

Country Profile

Republic of Kenya



Giraffe Conservation Status Report

General statistics

Size of country: 582,650 km²

Size of protected areas / percentage protected area coverage: 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. This was further emphasised when the majority 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 IUCN currently recognises one species (*Giraffa camelopardalis*) and nine subspecies of giraffe (Muller *et al.* 2016) historically based on outdated assessments of their morphological features and geographic ranges.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 (*G. c. thornicrofti*) and West African giraffe (*G. c. peralta*).

However, over the past decade 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) from all major natural populations of giraffe throughout their range in Africa. As a result, an update to the traditional taxonomy now exists. This study revealed that there are four distinct 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*). Nubian giraffe (*G. c. camelopardalis*), Kordofan giraffe (*G. c. antiquorum*), West African giraffe (*G. c. peralta*) are the three subspecies of the northern giraffe, while Angolan giraffe (*G. g. angolensis*) and South African giraffe (*G. g. giraffa*) fall under the southern giraffe. Rothschild's giraffe is genetically identical to the Nubian giraffe, and thus subsumed into it. Similarly, Thornicroft's giraffe is genetically similar to the Masai giraffe, and as such considered a separate subspecies of the Masai giraffe (*G. t. thornicrofti*) (Winter *et al.* 2018). Based on this research, GCF in all publications refers to the updated giraffe taxonomy of four species, while a taxonomy review by the IUCN is ongoing.

The following species and subspecies of giraffe occur in Kenya:

Species: Masai giraffe – *Giraffa tippelskirchi* (formerly *Giraffa camelopardalis tippelskirchi*)
Reticulated giraffe – *Giraffa reticulata* (formerly *Giraffa camelopardalis reticulata*)
Northern giraffe - *Giraffa camelopardalis*

Subspecies: Nubian giraffe – *Giraffa camelopardalis camelopardalis*, a subspecies of the northern giraffe
Giraffa camelopardalis (formerly Rothschild's giraffe *Giraffa camelopardalis rothschildi*)

Conservation Status

IUCN Red List (IUCN 2016):

The IUCN currently recognises one species and nine subspecies of giraffe.

Giraffa camelopardalis (as a species) – Vulnerable

G. c. rothschildi – Endangered

G. c. tippelskirchi – not assessed

G. c. reticulata – not assessed

In the Republic of Kenya:

In the Republic of Kenya (referred to as Kenya in the rest of this report), reticulated and Nubian giraffe are accorded full protection under the Wildlife (Conservation and Management) Act (Chapter 376). Although Masai giraffe are not awarded any special protection in Kenya, hunting has been banned in the country.

Issues/threats

Kenya is home to three giraffe species Masai, Nubian and reticulated giraffe, all of which vary in abundance and distribution and face their own set of conservation challenges and threats.

Although many parts of East Africa remain unrivalled in diversity and abundance of wildlife, conservation efforts in the region face several challenges (Mizutani *et al.* 2003). Kenya's human population has grown exponentially over the last century (AWF 2013). As the pressure on land becomes more intense, there is increased potential for conflict between people and wildlife (Muthiani 2001). Habitat loss, fragmentation and degradation, illegal hunting, unsustainable land use practices, and the expansion of human activities into giraffe habitat, all pose serious threats to the survival of each giraffe species in Kenya (Fennessy & Brown 2008; Githiru *et al.* 2007; Wanala 2005 Mizutani *et al.* 2003; Muthiani 2001).

A large percentage of Kenya's giraffe population is found outside of government protected areas (national parks and reserves) and private wildlife sanctuaries, but rather on communal grazing lands and group ranches, where wildlife, people and livestock all co-exist, interact and compete for the same natural resources (Githiru *et al.* 2007; Wanjala 2005). Poverty is widespread and the majority of Kenya's human population is made up of pastoralist groups relying on subsistence agriculture (AWF 2013). Farming often pushes into critical wildlife habitat, degrading land and putting humans and wildlife at odds (AWF 2013). As the country tries to build an infrastructure to support its population, it often comes at the expense of areas rich in biodiversity, including important wildlife habitat (AWF 2013).

Masai giraffe

Masai giraffe are the most abundant species in East Africa (and across the continent). However, the proliferation of these giraffe in the southern parts of Kenya is threatened by wholesale changes in land-use and land tenure, particularly the introduction of crop farming, logging, charcoal burning, the development of urban centres that fragment habitats and disrupt wildlife movements, as well as illegal hunting for bushmeat (Ngene *et al.* 2011; Ogutu *et al.* 2011a; KWS & TWIRI 2010).

A severe drop in Masai giraffe numbers in the Masai Mara Ecosystem has been attributed to habitat fragmentation and loss of wildlife dispersal areas caused by an increase of settlements and cultivated land in pastoral ranches, as well as illegal hunting (Ogutu *et al.* 2011a, 2009 and 2008; Ottichilo *et al.* 2000; Hofer *et*



al. 1996). A study by de Leeuw *et al.* (2001) indicated that giraffe in the Masai Mara Ecosystem were negatively associated with the presence of livestock and human activities and avoided areas around water holes. Given the rising number and the expanding distribution of small stock in the Mara ranches, Ogotu *et al.* (2011a) suggested that competition between livestock and wildlife would continue to intensify. Ogotu *et al.* (2011b) further suggested that expansion of pastoral settlements depressed the birth rate in giraffe. 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, exclude wildlife and disrupt their movements (KWS & TWIRI 2010).

Land use changes in the Athi-Kapiti Plains Ecosystem have been accelerated by its proximity to the capital city Nairobi and increased demand for residential and urban development areas (Obari 2008). Irrigated farms rapidly encroach into the wildlife dispersal areas of the Amboseli Ecosystem leading to habitat fragmentation, habitat loss and associated human-wildlife conflicts such as crop raiding by wildlife (KWS & TWIRI 2010). Charcoal burning poses serious concerns as mature trees, which are key browse forage for giraffe, are targeted, resulting in a loss of browse species and habitat degradation (KWS & TWIRI 2010). Livestock incursions into government protected areas pose further threats to areas such as the Tsavo-Mkomazi Ecosystem (Ngene *et al.* 2011).

Reticulated giraffe

A review of giraffe history in East Africa by Sidney (1965) reported that they were killed for food during the Great War. Reticulated giraffe were severely hunted by the local population and Dutch colonists for their hides (East 1999; Sidney 1965). East (1999) reported that large parts of the reticulated giraffe range in the north of the country were virtually un-administered. Armed conflicts in northern Kenya, southern Ethiopia and Somalia further adversely effected this species' range (Fennessy & Brown 2008; Mizutani *et al.* 2003). After the fall of the Republic of Somalia in the early 1990s, there was an influx of large numbers of refugees into northern Kenya. This influx led to the destruction of wildlife habitat, an increase in the consumption of bush meat and hence an unprecedented increase in illegal hunting (Githiru *et al.* 2007). This was exacerbated by the widespread availability of firearms in northern Kenya (De Leeuw 2001). 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 bush meat industry intensified following an earlier rise in the price of meat (Du Leeuw 2001).

Still today, reticulated giraffe refuges outside of protected areas are under increasing pressure from illegal hunting, increased settlements, expanding farmlands and other anthropogenic activities such as charcoal burning, wood cutting and sand harvesting (Wildlife Direct 2013; Githiru *et al.* 2007; Dahiye 2005; Mizutani *et al.* 2003; Ottichilo *et al.* 2000). Human settlements in areas such as the Laikipia District have blocked wildlife migratory corridors, which has led to intense human-wildlife conflict (Kinnaird *et al.* 2012; Litoroh *et al.* 2010). Reticulated giraffe have increasingly become confined to protected areas in recent times, including community and private conservancies, as well as government national parks and reserves (Doherty *et al.* 2011).

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 (GCF 2013; Brenneman *et al.* 2009; Sidney 1965). This resulted in the eradication of all known wild (or natural) populations of Nubian giraffe in Kenya (GCF 2013; Muller 2011; Fennessy & Brenneman 2010).



Kenya-wide extra-limital translocations of Nubian giraffe occurred in the 1960s and 1970s. Most of these introductions were into private fenced wildlife areas where specific threats result from their confinement (Brenneman *et al.* 2009). Brenneman *et al.* (2009) reported possible dietary complications in young Nubian giraffe. Their introduction to and confinement within Lake Nakuru National Park resulted in over consumption and declining numbers of preferred acacia trees, which in turn caused highly concentrated tannin levels in their forage. This might have compromised their health, making them easier and opportunistic prey for the park's lion population (Brenneman *et al.* 2009). Other complications which might arise from their confinement include genetic inbreeding and reduced genetic diversity, although Brenneman *et al.* (2009) suggested that Lake Nakuru National Park's Nubian giraffe population was in good genetic health with respect to the likelihood of inbreeding depression.

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). Wildfires, deliberately set by neighbouring communities in expressions of disgruntlement, further destroy and reduce giraffe habitat (Awange *et al.* 2004) and illegal hunting for medicinal use, meat and skins remains a concern (Muller 2011).

A major loss of Nubian giraffe is also accounted for by diseases (Kaitho *et al.* 2013). An anthrax outbreak occurred at the Mwea National Reserve in 2011, which caused a severe decline in giraffe numbers in the reserve (Kaitho *et al.* 2013).

Estimate population abundance and trends

Historic

Masai giraffe

According to Dagg (1962) giraffe formerly occurred widely throughout Kenya, with Masai giraffe occurring mainly along the border of Tanganyika (current day Tanzania). In 1958, 750 Masai giraffe were counted during a wildlife census of the Mara Plains and surrounding hills in southern Kenya's Narok District (Darling 1960). Masai giraffe numbered more than 6,500 in the Masai Mara Ecosystem (including the Masai Mara National Reserve & adjoining group ranches) in the late 1970s (Ottichilo *et al.* 2000). In 1994, there were an estimated 340 giraffe in the Masai Mara National Reserve and 1,370 individuals on the adjoining ranches (East 1999). Ottichilo *et al.* (2000) reported that giraffe numbers in the Masai Mara Ecosystem declined by 79% in the 20 year period between 1977 and 1997, from more than 6,500 to less than 1,500 individuals.

Game census estimates of Masai giraffe in 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 identified by their neck markings (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, although 250 different individuals were recognised by Foster & Dagg (1972), only about 70-125 individuals were present inside the park at any one time. In 1994, an estimated 100 giraffe were present in Nairobi National Park (East 1999).

Leuthold & Leuthold (1978) attempted to estimate Masai giraffe density and population numbers in Tsavo East National Park, using different methodologies such as road strip counts and aerial sample counts. Taking a number of untested assumptions into account, as well as the possibility of seasonal movement in and out of the park, they estimated a mean number of 750 giraffe (Leuthold & Leuthold 1978).



Total aerial counts of the Tsavo-Mkomazi Ecosystem (Tsavo East, Tsavo West, Chyulu National Parks and surrounding ranches, and Mkomazi National Park in Tanzania) were conducted in 1999 (Ngene *et al.* 2011). A total of 1,148 Masai giraffe were counted, 1,066 of these in Kenya (Ngene *et al.* 2011). Of these, 355 giraffe were counted in Tsavo East National Park, 272 in Tsavo West National Park, 171 in Galana, 147 in Taita and 121 in other blocks (Ngene *et al.* 2011).

In 1996, Amboseli National Park's Masai giraffe population was estimated at 50 individuals (East 1999). By the late 1990s, 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). The largest population, approximately 9,990 giraffe, occurred in the Kajiado District (including the Rift Valley, the Athi Kapiti Plains, the Central Hills and the Amboseli Plains; East 1999). Other major populations occurred in the Masai Mara Ecosystem, Tsavo National Parks and surrounds, as well as the Tana River Districts (East 1999).

Reticulated giraffe

According to Dagg (1962) reticulated giraffe formerly occurred in the north and east of Kenya, including the arid semi-desert parts of the northern regions. Aerial surveys of the Ewaso Nyiro Basin in the Laikipia District estimated the occurrence of some 6,398 reticulated giraffe in 1977 (Muchoki 2000). The Laikipia District comprises of private wildlife conservancies, commercial cattle ranches and traditional pastoralist communities, and forms part of the Greater Ewaso Ecosystem (Kinnaird *et al.* 2012). This population declined to an estimated 5,410 individuals in 1990, 2,118 individuals in 1994 and 2,903 individuals in 1997 (Shorrocks & Croft 2009; Muchoki 2000), indicating a decline of more than 50% over a 20-year period (Shorrocks & Croft 2009). According to Georgiadis 2007(b) the giraffe population in the Laikipia District further declined to 1,856 individuals in 1998 and 1,498 in 1999. According to East (1999), only about 75 reticulated giraffe found a refuge inside Samburu National Park, Buffalo Springs and the Shaba complex of national reserves.

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 on average declining. 440 giraffe were counted in 1990, 376 in 1991, 588 in 1992, 361 in 1993, 229 in 1994, 334 in 1995, 196 in 1996, 202 in 1997, 186 in 1998 and 240 in 1999. (E. Kisio pers. comm.).

An increase in illegal hunting and destruction of wildlife habitat followed the influx of refugees into Kenya after the collapse of the Republic of Somalia in 1991. During this time, some 30 reticulated giraffe found a refuge along the Tana River, close to the town of Garissa in the Garissa District (Githiru *et al.* 2007). The Garissa Community Giraffe Sanctuary (also known as Bour-Algi Giraffe Sanctuary) was established in 1999 in an attempt to protect reticulated giraffe in the area (Dahiye 2005).

In 1995, more than 300 reticulated giraffe were estimated to occur in Marsabit National Park and Reserve in the Marsabit District in eastern 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). 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). The majority of the species' population occurred on unprotected rangeland, particularly in the Wajir, Garissa and Marsabit Districts, with relatively small numbers occurring in protected areas such as Marsabit and Maru National Parks and Lewa Wildlife Sanctuary (East 1999). East (1999) estimated that 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.



Nubian giraffe

The Nubian giraffe is one of the most imperilled giraffe subspecies remaining (Fennessy & Brenneman 2010). When it was first described by Lydekker in 1903, 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). 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 this area by a number of conservation and translocation efforts implemented in the 1970s, which resulted in the establishment of new populations in enclosed, protected areas (Fennessy & Brenneman 2010). The Nubian giraffe has been re-introduced to six sites in Kenya within their assumed native range, namely Ruma National Park, Mt Elgon National Park, Murgor and Sergoit-Kruger Farms in Iten, Kitale Area Farm and Nasalot Reserve (Fennessy & Brenneman 2010). Six extralimital introductions have also taken place in Kenya (Fennessy & Brenneman 2010).

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 in 1999 (Awange *et al.* 2004). In the late 1980s, 17 Nubian giraffe were translocated from Soi Ranch to Lake Nakuru National Park (Awange *et al.* 2004). In 1994, a wildlife census estimated the (extralimital) Nubian giraffe population in Lake Nakuru National Park at 153 individuals (Brenneman *et al.* 2009).

Recent

Masai giraffe

Two total ground counts of the Masai Mara Ecosystem were conducted in 1999 and 2002 (Reid *et al.* 2003). The 1999 count included the central portion of the Masai Mara National 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 ground count in 2002 was expanded to include the Mara Triangle, the entire Koyiaki Group Ranch, the western corner of Siana Group Ranch, south-western Olkinyei Group Ranch and the entire Masai Mara National 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 total of 621 giraffe were estimated in 2002 compared to 583 giraffe in 1999. Drought related mortalities in 1999 combined with migration into the area may account for observed increases between 1999 and 2002 (Reid *et al.* 2003). However, in contrast, Ogutu *et al.* (2008) reported that giraffe numbers dropped by more than 50% in the greater Masai Mara Ecosystem between 1989 and 2003, decreasing sharply from 1998 to 2003. Giraffe remained more abundant on the adjoining pastoral ranches than inside the Masai Mara National Reserve (Ogutu *et al.* 2011a; Reid *et al.* 2003).

Annual counts of Masai giraffe in Nairobi National Park conducted between 2000 and 2008 showed population fluctuations between 58 and 104 individuals (Obari 2008). The population was estimated to number 73 individuals in 2000, 58 in 2001, 65 in 2002, 69 in 2003, 104 in 2004, 76 in 2005, 76 in 2006, 85 in 2007 and 90 in 2008. These oscillatory changes in giraffe numbers were likely a result of both immigration and emigration of giraffe from Nairobi National Park to and from ranches in the Athi-Kapiti Plains (Obari 2008). This is consistent with the giraffe population trends in Nairobi National Park as shown by Foster (1966) and suggests that giraffe numbers in the park have remained stable over the years.



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). Total aerial counts of the same area, conducted in 2008, 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).

Reticulated giraffe

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 comprise of the Laikipia District, a large part of the Samburu District and a small portion of the Isiolo District. However, for the purpose of this count, the Laikipia District and the Lewa and Lorogi areas were excluded (Kinnaird *et al.* 2010).

According to Georgiadis *et al.* (2007b), an estimated 1,543 reticulated giraffe occurred in the Laikipia District in 2000, while an estimated 1,433 giraffe occurred in 2001. However, according to Kinnaird *et al.* (2012), 2001 aerial counts estimated Laikipia's giraffe population at 1,727 individuals. An estimated 1,720 giraffe occurred in the district 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).

Aerial total counts of wildlife in the south eastern part of Samburu District were conducted in 2005 (Ihwagi & Douglas-Hamilton 2005). The census area is part of the wider Ewaso Ecosystem and comprised formally protected areas, national reserves and community conservation areas, including three protected areas, namely Samburu, Shaba and Buffalo Springs National Reserves (Ihwagi & Douglas-Hamilton 2005). A total of 317 reticulated giraffe were recorded. Of these, 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 the surrounding areas (Ihwagi & Douglas-Hamilton 2005).

Total aerial counts of the Samburu-Laikipia Ecosystem and parts of the Marsabit District were conducted in 2008 (Litoroh *et al.* 2010). The census area comprised the Isiolo, Laikipia, Imenti, Meru North and Samburu Districts, Samburu, Shaba and Buffalo Springs National Reserves, 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 recorded throughout the entire area (Litoroh *et al.* 2010).

Annual total counts of wildlife in the Lewa Wildlife Conservancy were conducted between 2000 and 2012 and indicate that the reticulated giraffe population fluctuating between 147 and 293 individuals (E. Kisio pers. comm.): 237 giraffe were counted in 2000, 236 in 2001, 245 in 2002, 215 in 2003, 177 in 2004, 173 in 2005, 147 in 2006, 189 in 2007, 243 in 2008, 293 in 2009, 252 in 2010, 243 in 2011 and 241 in 2012.

Birkett (2002) reported that 150 reticulated giraffe occurred in the Sweetwaters Game Reserve on the plains of Mount Kenya in 2002. The Sweetwaters Game Reserve was later extended to create the OI Pejeta Conservancy and an aerial surveys of the conservancy in 2005 estimated 132 individuals, in 2008 172 individuals, in 2009 178 individuals, and in 2011 165 individuals (OI Pejeta Conservancy 2008, OI Pejeta Conservancy 2009 and OI Pejeta Conservancy 2011, respectively).



The Garissa Community Giraffe Sanctuary has improved security for reticulated giraffe in north eastern Kenya's Garissa District and, since its establishment in 1999, more giraffe have naturally populated the sanctuary from other parts of the district where illegal hunting was rampant (Ali 2009; Githiru *et al.* 2007). By 2003, the giraffe population had increased to over 300 individuals (Wildlife Direct 2013; Dahiye 2005).

Nubian giraffe

In 1999 an estimated total of 69 individuals resided in Ruma National Park, while a survey in 2002 estimated the Nubian giraffe population at 75 individuals (Awange *et al.* 2004). The population increased to an estimated 130 giraffe in 2011 (Muller 2011).

The Nubian giraffe population in Lake Nakuru National Park declined from 153 individuals in 1995 to 62 individuals in 2002 – a failure in recruitment of offspring into the gene pool (Brenneman *et al.* 2009). The population was estimated at 65 individuals in 2008 (Muller 2011).

Adjacent to Lake Nakuru National Park, the Soysambu 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 giraffe (Soysambu Conservancy 2009), increasing to an estimated 70 individuals in 2010 (Soysambu Conservancy 2010).

In 2011, an anthrax outbreak at Mwea National Reserve resulted in the death of 11 giraffe (Kaitho *et al.* 2013). Before the anthrax outbreak, there were an estimated 44 Nubian giraffe in the reserve (Kaitho *et al.* 2013). The environment was decontaminated by rapidly incinerating all carcasses and 20 of the remaining 33 giraffe were vaccinated against anthrax and black quarter to prevent further losses (Kaitho *et al.* 2013). Although all the remaining giraffe were not vaccinated as a result of difficult terrains and dense bushes where they could not be pursued, the number of those that were vaccinated was sufficient to halt the outbreak (Kaitho *et al.* 2013).

In 2011 an estimated population of 32 Nubian giraffe resided in the Kigio Wildlife Conservancy (Muller 2011). Less than 20 giraffe were further estimated to occur on each of four properties respectively, namely Giraffe Manor, Mt Elgon National Park, Murgor Farm and Sergoit-Kruger Farm (Muller 2011). Kitale Area Farm and Nasalot Reserve each host an additional maximum of 10 Nubian giraffe (Muller 2011).

Current

Masai giraffe

A survey of Nairobi National Park in 2012 estimated the Masai giraffe population at 80 individuals (FONMAP 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 reputedly occur on the Machakos Ranches (NGCS 2013).

The 2002 total ground count of the Masai Mara Ecosystem is the most recent data available estimating giraffe at approximately 880 individuals (Reid *et al.* 2003). However, an estimated 1,690 giraffe occur across the broader Loita Plains (NGCS 2013).

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 & TWIRI 2010). 4,164 Masai giraffe were estimated throughout the entire area, of which 3,063 occurred on the Kenyan side (KWS & TWIRI 2010). Wildlife does however move within the entire area and across the border into Tanzania depending on seasonality and forage availability (KWS & TWIRI 2010). A previous total aerial



count of large mammals of the Amboseli Ecosystem, conducted in 2007 (Ngoru & Mwangi 2007), reported the occurrence of 1,458 individuals (KWS & TWIRI 2010). In comparison to this, 1,991 giraffe were counted in the same area during the 2010 count (KWS & TWIRI 2010).

Total aerial counts of the Tsavo-Mkomazi Ecosystem were conducted in 2011 (Ngene *et al.* 2011). A total of 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, 6 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). However, compared with the number of giraffe in 2008, the population has declined by approximately 19% in the recent three years (Ngene *et al.* 2011).

An estimated 620 Masai giraffe reside across the Nakuru district (NGCS 2013). 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 (NGCS 2013).

Estimated population numbers for Masai giraffe in Kenya 1958 -2013:

Year	Masai Mara	Nairobi NP	Tsavo & Chyulu NPs	Amboseli Ecosystem	Machakos Ranches	Nakuru District	Total
1958	750 *						
late 1960s		250					
1978			750 **				
late 1970s	6,500						
1994	1,710	100					
1996				50***			
1999	583		1,066				
2000		73					17,330
2001		58					
2002	880 ****	65					
2003		69					
2004		104					
2005		76					
2006		76					
2007		85		1,458			
2008		90	2,379				
2010				3,063 *****			
2011			1,935 *****				
2012		80					
2013	1,690 *****				300	620	>8,000

Masai Mara = Masai Mara Ecosystem; Tsavo & Chyulu NPs = Tsavo East & West and Chyulu National Parks & surrounds
** Mara Plains & surrounding hills; ** Tsava East NP; *** Amboseli NP; **** extended area; ***** including Namanga-Magadi areas;*
****** including Mkomazi ecosystem; ***** including Loita Plains*
Sources: Darling 1960; Foster & Dagg 1972; Leuthold & Leuthold 1978; East 1999; Ottichilo et al. 2000,2001; Reid et al. 2003; Omondi & Bitok 2005; Ngoru & Mwangi 2007; Obari 2008; KWS & TWIRI 2010; Ngene et al. 2011; FONMAP 2013; NGCS 2013.

Reticulated giraffe

The range of reticulated giraffe extends from central Kenya northwards into Ethiopia and possibly Somalia (Shorrocks & Croft 2009). In 2010, reticulated giraffe populations in the Greater Ewaso Ecosystem were estimated at 2,366 individuals (Kinnaird *et al.* 2010). Of these, 1,432 giraffe occurred in the Laikipia District (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 the Laikipia District estimated the giraffe population at 1,105 individuals, indicating a population decline of 36% from the 2001 count (Kinnaird *et al.* 2012).



Annual total counts of wildlife species in the Lewa Wildlife Conservancy conducted in 2013 estimated the current reticulated population at 158 individuals (E. Kisio pers. comm.). An estimated 204 reticulated giraffe are currently present in the Ol Pejeta Conservancy (Ol Pajeta Conservancy 2011).

In 2011, aerial total counts of Ijara and parts of Fafi, Lamu and Garissa districts in Kenya's North Eastern Province, estimated 1,666 reticulated giraffe to roam in the area (King *et al.* 2011). Of these, an estimated 400 giraffe find refuge in the Garissa Community Giraffe Sanctuary (Wildlife Direct 2013; Ali 2009). Similar numbers of reticulated giraffe are expected to occur north of Garissa, between Sankuri, Rahole and Balambala (Ali pers. comm.), although no recent count have been done. Anecdotal information suggests that more than 500 reticulated giraffe may possibly be present in the Wajir District, while less than 400 reticulated giraffe might still occur in the Mandera District (NGCS 2013).

These recent numbers add up to a total estimate of less than 6,500 reticulated giraffe. Compared to the 27,000 individuals estimated to have existed only a decade earlier (East 1999), this species has recently suffered a major and rapid decrease in numbers, giving rise to major concern about its long-term survival (Doherty *et al.* 2011).

Estimated population numbers for reticulated giraffe in Kenya 1977 -2013:

Year	Laikipia District	Ewaso	Lewa	GCGS	Ijara	Meru & Kora NP	Ol Pejeta	Wajir District	Mandera District	Total
1977	6,398		190							
1990	5,410		440							
1991			376	30						
1992			588							
1993			361							
1994	2,118		229							
1995			335							
1996		300 *	196			200				
1997	2,903		202							
1998	1,856		186							
1999	1,498	75 **	240							28,115
2000	1,543		237							
2001	1,727	966 ***	236							
2002	1,720		245				150			
2003	1,597		215	300						
2004			177							
2005		317 ****	173				132			
2006			147							
2007			189							
2008	1,931	2,557 *****	243				172			
2009			293				178			
2010		2,366	252							
2011			243		1,666		165			
2012			241							
2013			158				204	500	400	<6,500

Ewaso = Greater Ewaso Ecosystem; Lewa = Lewa Wildlife Sanctuary; GCGS = Garissa Community Giraffe Sanctuary; Ijara = Ijara & parts of Fafi, Lamu & Garissa Districts; Meru & Kora NP = Meru & Kora National Parks & Rahole & Bisanadi National Reserves

** Marsabit NP & Reserve; ** Samburu, Buffalo Springs & Shaba complex; *** excluding Laikipia district & lewa & Lorogi areas; **** South East Samburu District; ***** Samburu-Laikipia Ecosystem & parts of Marsabit District*

Sources: East 1999; Muchoki 2000; Birkett 2002; Dahiye 2005; Ihwagi & Douglas-Hamilton 2005; Georgiadis et al. 2007b; Githiru et al. 2007; Kinnaird & Ojwang' 2008; Ol Pajeta Conservancy 2008, 2009, 2011; Shorrocks & Croft 2009; Litoroh et al. 2010; King et al. 2011; Kinnaird et al 2010,2012; NGCS 2013; E Kisio pers. comm.

Nubian giraffe

Nubian giraffe in Ruma National Park are estimated to number 144 individuals, while the population in Lake Nakuru National Park is estimated at 81 individuals (NGCS 2013). The privately owned Soysambu Conservancy's Nubian giraffe population has increased to an estimated 80 individuals in 2012 (Soysambu Conservancy 2012). In 2011, eight Nubian giraffe were re-introduced into the Baringo area, where they had previously disappeared over 40 years ago. These giraffe were translocated from the Soysambu Conservancy



to the Ruko Community Wildlife Conservancy (The Wildlife Researcher 2012; Soysambu Conservancy 2011). A population of 37 Nubian giraffe occurs in the Kigio Wildlife Conservancy (Z. Muller pers. comm.), an estimated 100 individuals in Mwea National Reserve, 10 individuals at Giraffe Manor and eight individuals in Mt. Elgon National Park (NGCS 2013).

Estimated population numbers for Nubian giraffe in Kenya 1983 -2013:

Year	Ruma	LNNP	Ruko	Soysambu	Kigio	Mwea	Giraffe Manor	Mt. Elgon NP	Murgor	Sergoit	Kitale	Nasalot	Total
1983	27												
late 1980s		17											
1994	40	153											
1999	69												
2002	75	62											
2008		65											
2009				63									
2010				70		44							
2011	130		8		32	33	20	20	20	20	10	10	
2012				80									
<i>Ruma = Ruma National Park; LNNP = Lake Nakuru National Park; Kigio = Ruko Community Wildlife Conservancy;</i>													450
<i>Soysambu = Soysambu conservancy; Kigio = Kigio Conservancy; Mwea = Mwea National Reserve; Murgor = Murgor farm;</i>													
<i>Sergoit = Sergoit-Kruger farm; Kitale = Kitale Area Farm; Nasalot = Nasalot Reserve</i>													
<i>Sources: East 1999; Awange et al. 2004, 2005; Brenneman et al. 2009; Muller 2011; The Wildlife Researcher 2012;</i>													
<i>Soysambu Conservancy 2012; NGCS 2013; Z. Muller pers. comm.</i>													

Uncertainty remains regarding the current total numbers of giraffe in Kenya as no official country-wide census has been undertaken recently and data are few, incomplete and unreliable. However, current Masai giraffe numbers are estimated at more than 8,000 individuals, reticulated giraffe are estimated to number less than 6,500 individuals, and Nubian giraffe are currently estimated to number approximately 450 individuals.

Future Conservation Management

The following are proposed conservation management options for giraffe in Kenya:

- Finalising the first Kenyan National Giraffe Conservation Strategy and implementation of its action plan;
- Establishment of giraffe species-specific working groups to guide their conservation management;
- Anti-poaching efforts to conserve key populations of all three species;
- Greater understanding of giraffe population numbers, range and conservation status across the country, including speciation;
- Re-establishing priority conservation areas where needed;
- Support to dedicated giraffe conservation, habitat protection, education and awareness initiatives (government, NGO and academic); and
- Assess transboundary giraffe conservation and management initiatives with neighbouring counties i.e. Tanzania, Uganda, Ethiopia and South Sudan.

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References

- Ali, H. 2009. Community based giraffe conservation & poverty alleviation in Garissa, Kenya. *Giraffa* **3(1)**: 11-13.
- Awange, J.L., Aseto, O. & Ong'ang'a, O. 2004. A case study on the impact of giraffes in Ruma National Park in Kenya *Journal of Wildlife Rehabilitation* **27(2)**: 16-21.
- AWF. 2013. Kenya. African Wildlife Foundation. <http://www.awf.org/country/kenya> (Accessed 15 April 2013).
- Birkett, A. 2002. The impact of giraffe, rhino and elephant on the habitat of a black rhino sanctuary in Kenya. *African Journal of Ecology* **40**: 276-282.
- Brenneman, R.A., Bagine, R.K., Brown, D.M., Ndetei, R & Louis Jr, E.E. 2009. Implications of closed ecosystem conservation management: the decline of Rothschild's giraffe (*Giraffa camelopardalis rothschildi*) in Lake Nakuru National park, Kenya. *African Journal of Ecology* **47**: 711-719.
- Brown, D.M., Brenneman, R., Koepfli, K.P., Pollinger, J., Mila, B., Louis, E.E. Jr., Georgiadis, N., Grether, G. & Wayne, R.K. 2007. Extensive population genetic structure in the giraffe. *BMC Biology* **5**: 57-70.
- Dagg, A.I. 1962. *The distribution of the giraffe in Africa*. School of Graduate Studies, University of Waterloo. Waterloo, Ontario, Canada.
- Dagg, A.I. & Foster, J.B. 1976. *The Giraffe: Its Biology, Behavior and Ecology*. Robert E. Krieger Publishing Company, Inc., Malabar, FL.
- Dahiye, Y. M. 2005. *A reconnaissance survey report on the Bour-Algi Giraffe Sanctuary and its environs, Garissa*. Transboundary Environmental Project, Terra Nuova, Garissa.
- Darling, F.F. 1960. An ecological reconnaissance of the Mara Plains in Kenya Colony. *Wildlife Monos* **5**:1-41.
- De Leeuw, J., Waweru, M.N., Okello, O.O., Maloba, M., Nguru, P., Said, M.Y., Aligula, H.M., Heitkönig, I.M.A., & Reid, R.S. 2001. Distribution and diversity of wildlife in northern Kenya in relation to livestock and permanent water points. *Biological Conservation* **100**: 297-306.
- Doherty, J., Elwood, R. & Scantlebury, M. 2011. Reticulated Giraffe Project. *Giraffa* **5(1)**:29.
- East, R. 1999. *African Antelope Database 1998*. IUCN/SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.
- Fennessy, J. & Brown, D. 2008. *Giraffa camelopardalis*. In: IUCN 2008. 2008 IUCN Red List of Threatened Species. www.iucnredlist.org (Downloaded on 08 March 2013).
- Fennessy, J. & Brenneman, R. 2010. *Giraffa camelopardalis ssp. rothschildi*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org (Downloaded on 08 July 2013).
- Fennessy, J., Bidon, T., Reuss, F., Kumar, V., Elkan, P., Nilsson, M.A., Vamberger, M. Fritz, U. & Janke, A. 2016. From one to four species: multi-locus analyses reveal hidden genetic diversity in giraffe. *Current Biology* 10.1016/j.cub.2016.07.036
- FONMAP 2013. Nairobi National Park April Game Counts. Friends of Nairobi National Park. <http://fonnap.wordpress.com/2012/04/05/nairobi-national-park-april-game-counts/> (Accessed 30 May 2013).
- Foster, J.B. 1966. The giraffe of Nairobi National Park: Home range, sex ratios, the herd and food. *East African Wildlife Journal* **4**:139-148.



- Foster, J.B. & Dagg, A.I. 1972. Notes on the biology of the giraffe. *East African Wildlife Journal* **10**:1-16.
- GCF 2013. Rothschild's giraffe joins list of species threatened by extinction. Giraffe Conservation Foundation. *Giraffa* **4(1)**: 2.
- Georgiadis, N.J., Olwero, J.G.N., Ojwang, G. & Roman, S.S. 2007a. Savanna herbivore population dynamics in a livestock-dominated landscape: I. dependence on land use, rainfall, density and time. *Biological Conservation* **137**: 461–472.
- Georgiadis, N.J., Ihwagi, F., Nasser Olweroc, J.G. & Roman, S.S. 2007b. Savanna herbivore dynamics in a livestock-dominated landscape. II: Ecological, conservation, and management implications of predator restoration. *Biological Conservation* **137**: 473-483.
- Githiru, M., Njeri, T., Muthoni, F.K., Yego, R., Muchane, M., Njoroge, P. & Giani, A. 2007. *Wild herbivores in Bour-Algi Giraffe Sanctuary, Kenya: Abundance, habitat use and interactions with humans*. Zoology Department Research Report 06. National Museums of Kenya, Nairobi.
- Hassanin, A., Ropiquet A., Gourmand, A.L., Chardonnet, B. & Rigoulet, J. 2007. Mitochondrial DNA variability in *Giraffa camelopardalis*: consequences for taxonomy, phylogeography and conservation of giraffes in West and central Africa. *Comptes Rendus Biologies* **330**: 265-274.
- Hofer, H., Campbell, K.L.I., East, M.L. & Huish, S.A. (1996). The impact of game meat hunting on target and non-target species in the Serengeti. In *The exploitation of mammal populations*. Taylor, V.J. & Dunstone, N. (Eds.) 117–146. London: Chapman and Hall.
- Ihwagi, F.W. & Douglas-Hamilton, I. 2005. *A Report on the Samburu October 2005 Aerial Total Count*. Save the Elephants. Nairobi, Kenya.
- IUCN 2016. *The IUCN Red List of Threatened Species. Version 2012.1*. <http://www.iucnredlist.org> Downloaded on 07 February 2017.
- Kaitho, T., Ndeereh, D., Ngoru, B. 2013. An outbreak of anthrax in endangered Rothschild's giraffes in Mwea National Reserve, Kenya. *Veterinary Medicine: Research and Reports* **2013(4)**:45-48.
- King, J., Andanje, S., Goheen, J., Amin, R., Musyoki, C., Lesimirdana, D. & Ali, A.H. 2011. Aerial survey of Hirola (*Beatragus hunteri*) and other large mammals on south-east Kenya. Kenya Wildlife Services Report, Kenya.
- Kinnaird, M. & Ojwang', G.O. 2008. *Facilitating Management of an African Savanna Landscape: Aerial Surveys of wildlife and livestock across the Greater Ewaso Landscape*. Report to the Chester Zoo North of England Zoological Society.
- Kinnaird, M., Ojwang', G.O. & O'Brien, T. 2010. *Facilitating Management of an African Savanna Landscape: Aerial Surveys of wildlife and livestock across the Greater Ewaso Landscape*. Year 3 Report to: Chester Zoo, North of England Zoological Society and The Laikipia Wildlife Forum.
- Kinnaird, M., O'Brien, T. & Ojwang, G. 2012. *Sample Count Aerial Surveys as a Monitoring Tool for Wildlife and Livestock: a Case Study from Laikipia County*. Laikipia Wildlife Forum Report, Kenya.
- KWS & TWIRI 2010. *Aerial total count: Amboseli-West Kilimanjaro and Magadi-Natron cross border landscape Natron cross border landscape, wet season, March 2010*. Kenya Wildlife Service and Tanzania Wildlife Research Institute.
- Leuthold, B.M. & Leuthold, W. 1978. Ecology of the giraffe in Tsavo National Park, Kenya. *East African Wildlife Journal* **16**: 1-20.



- Litoroh, M., Ihwagi, F.W., Mayienda, R., Bernard, J. & Douglas-Hamilton, I. 2010. *Total Aerial Count of Elephants in Laikipia-Samburu Ecosystem in November 2008*. Kenya Wildlife Service, Elephant Program, Nairobi, Kenya.
- LWC 2012. *Annual Game Count Report. March 2012*. Wildlife Department, Lewa Wildlife Conservancy, Kenya.
- Mizutani, F., Muthiani, E., Kristjanson, P. & Recke, H. 2003. Impact and value of wildlife in pastoral livestock production systems in Kenya: possibilities for healthy ecosystem conservation and livestock development for the poor. In *AHEAD*: 121-132. World Parks Congress. WCS, IUCN, Durban, South Africa.
- Muchoki, C.H.K. 2000. Livestock and wildlife population trends (1977-97) in Ewaso Nyiro Basin, Kenya. *African Journal of Ecology* **38**: 178–181.
- Muller, Z. 2010. Sticking our necks out: developing a National Giraffe Conservation Strategy for Kenya. *Giraffa* **4(1)**: 26-27.
- Muller, Z. 2011. Ecology and conservation of the endangered Rothschild's giraffe, *Giraffa camelopardalis rothschildi*. Update Report for Sea World and Bush Gardens Conservation Fund.
- Muthiani, E.N. 2001. *Wildlife utilization for community benefit: an assessment of ecological and socioeconomic viability of community wildlife utilization*. KARI-ILRI, Nairobi, Kenya.
- NGCS. 2013. National Giraffe Conservation Strategy for Kenya, draft report. Unpublished.
- Ngene, S., Ihwagi, F., Nzisa, M., Mukeka, J., Njumbi, S. & Omondi, P. 2011. *Total aerial census of elephants and other large mammals in the Tsavo-Mkomazi Ecosystem*. Kenya Wildlife Services Report. Nairobi, Kenya.
- Ngoru, B. & Mwangi, C. 2007. *Total aerial count of large mammals in Amboseli Ecosystem*. Kenya Wildlife Services Report, Kenya.
- Obari, T. 2008. Factors affecting habitat use by Masai giraffe (*Giraffa camelopardalis tippelskirchii*) in the Athi-Kapiti and Amboseli Ecosystems, Kenya. MSc. thesis, University of Nairobi, Kenya.
- Ogutu, J. O., Piepho, H.-P., Dublin, H.T., Bhola, N. & Reid, R. S. 2008. Dynamics of Mara–Serengeti ungulates in relation to land use changes. *Journal of Zoology* **278**: 1–14.
- Ogutu, J.O., Piepho, H.-P., Dublin, H.T., Bhola, N. & Reid, R.S. 2009. Dynamics of Mara-Serengeti ungulates in relation to land use changes. *Journal of Zoology* **278**: 1–14.
- Ogutu, J.O., Owen-Smith, N., Piepho, H.P. & Said, M.Y. 2011a. Continuing wildlife population declines and range contraction in the Mara region of Kenya during 1977-2009. *Journal of Zoology* **285 (2)**: 99-109.
- Ogutu, J.O., Piepho, H.-P., Dublin, H.T., Bhola, N. & Reid, R.S. 2011b. Dynamics of births and juvenile recruitment in Mara-Serengeti ungulates in relation to climatic and land use changes. *Population Ecology* **53(1)**: 195-213.
- Ol Pejeta Conservancy. 2008. Wildlife Numbers Continue to Increase on the Ol Pejeta Conservancy. <http://www.olpejetaconservancy.org/about/news/wildlife-numbers-continue-increase-ol-pejeta-conservancy> (Accessed 17 May 2013).
- Ol Pejeta Conservancy. 2009. Research and Wildlife Teams Complete Annual Wildlife Census. <http://www.olpejetaconservancy.org/about/news/research-and-wildlife-teams-complete-annual-wildlife-census-0> (Accessed 17 May 2013).
- Ol Pejeta 2011. Giraffes get a chance to stand tall. <http://www.olpejetaconservancy.org/about/news/giraffes-get-chance-stand-tall> (Accessed 17 May 2013).



- Omondi, P. & Bitok, E. 2005. *Total Aerial Count of Elephants, Buffalo & other species in the Tsavo/Mkomazi Ecosystem*. KWS/ MIKE Programme Report.
- Omondi, P., Bitok E.K., Mukeka, J., Mayienda, R.M. & Litoroh, M. 2008. *Total aerial count of elephants and other large mammal species of Tsavo/Mkomazi Ecosystem*. Kenya Wildlife Service Report, Nairobi, Kenya.
- Ottichilo, W. K., de Leeuw, J., Skidmore, A.K., Prins, H.H.T. & Said, M.Y. 2000. Population trends of large non-migratory wild herbivores and livestock in the Masai Mara Ecosystem, Kenya, between 1977 and 1997. *African Journal of Ecology* **38**: 202-216.
- Reid, R.S., Rainy, M., Ogutu, J., Kruska, R.L., Kimani, K., Nyabenge, M., McCartney, M., Kshatriya, M., Worden, J., Ng'ang'a, L., Owuor, J., Kinoti, J., Njuguna, E., Wilson, C.J., & Lamprey, R. 2003. *People, Wildlife and Livestock in the Mara Ecosystem: the Mara Count 2002*. Report, Mara Count 2002, International Livestock Research Institute, Nairobi, Kenya.
- Reid, R.S., Gichohi, H., Said, M.Y., Nkedianye, D., Ogutu, J.O., Kshatriya, M., Kristjanson, P., Kifugo, S.C., Agatsiva, J.L., Andanje, S.A. & Bagine, R. 2008. Fragmentation of a peri-urban savanna, Athi-Kaputiei Plains, Kenya. In *Fragmentation in Semi-Arid and Arid Landscapes: Consequences for Human and Natural Systems*: 195–224. Galvin, K.A., Reid, R.S., Behnke, R.H. & Hobbs, N.T. (Eds). Dordrecht: Springer.
- Shorrocks, B. & Croft, D.P. 2009. Necks and networks: a preliminary study of population structure in the reticulated giraffe (*Giraffa camelopardalis reticulata* de Winston). *African Journal of Ecology* **47**: 374-381.
- Sidney, J. 1965. The past and present distribution of some African ungulates. *Transactions of the Zoological Society of London*, 30.
- Soysambu Conservancy 2009. Soysambu Wildlife Census, September 27th. <http://soysambuconservancy.wildlifedirect.org/2009/10/04/soysambu-game-count-september-27th/> (Accessed 23 May 2013).
- Soysambu Conservancy 2010. Rothschild Giraffe now an endangered species. <http://soysambuconservancy.wildlifedirect.org/2010/08/13/rothschild-giraffe-now-an-endangered-species/> (Accessed 23 May 2013).
- Soysambu Conservancy 2011. Rothschild giraffe translocation ends. <http://soysambuconservancy.wildlifedirect.org/2011/01/18/rothschild-giraffe-translocation-ends/> (Accessed 23 May 2013).
- Soysambu Conservancy 2012. Soysambu dry season wildlife census. <http://soysambuconservancy.wildlifedirect.org/2012/10/14/soysambu-dry-season-wildlife-census/> (Accessed 23 May 2013).
- The Wildlife Researcher 2012. Tall on land, towering on water – Giraffes on a yacht. The Wildlife Researcher. *E-issue* no. 1 February 2012. Kenya Wildlife Services.
- Wanjala, M. J. 2005. An overview of wildlife and tourism management in Kenya. In *Third African conference on peace through tourism*. Lusaka, Zambia.
- Western, D., Russell, S. & Cuthill, I. 2009. *The status of wildlife in protected areas compared to non-protected areas of Kenya*. PLoS ONE 4, e6140. Online DOI: 10.1371./journal.pone.0006140.
- Wildlife (Conservation and Management) Act.
- Wildlife Direct 2013. *Community based giraffe conservation and poverty alleviation in Garissa District, Kenya: Approaches, Challenges and achievements*. <http://giraffesanctuary.wildlifedirect.org/> (Accessed 5/03/2013).

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Map

In preparation.

