trees, which resulted in highly concentrated tannin levels occurring in the remaining forage. This might have compromised the giraffe's nutrition, causing them to be weakened and potentially making them easier prey for the park's lion population (Brenneman *et al.* 2009). Another concern for any small population in a confined area is genetic inbreeding and/or reduced genetic diversity (Brenneman *et al.* 2009), though this has not been recorded in any of the giraffe populations.

Human-wildlife conflict is another factor affecting this subspecies, especially in areas surrounding protected areas. Inadequate staffing and patrolling, vandalism, and lack of fence maintenance in Ruma National Park allow adjacent communities 'easy' access to the park and at the same time allow giraffe to enter human settlements and destroy crops (Awange *et al.* 2004). Wildfire outbreaks in Ruma National Park are a result of fires set on community lands adjacent to the park and this further destroys/reduces giraffe habitat (KWS per. comm.). Additionally, illegal hunting for medicinal use, meat and skins remains a concern (Muller 2011). A major loss of Nubian giraffe is disease, with an anthrax outbreak occurred at the Mwea National Reserve in 2011 killing at least 11 giraffe (Kaitho *et al.* 2013).

Estimate population abundance and trends

Historic

Masai giraffe

Giraffe formerly occurred widely throughout Kenya, with Masai giraffe occurring mainly along the border of Tanganyika, current day Tanzania (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 National Reserve and adjoining group ranches) (Ottichilo *et al.* 2000). However, by 1994, there were only an estimated 340 giraffe in the Masai Mara National Reserve and 1,370 individuals on the adjoining ranches (East, 1999). Giraffe numbers in the Masai Mara Ecosystem declined by 79% in the 20-year period 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 giraffe on the group ranches, and 199 individuals 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, south-western 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 giraffe 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. 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 to 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 National Park between 1960-1963 ranged from 66 to 124 giraffe, 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 & Dagg 1972). The southern boundary of Nairobi National Park is unfenced and open to the Kitengela Conservation Area and the Athi-Kapiti Plains. There is considerable movement of giraffe across this boundary and only about 70-125 individuals were present inside the park at any one time. In 1994, an estimated 100 giraffe were present in the Park (Foster & Dagg 1972; East 1999).

Road strip and aerial sample counts estimated 750 Masai giraffe in the Tsavo East National Park in the early 1970s (Leuthold & Leuthold 1978). Aerial surveys and field observation data between 1991 and 1994, covering an extensive area between Shimba Hills National Reserve and the surrounding coastal rangelands, estimated 1,930 giraffe (East 1999).

Combined, the Masai giraffe population in Kenya was estimated as ~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 rangeland 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 formerly occurred in the north and east of Kenya, including the arid parts of the northern regions (Dagg 1962). Aerial surveys of the Ewaso Nyiro Basin in the Laikipia County estimated the occurrence of some 6,398 reticulated giraffe in 1977 (Muchoki 2000). Laikipia County comprises of private wildlife conservancies, commercial cattle ranches and traditional pastoralist communities, and forms part of the Greater Ewaso Ecosystem (Kinnaird *et al.* 2012). In 1990, this population declined to an estimated 5,410 individuals and further down to 2,118 individuals in 1994 (Muchoki 2009; Shorrocks & Croft 2009). However, in 1997, the population increased to 2,903 individuals. Over a period of 20 years, between 1977 and 1997, the population had declined by approximately more than 50% (Muchoki 2009; Shorrocks & Croft 2009). Giraffe population in the Laikipia County was estimated at 1,856 individuals in 1998 and 1,498 in 1999 (Georgiadis 2007b). Approximately 1,543 reticulated giraffe occurred in the Laikipia County in 2000, and dropped to an estimated 1,433 giraffe 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 the 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 north eastern 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 National Park in Marsabit County in northern Kenya (East 1999). At the same time, Meru National Park, together with the adjacent Kora National Park and Rahole and Bisanadi National Reserves, 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 the Laikipia County,



a large part of the Samburu County and a small portion of the Isiolo County. However, for the purpose of 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 (E. Kisio pers. comm.). 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 1977, reticulated giraffe population was approximately 40,910 countrywide (Ogutu *et al.* 2016). The population declined to 26,206 in 1990 and later 28,115 by 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 & 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 & Foster 1976; Lydekker 1903). Their numbers declined so drastically that only a few hundred individuals remained by the 1960s (Fennessy & Brenneman 2010). The subspecies was effectively saved from extinction in Kenya by several conservation and translocation efforts implemented in the 1970s, which resulted in the establishment of new populations in enclosed, protected areas (Fennessy & Brenneman 2010). In Kenya between the mid-1970s and 1990s, the subspecies has been introduced into Lake Nakuru National Park (17), Ruma National Park (27), Yodder Farm (6), Soysambu Conservancy (2), and Giraffe Centre (2) (Giraffe Centre and KWS pers. comm.; Fennessy and Brenneman, 2010). More recently, the subspecies was re-introduced into Mount Elgon (21), Kitale Farm, Nasalot National Reserve, Sergoit Kruger Farm (10) and Ruko Conservancy (8).

In the late 1980s, 17 Nubian giraffe were translocated from Soi Ranch to Lake Nakuru National Park (Awange *et al.* 2004). In 1994, the estimated (extralimital) Nubian giraffe population in Lake Nakuru National Park was 153 individuals (Brenneman *et al.* 2009). It subsequently declined to 62 individuals in 2002 – a failure in 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 concentration of tannin levels could have also contributed to giraffe decline.

In 1980s, six giraffe were translocated to Yodder Farm in Embu County from Soi Ranch (KWS pers. comm.). By mid 1990s, the population Yodder farm had bred over and grew to 24 individuals (Giraffe Centre and KWS pers. comm.). In 1983, 27 Nubian giraffe were translocated from Soi Ranch in Kenya's Rift Valley to Ruma National Park (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).



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

Current

Masai giraffe

The population in Masai Mara ecosystem in 2007 was estimated to be 961 which increased to 1,619 by 2010 and then to 2,607 individuals by 2017 (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 (KWS pers. comm.). Masai Mara National Reserve and Mara Triangle had the smallest population 292 (11.2%) and 143 (5.4%) respectively (KWS pers. comm.). A recent photographic mark-recapture survey conducted in the Masai Mara ecosystem between 2019 and 2020 by GCF estimates the population of Masai giraffe to be a minimum of 3,073 individuals. These findings further support previous studies showing there are more giraffe in the conservancies compared to Masai Mara National Reserve and Mara Triangle.

Annual counts of Masai giraffe in Nairobi National Park 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 National Park 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 National Park in 2012 estimated the Masai giraffe population at 80 individuals (FONNAP 2013). With the park's open border to the Athi-Kapiti Plains, considerable movement of giraffe occurs across these landscapes and as shown historically, the population is likely to be larger. While little data on giraffe numbers across this ecosystem is available, 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 respectively observed 317 giraffe (Mukeka *et al.* 2021).

Cross-border aerial total counts of the Amboseli National Park 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 & TAWIRI 2010). An estimated 4,164 Masai giraffe occurred in the entire area, of which 3,063 were observed 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 & TAWIRI 2010). A previous total aerial count of large mammals of the Amboseli Ecosystem, conducted in 2007 reported the occurrence of 1,458 individuals (Ngoru & Mwangi 2007; KWS & TAWIRI 2010). In comparison to this, 1,991 giraffe were counted in the same area during the 2010 count (KWS & 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 giraffe (Muteti *et al.* 2018).



Total aerial counts of the Tsavo-Mkomazi Ecosystem, comprising of Kenya's Tsavo East, Tsavo West and Chyulu Hills National Parks and surrounding private ranches, as well as the Mkomazi National Park in Tanzania, were conducted in 2005 (Omondi & Bitok 2005). A total of 1,584 Masai giraffe were counted of which 1,522 occurred in Kenya (Omondi & Bitok 2005). Of these, 542 giraffe were counted in Tsavo East National Park, 568 in Tsavo West National Park, 153 in Galana, 148 in Taita and 111 in other blocks (Omondi & 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 giraffe were counted in Tsavo East National Park, 678 in Tsavo West National Park, 534 in Chyulu Hills National Park, 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 National Park, 691 in Tsavo West National Park, 292 in Chyulu Hills National Park, six in South Kitui Nature Reserve, 93 in Galana, 282 in Taita and 179 in other blocks (Ngene *et al.* 2011). Compared to data from past aerial counts, 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). A recent aerial survey in 2017 by KWS estimates there are 4,323 individuals in Tsavo-Mkomazi ecosystem with a total of 4,068 individuals found in Kenya – a significant increase from 2,891 in 2014 (KWS 2018). From the survey, 889 giraffe were found in Tsavo East National Park, 1,389 in Tsavo West National Park, 48 in Chyulu National Park, four in South Kitui National Park, 84 in Galana, 510 in Taita, 321 in Rombo and 321 in other blocks (Ngene *et al.* 2017).



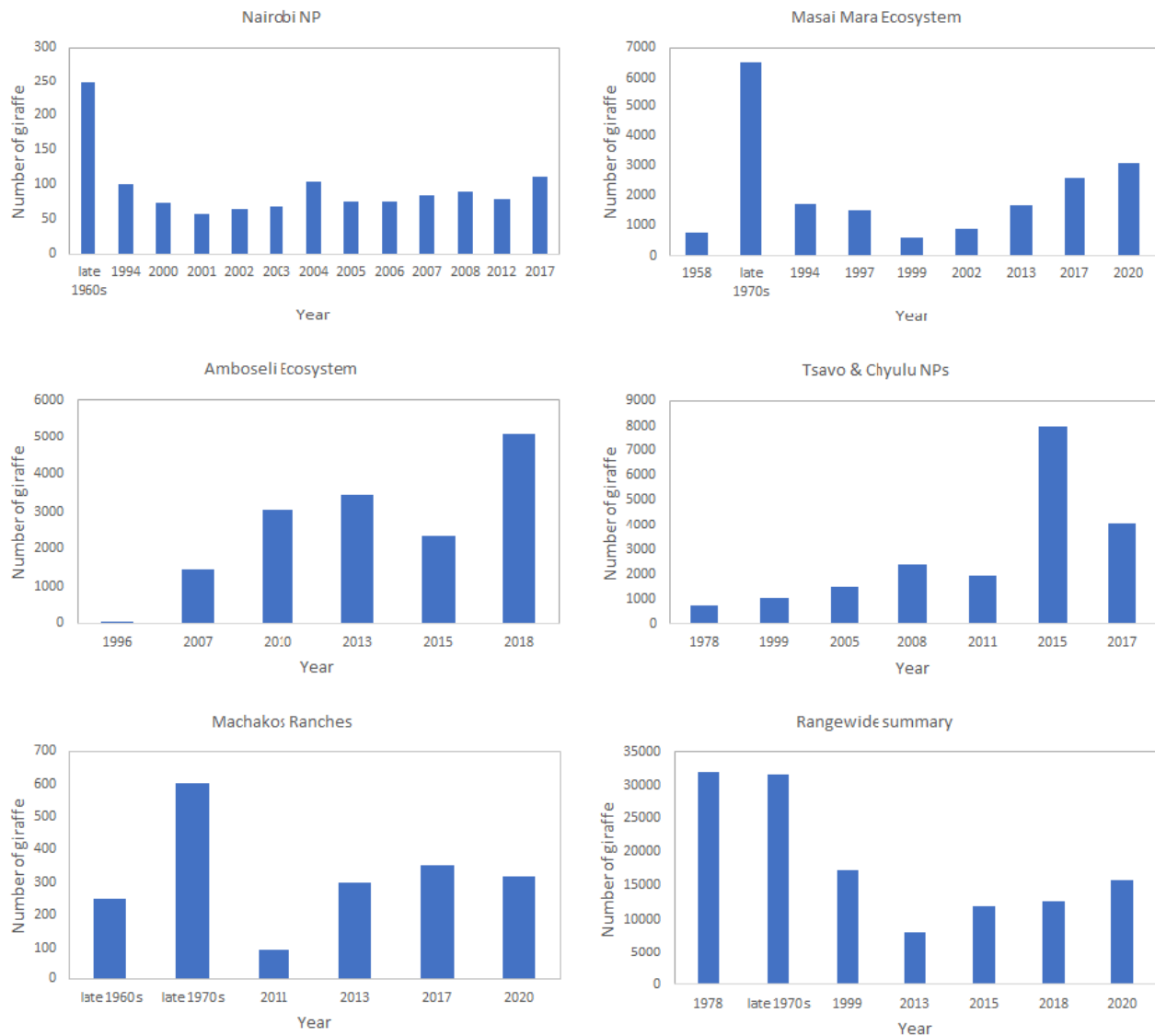


Fig 1. Estimated population numbers for Masai giraffe between 1958-2020 in the major ecosystems in Kenya. Ecosystems with inconsistent survey data over the given timeline are included in the rangewide summary instead (this includes ranches and parks within Naivasha-Nakuru ecosystem).

An estimated 620 Masai giraffe resided across the 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 National Park, while the remaining 294 mostly occur on surrounding private ranches (KWS 2018). In 2017, the population of Masai giraffe in Nakuru-Naivasha ecosystem was ~529, a slight decline from the previous estimates in 2013 (KWS 2018).

Currently, the total population of Masai giraffe in Kenya is estimated at 15,790 individuals - a 68% decline from a historic 32,000 individuals over approximately the last 38 years (KWS 2018; Bolger *et al.* 2019).



Reticulated giraffe

The current range of reticulated giraffe extends from central Kenya northwards into Ethiopia and possibly Somalia (Shorrocks & Croft 2009). An estimated 1,720 giraffe occurred in Laikipia County in 2002, while the population was estimated at 1,597 individuals in 2003 (Georgiadis *et al.* 2007b). In 2008, aerial counts estimated Laikipia's giraffe population at 1,931 individuals (Kinnaird & Ojwang' 2008). In 2010, reticulated giraffe in the Greater Ewaso Ecosystem were estimated at 2,366 individuals (Kinnaird *et al.* 2010). Of these, 1,432 giraffe occurred in Laikipia County (Kinnaird *et al.* 2010). Although three times smaller in area, Laikipia holds a larger population of giraffe than the rest of the Ewaso Ecosystem. The 2012 aerial count of Laikipia County estimated the giraffe population at 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 North Eastern Province, estimated 1,666 reticulated giraffe in the area (King *et al.* 2011). Of these, an estimated 400 giraffe resided in the Garissa Community Giraffe Sanctuary (Hussein 2009; Wildlife Direct 2013). Similar numbers of reticulated giraffe were expected to occur north of Garissa, between Sankuri, Rahole and Balambala (Hussain pers. comm.). In 2015, the numbers increased to 1,974 in Lamu (KWS 2018). In Garissa, the population increased to 4,356 individuals in 2016 (KWS 2018). Anecdotal information suggests that there more than 500 reticulated giraffe in the Wajir County, while less than 400 reticulated giraffe may have occurred in Mandera County in 2013 (KWS 2018).

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

Aerial total counts of wildlife in the south eastern part of Samburu County were conducted in 2005 and comprised of Samburu, Shaba and Buffalo Springs National Reserves among other communal areas (Ihwagi & Douglas-Hamilton 2005). A total of 317 reticulated giraffe were recorded, 33 occurred in Shaba National Reserve, 40 in Samburu National Reserve, 44 in Buffalo Springs National Reserve and 108 in the Namunyak Community Wildlife Conservancy. The remainder were scattered throughout Kalama, Sera, Westgate, Klipsing and Lekuruki community wildlife conservancies and surrounding areas (Ihwagi & Douglas-Hamilton 2005).

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 National Reserves, several community conservation areas



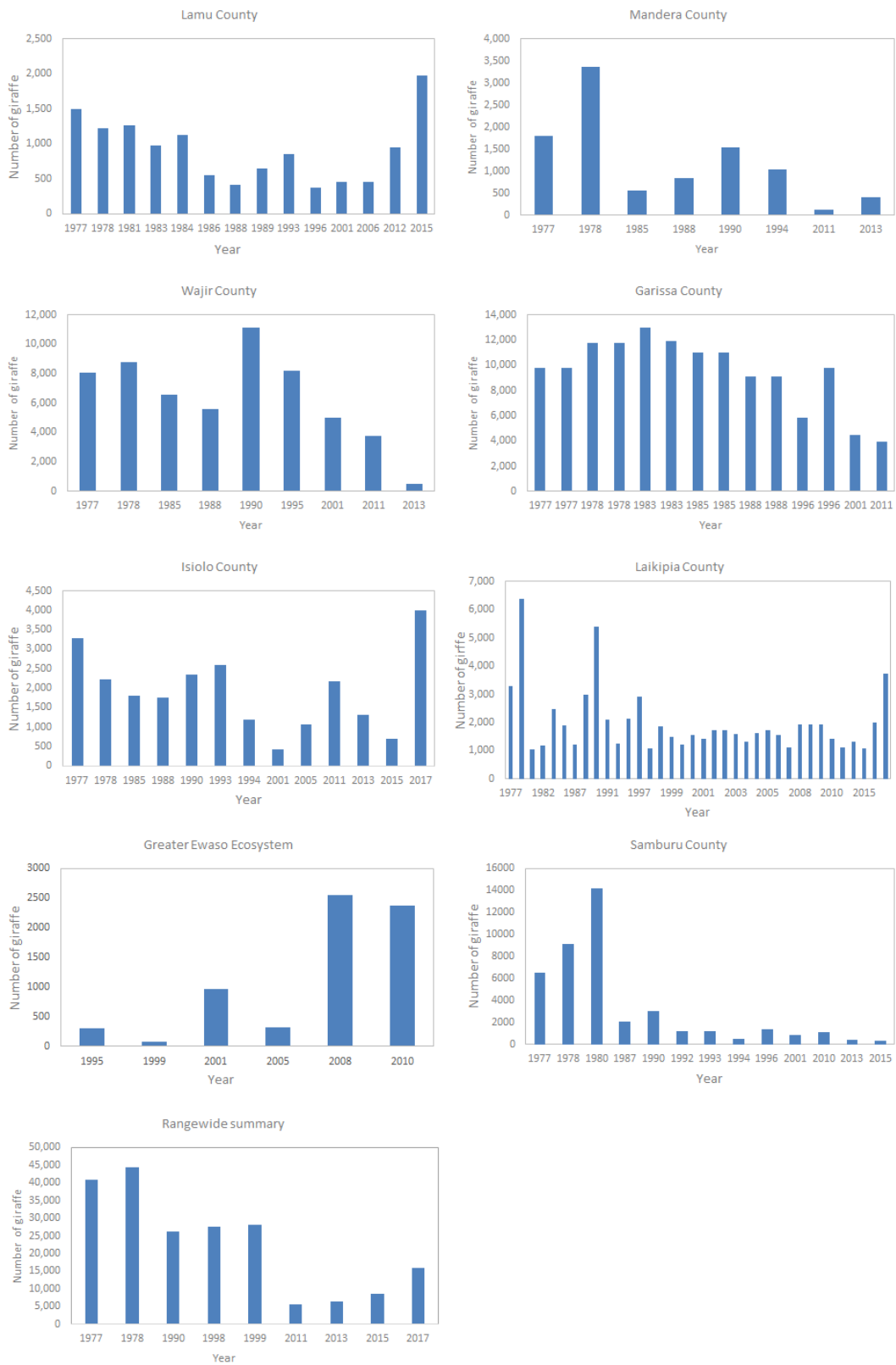


Fig 2. Estimated population numbers for reticulated giraffe by counties, ecosystems and country-wide in Kenya 1977-2020. Smaller populations with inconsistent data reporting (LIST SITES HERE IF APPLICABLE) are included in the range-wide summary.



(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 observed (Litoroh *et al.* 2010).

In 2011, approximately 5,528 reticulated giraffe were estimated in Kenya, and increasing to 6,500 by 2013, then 8,561 individuals in 2015 (KWS 2018; Muneza *et al.* 2018). The population has since been estimated at approximately 15,807 individuals (KWS 2018). The reticulated giraffe population increase in recent years is attributed to better surveys, monitoring, previous undercounts and lack of reporting/surveys. Additionally, increased awareness and communication amongst key stakeholders in reticulated giraffe range has contributed to the increase in numbers. Despite the recent increase, the reticulated giraffe population has overall declined from 44,345 in 1978 to current estimates, representing a decrease of XX%. The general population decrease over the years has been attributed to habitat loss (due to change in land-use in giraffe habitat range) and quality of the habitat deteriorating, and illegal killing for bushmeat and increasing social status (Muneza *et al.* 2018).

Nubian giraffe

In Ruma National Park, 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). Most recently, 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.* 2017a).

In 2000, some giraffe of the 24 in Yodder Farm were translocated to Mwea National Reserve due to the small size of the Farm which could not sustain the rapidly growing population (KWS pers. comm.). In 2004, due to the increasing human-wildlife conflict with the adjacent community, Yodder Farm management requested KWS to move remaining giraffe in the Farm to Mwea National Reserve. At the time of translocation, six giraffe remained in the Farm (Giraffe Centre & KWS pers. comm.). In 2011, an anthrax outbreak in Mwea National Reserve resulted in the death of 11 Nubian giraffe (Kaitho *et al.* 2013). Before the anthrax outbreak, there were an estimated 44 individuals (Kaitho *et al.* 2013). The outbreak was controlled by rapidly incinerating all carcasses and 20 of the remaining 33 giraffe were vaccinated against anthrax and black quarter (clostridial infection) to prevent further losses and provide adequate herd immunity (Kaitho *et al.* 2013). Thirty-four giraffe were counted in 2014 and this had increased to an estimated 51 individuals following a photographic mark-recapture survey of the GCF and AFEW (Muneza *et al.* 2017a). The population has since grown to approximately 70 individuals which includes recent translocations into the reserve from the Giraffe Centre (Fig 3; GCF & Giraffe Centre pers. comms.).

In 2019, a targeted photographic mark-recapture survey conducted by GCF and KWS in Lake Nakuru National Park counted 113 individuals, higher compared to the previous estimates of 80-90 in 2017 (Fig 3; Muruana *et al.* 2019). Adjacent to Lake Nakuru National Park, the Soysambu Wildlife Conservancy is home to one of the largest populations of Nubian giraffe in Kenya, and the largest on private land. A 2009 total census counted 63 Nubian giraffe (Soysambu Conservancy 2009), increasing to an estimated 70 individuals in 2010 (Soysambu Conservancy 2010). In 2012, Nubian giraffe population increased to an estimated 80 individuals (Soysambu Conservancy 2012) and by 2015 an estimated 109 individuals (Fennessy *et al.* 2016). Currently, there are an estimated 141 individuals in 2020 (Fig 3; Soysambu pers. comm.).



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 and the population has remained stable and there are only eight giraffe in the conservancy (Fig 3; (Soysambu Conservancy 2011; The Wildlife Researcher 2012; KWS 2018).

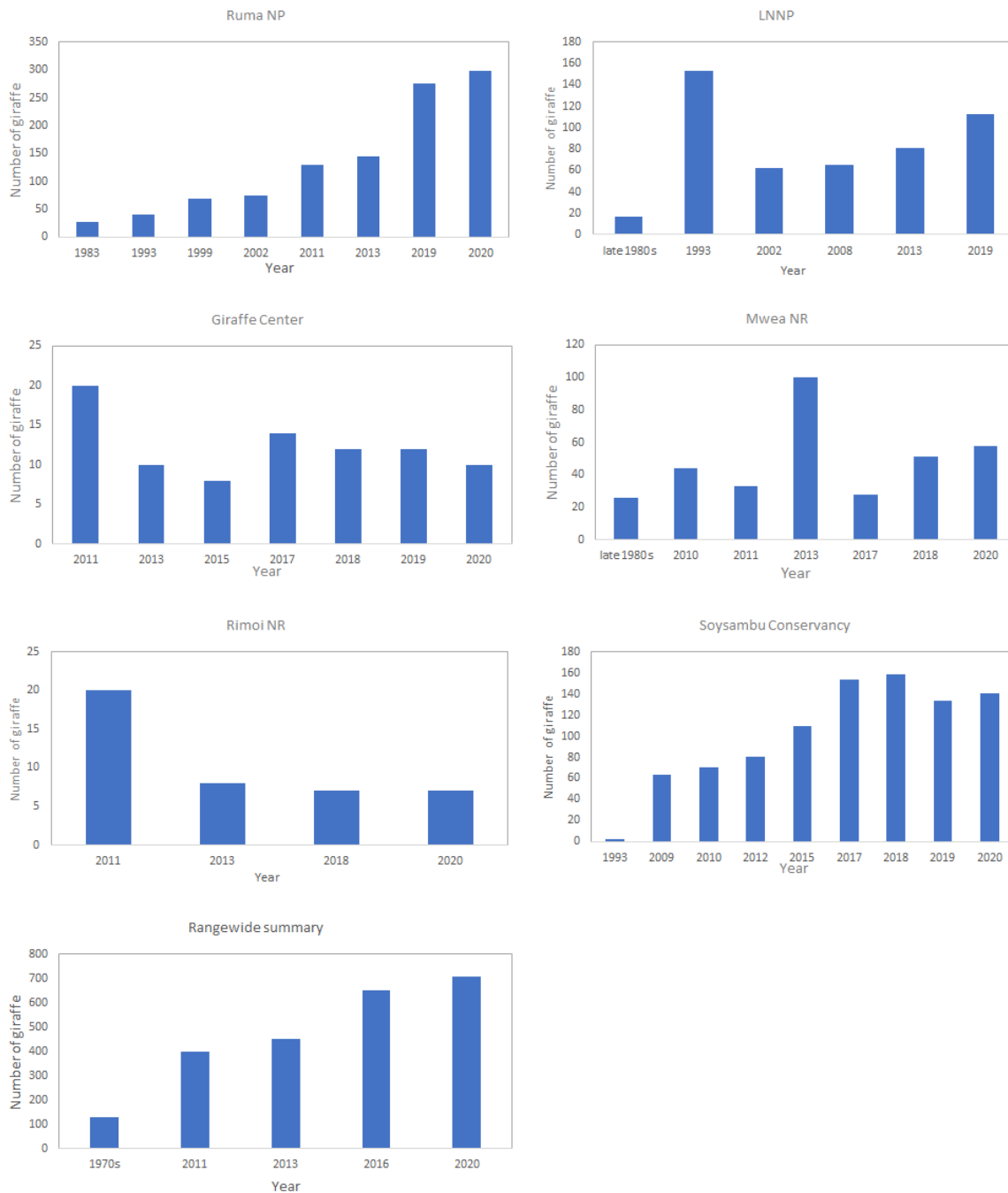


Fig 3. Estimated population numbers for Nubian giraffe across different habitats and a general summary in Kenya 1983-2020. Over the given timeline, some habitats had inconsistent data to design a graph representing Nubian giraffe population trend. The data was however, included in the range wide summary graph.



In 2011, an estimated 32 Nubian giraffe resided in the Kigio Wildlife Conservancy, and less than 20 giraffe each on Giraffe Manor, Mt Elgon National Park, Murgor Farm and Sergoit-Kruger Farm (Muller, 2011). Additionally, less than ten giraffe were estimated each on Kitale Area Farm and Nasalot Reserve (Muller, 2011). Currently, there are 34 Nubian giraffe in Kigio Wildlife Conservancy, 10 individuals at the Giraffe Centre in Nairobi and two individuals in Mt. Elgon National Park. In October 2020, two Nubian giraffe were translocated to Tindress Farm (in Nakuru County) from Soysambu, increasing their population to seven individuals (KWS & Soysambu pers. comm.). In Sergoit Farm, there are 14 individuals while Bora Bora Wildlife Park have seven giraffe (KWS 2018). In March 2021, three giraffe (one bull and two females) between two and three years old were translocated from Giraffe Centre to Rimoi National Reserve (Giraffe Centre & KWS pers. comm.). Currently, there are a total of 10 giraffe in Rimoi National Reserve (Giraffe Centre & KWS pers. comm.). Additionally, there are eight Nubian giraffe in Haller Park, and are now no longer occurring in Murgor Farm and Nasalot National Reserve.

The Nubian giraffe population in Kenya has increased to approximately 707 individuals from 130 in 1970s, representing an increase of 443.8%. 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.

To summarise these, there are approximately 35,737 giraffe currently residing in Kenya – including 15,790 Masai giraffe (44.7%), 15,850 reticulated giraffe (44.4%), and 707 Nubian giraffe (9%). The total number of giraffe across Kenya, accounts for approximately 31% of giraffe in Africa. Despite an overall decline in giraffe numbers in Kenya from ~45,000 individuals in 1998, the recent upwards 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. The objective of the giraffe recovery plan is to ensure sustainable future for giraffe. GCF, KWS and partners will work together to ensure that the National Recovery and Action Plan for Giraffe is implemented. One of the objectives of the giraffe recovery plan is to hold giraffe range committee meetings to share and develop giraffe conservation initiatives. The first Nubian giraffe range committee meeting was held at Soysambu Conservancy in May 2017, while the first Masai giraffe range committee meeting was held at Manzoni Lodge in February 2018. The first reticulated giraffe range committee meeting was held in January 2019 where reticulated numbers were updated, and a specific action plan was drafted. Subsequently, the second Masai and Nubian giraffe range committee meetings were conducted in 2019 where specific Masai and Nubian giraffe action plans were drafted and shared with stakeholders. The range committee meetings were successful as stakeholders were able to evaluate conservation threats, determine priority action plans and identify future research studies for giraffe in Kenya.

The following are proposed conservation management options for giraffe in Kenya, and building on recent activities on the ground:

- Update and review Recovery and Action Plan for Giraffe in Kenya (2018-2022).
- Anti-poaching efforts through bushmeat forensic analysis to conserve key populations of all three species.



- Undertake ongoing studies to understand the populations in Lake Nakuru NP, Ruma NP and Mwea NR, and loss of skin pigment in giraffe in Soysambu Conservancy.
- Greater understanding of giraffe population numbers, range, and conservation status across the country, including speciation.

- Re-establishing priority conservation areas where needed.
- Assess transboundary giraffe conservation and management initiatives with neighbouring counties i.e. Tanzania, Uganda, Ethiopia and South Sudan.
- Support to dedicated giraffe conservation, habitat protection, education, and awareness initiatives (government, NGO and academic); and
- Continue monitoring Masai and reticulated giraffe using satellite tracking in southern and northern Kenya, respectively.

Acknowledgements

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Map

