

Article

Status and distribution of African elephant (*Loxodonta africana*) in Eastern Africa

Aster Arefaine Gebrehiwet¹, Gebre Gidey Weldeabzgi²

¹Department of Natural Resources Management, Adigrat University, Ethiopia

²Department of Natural Resources Management, Dambi Dollo University, Ethiopia

E-mail: asterarefayne1234@gmail.com, gebregidey09@gmail.com

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Abstract

This review aims to illustrate the status and distribution of African elephant in Eastern Africa. The source of data for this review was secondary data including published articles, books, Master theses, PhD dissertations and unpublished literatures. The African elephant (*Loxodonta africana*) is the largest living terrestrial mammal on the earth and perhaps one of the most intelligent. They are present in 50 countries, 13 of which are in Asia and 37 in Africa. The total estimation of elephant in Africa is 472,269, with 29.1% in the Eastern Africa. In recent report, African elephant in South Africa holds approximately 42%, followed by Eastern Africa with 28%, Central Africa with 25%, and West Africa with 5%. As a result of illegal hunting, African elephant in Eastern Africa declined by 62 percent from 2006 to 2013. Largely attributed decrease in Tanzania. However, the number of African elephants in south Sudan has been increase but there is no longer a resident elephant in Somalia. To sustain African elephant, first and foremost requirement is identifying and assessing its population status and distribution across targeted areas. Therefore, this review is important to realize sustainable management approaches for African elephant in Eastern Africa by understanding their status and distribution.

Keywords population status; distribution; African elephant; Eastern Africa.

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1 Introduction

Elephants are extremely adaptable, occupying a variety of habitats from desert to savanna to gallery forest. Environmental and manmade factors affect elephant population dynamics, home range, migration patterns, diet, group size and composition, all of which can vary tremendously, in turn influencing the dynamics of elephants and their habitats (Tchamba, 1996).

The African elephant (*Loxodonta africana*) is the largest living terrestrial mammal on the earth and perhaps one of the most intelligent (Feldhamer et al., 2007) (Fig. 1). They are present in 50 countries, 13 of which are in Asia and 37 in Africa. The African elephant (*Loxodonta africana*) were once found throughout

Africa, it includes Eastern Africa, such as in Sudan, South Sudan, Ethiopia, Somalia, Uganda, Kenya, and Burundi (Douglas, 1987).

According to Blanc et al. (2007), total estimation of elephant in Africa is 472,269, with 29.1% in the Eastern Africa. In recent report, African elephant in South Africa holds approximately 42%, followed by Eastern Africa with 28%, Central Africa with 25%, and West Africa with 5% (Babji, 2024). As a result of illegal hunting, African elephant in Eastern Africa declined by 62 percent from 2006 to 2013. Largely attributed decrease in Tanzania. However, the number of African elephants in south Sudan has been increase but, there is no longer a resident elephant in Somalia (Thouless et al., 2016).

To sustain African elephant, first and foremost requirement is identifying and assessing its population status and distribution across targeted areas. Therefore, this review is important to realize sustainable management approaches for African elephant in Eastern Africa by understanding their status and distribution.



Fig. 1 African elephant.

2 Methodology

2.1 Study area description

The review assessed African elephant population status and distribution in Ethiopia, Eritrea, Sudan Kenya, Tanzania and Uganda of Eastern African counties (Fig. 2).

2.2 Data sources

The source of data for this review was secondary data including published articles, books, Master theses, PhD dissertations and unpublished literatures.

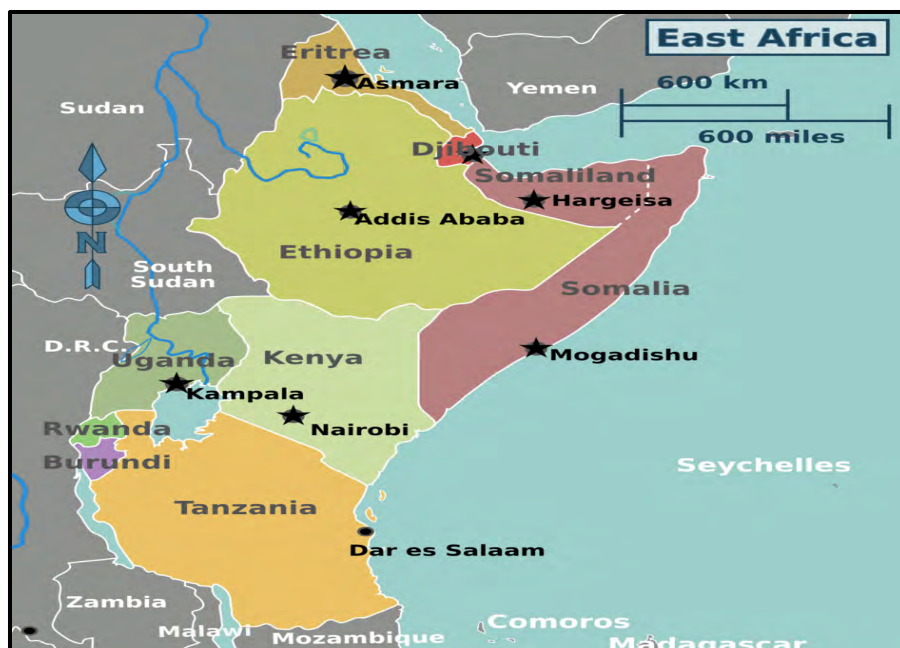


Fig. 2 Map of Eastern Africa.

3 General Description and Distribution of African Elephant

3.1 Habitat and food preference of African elephant

Elephants are capable of surviving in nearly any habitat that has adequate quantities of food and water, such as grassy plains, woodlands, swamps, and bush lands from sea level to high mountain elephant diet in the savannas consists of primarily grasses, herbs, and shrubs, as well as fruits, while forests elephants are less herbivorous than the savanna species as they are largely frugivorous, utilizing the fruit-bearing trees in their habitat. Additionally, Elephant herds can consume large amounts of fruit throughout their extensive range, which makes them proficient seed dispersers through their droppings (Blake et al., 2009). It has two upper incisor teeth that protrude outside the mouth forming its characteristic tusks. Tusks in males have an average length of 355 cm and weight of 61 kg. The height and body weight may vary geographically and individually but fully mature bulls average a height of about 3m and weigh 5,000 kg while cows average 2.5 m and 3,000 kg (Blake et al., 2009).

3.2 Ecological importance of African elephant

African elephant create land maintain ecosystem through physically changing the habitat. The iconic stature and beauty of elephants is recognized worldwide as a symbol of the African landscape, making them a flagship species, or ambassador, for the ecosystem (Wasser et al., 2015). In addition to this Elephants function as a keystone species, contributing to the health and functionality of an ecosystem, by manipulating and transforming the environment in such a way that benefits an abundance of species. According to Jyoti et al. (2020), the dung acts as a fertilizer and provides numerous nutrients that promote germination and growth. In addition to this, Ramakrishan et al. (2018) also state that their activity produce new habitat for smaller animals like lizard, which show a strong preference for elephant- damaged tree, using the crevices created by broken tree limbs and torn bark.

3.3 Distribution and population status of African elephant in Eastern Africa

3.3.1 Ethiopia

Ethiopia is one of Sub-Saharan African countries that have African elephants (Blanc et al., 2003). In Ethiopia, elephants had a large range in the northern, central, southwestern, and southern areas of the Rift Valley

(Dejene, 2016; Yirmed, 2010). Since that time, however, it has been greatly reduced in number and its altitudinal range has contracted. The greatest portion of elephants inhabits these areas while only few of the elephant populations live in the mid and high altitude forests of western Ethiopia as small fragmented populations. Currently, elephants exist in six protected areas of Ethiopia, Babile Elephant sanctuary, Chebera-Churchura National park, Omo national park, Mago national park, Gambella National park and Kafta Sheraro National park (Dejene et al., 2014). The largest elephant population expansion of their activities into elephant range are recorded from Omo National Park, followed by increasingly calling wildlife authorities to consider not Gambella National Park (Sintayehu and Dejene, 2014).

In the 1970s the status of elephants in Ethiopia was estimated to number from 6,000 to 10,000 (Demeke, 2009; Demeke, 2010). However, according to (EWCA, 2015) the elephant population in Ethiopia is estimated to be between 1900 and 2151 with decreasing large number of elephants.

African elephant has suffered a considerable reduction in number. At present, African elephants in Ethiopia are among the threatened by a variety of pressures. Ethiopia has lost about 90% of its elephant population since 1980's and hence nationally elephants are regarded as endangered (Yirmed, 2010). Habitat loss and fragmentation and illegal hunting are the main reasons for population decline (Dejene, 2016; EWCA, 2015). Similarly, the number of African elephants has shown declining trends over the past years in Omo National Park (EWCA, 2015) it estimated 800 elephants, and reported 450 elephants.

The total population estimate was 756 individuals in cheberachurchrainservey 2020–2021 (Adane Tsegaye et al., 2022). In addition to this, the estimation in 2015 indicates elephant population in Kafta Sheraro National Park is 300 (African Elephant Status Report, 2016). The elephants are threatened with habitat loss as a result of frequent fires, and corridor obstruction by irrigation schemes, settlement and agricultural expansion.

3.3.2 Eritrea

In the 19th century elephants in Eritrea were observed in many parts of the country but there are no elephants today. However, elephants in Eritrea are confined to the Gash-Setit area in the southwest of the country along the Ethiopian border. The area is bound by the seasonal Gash River to the north and the permanent Setit River, which forms the border with Ethiopia to the south (Blanc et al., 2007). Yacob et al (2004) state that, during the 20th century they were confined to Zoba Gash Barka. An aerial survey conducted in Gash-Barka between 2001 and 2003 estimated that around 100 African elephants persisted in Eritrea (Hagos et al., 2003; Shoshani et al., 2004).

Due to human– wildlife conflicts and habitat loss, the population of elephants in Eritrea is small. Currently, elephant migration into Ethiopia occurs only during the wet season and during dry season from Ethiopia to Eritrea (Yacob et al., 2004). Eritrea has been trying to conserve wildlife, in spite of economic hardship, so it is a setback to lose 11 elephants in a period of 27 months (from February 2002 to May 2004), a loss of about 5% per annum (Yacob et al., 2004).

3.3.3 Tanzania

Ruaha National Park, Serengeti National Park, Ngorongoro Conservation Area, Kilimanjaro National Park, Lake Manyara National Park, Mikumi National Park, Selous Game Reserve and Tarangire National Park are Tanzania's National Parks support a significant number of African elephants (Ethan Smith, 2023). One of the largest and most monitored populations in the country occurs in the Selous ecosystem of Tanzania. Tanzania contributes 80% of eastern regional population, with 137,485 elephants. Tanzania has lost about 20 percent of its elephants since 2008, with 130,000 remaining). Tanzania holds the majority of the region's elephants with over 109,000 individuals in 2009, but those populations have declined by 60 percent in just five years, with only about 43,000 remaining in 2015. In the Selous-Mikumi ecosystems, the population dropped from 70,406 in 2006 to 38,975 in 2009 and to 13,084 in 2013 (TAWIRI, 2013). In the Ruaha-Rungwa ecosystem, another

stronghold of African elephants, the population plummeted by 37% from 31,625 in 2009 to 20,090 in 2013. Between 2010 and 2013, a total of 34.1 tons of ivory was seized from 208 recorded incidences within Tanzania (TAWIRI, 2013).

3.3.4 Kenya

African elephant is distributed in the Tsavo Ecosystem, Amboseli National park, Masai Mara National Park, Meru National Park, Lewa Wildlife conservancy and Laikipia-Samburu ecosystem of northern Kenya. In Kenya, people are killed every year by elephants in an attempt to defend their crops and elephants in their turn are killed legally and illegally (Omondi et al., 2004). In the 1970s and 1980s poaching threatened the very survival of these elephants, which had been reduced to population. Poaching increased in the last few years of the period in several of Kenya's major elephant populations including Tsavo, Laikipia-Samburu and Marsabit. The Tsavo elephant crisis mirrored the decline in Kenya's entire elephant population, causing alarm both nationally and internationally. Elephant populations declined from a crude estimate of 167,000 in 1973 to just 20,000 animals in 1990, although it is difficult to compare the quality of data and survey techniques across decades (KWS, 2012).

The most recent elephant census in 2014 estimates Kenya's elephant population to be 32,520, with a marginal decline over the last three years. Tsavo hosted a population of some 45,000 elephants in 1970, but this number was reduced to about 7,000 by 1988 primarily as a result of large-scale poaching and drought (Douglas, 2009). However, Currently, Kenya's elephant population is increasing by 5% annually, with an estimated 36,280 elephants in 2021 from those populations, 15,989 are located in the Tsavo-Mkomazi ecosystem between Kenya and Tanzania due to improved anti-poaching laws by the Kenya Wildlife Service (AWF, 2022).

3.3.5 Sudan

African elephant is distributed in Boma National Park area, the Southern National Park, Jonglei and the Lotilla block, produced a total estimate of 6,850 elephants (Fay et al., 2007). In the Jonglei area, the estimate of 5,462 elephants is higher than the 1980s estimate for the same area using the same survey methodology. However, According to (Boitani et al., 1981) comparison of the results with those of in Southern National Park area suggests a dramatic decline in elephant populations apparently due to organized poaching by nomadic pastoralists and 'horsemen from the north and west, as well as the Murahleen militia men from western Sudan. All these populations are threatened by uncontrolled development of extractive industries (oil, timber and minerals), major infrastructure developments (e.g. roads), and return of people displaced by the war, poaching and increased encroachment in important habitats (Fay et al., 2007).

3.3.6 Uganda

From the history, Elephants ranged throughout Uganda; however, today their range of habitats has contracted to the few protected areas scattered and unconnected across Uganda (Daniel, 2021). The elephant population reduction from 1970 to the 1980s could be attributed to poaching for ivory and poor law enforcement during the time of political turbulence experienced from 1972 to 1986. The number of elephants in Uganda in 2016 was 2,911 (African elephant Status Report, 2016). However, in the last census in 2017, the elephant population in the landscape increased to 5,808, up from 2,000 elephants in 1983. Because in 2013, AWF has trained 282 community scouts 202 in Kidepo Valley National Park, 65 in Murchison Falls National Park, and 15 in Lake Mburo National Park, to collect ecological data and conduct anti-poaching patrols within the landscape (AWF, 2021).

3.4 Physical factors affecting African elephant population

3.4.1 Poaching trend and illegal ivory trade

According to Gobush et al. (2008), Poaching has had a huge impact on elephant populations across the African

continent, with the total number being more than halved in less than a decade from 1.3 million individuals to 600,000 between 1979 and 1987. (AWF, 2014) reported that ivory taken from an elephant in Africa travels along an elaborate trade chain that spans countries, oceans, and continents, and comprises a network of poachers, traffickers, fixers, kingpins, and consumers. Additionally, without the safety and the leadership of an older and wiser elephant, the remaining individuals show an increase in stress and a decrease in productivity (Gobush et al., 2008).

Europe was importing about 100-200 tons of ivory per year and by the rate of 19th century, European ivory imports may have been as high as 700 tones, representing 60,000 elephants killed per year (Stephenson, 2007). Eastern Africa witnessed that another major peak in ivory demand occurred with the industrialization of Europe and US during the mid-nineteenth century (Hakansson, 2004). In addition to this throughout much of the 20th century the hunting of African elephants for their ivory (Both legal and increasingly illegal) continued to destroy populations across the continent (Stephenson, 2007).

According to (Said et al., 1995) The 1970s and 1980s observed another period of large-scale, ivory-driven uncontrolled exploitation of elephants particularly in Eastern Africa. The resurgence of elephant poaching was due to the influx of automatic weapons into Africa, economic crisis in sub-Saharan Africa and budget cuts. These led to loss of moral and corruption to many wildlife departments in Africa, which in turn led to severe reduction of elephant populations across the continent (AfESG, 1999; Okello et al., 2008). These mass killings of elephant halved the population from approximately 1.3 million in 1979 to 600,000 in 1989. In Eastern Africa, elephants dramatically declined in response to the poaching during this period, for instance, Uganda's elephant numbers fell from 17,600 to 1,800, Kenya from 130,000 to 19,000 (Douglas, 1987). In Tanzania, the elephant population was also halved from 110,000 to 55 000 during the same period (TAWIRI, 2010).

The African elephant is currently listed as vulnerable on the IUCN Red List (CITES et al., 2013). The effect of the CITES ban on the trade in elephant products including ivory, reduced poaching pressure on many savannah populations. As a result some populations increased, for instance, in Kenya from 19,000 to 29,000 in 2005 and Tanzania from 55,000 to 110,000 in 2006 (TAWIRI, 2010). In Tanzania, CITES coupled with effective anti-poaching operations, such as Operation Uhai in 1990, where the Army and Police Forces collaborated with the Wildlife Department to bring poaching under control, led to an almost complete cessation of the international ivory trade although poaching never stopped completely. This allowed the elephant population in Africa in general and Tanzania in particular, to recover (TAWIRI, 2010).

In Eastern Africa, African elephant populations which had been recovering for two decades after the heavy poaching of the 1970s and 1980s are now witnessing a resurgence of large-scale poaching due to higher market demand in Asia (UNEP, 2013). From 2000 through 2013 the number of large-scale ivory movements has steadily grown in terms of the number of such shipments and the quantity of ivory illegally traded. Most large consignments of ivory are reaching the Asian markets through the Eastern Africa sub-region. This is because Kenya, Uganda and Tanzania accounted for nearly 83 percent of the total volume of ivory seized for which the country of origin or export was known and continue to increase at alarming rates (CITES et al., 2013).

Since 2009, trade routes shifted from West and Central Africa seaports to Eastern Africa, with Tanzania and Kenya as the primary exit points for illegal ivory trade leaving the continent through Indian Ocean ports (Mombasa, Dares Salaam and Zanzibar). Meanwhile Malaysia, Vietnam and Hong Kong are highly concerned in the trade as the key trade routes and transit with the ivory mostly destined for China, although Thailand is also a destination. But over the last two years, trade routes used by traffickers appear to be shifting as new countries such as Togo and Ivory Coast emerge as exit points in Africa, with Indonesia, Spain, Sri Lanka, Turkey and United Arab Emirates as new transit countries. Therefore, Tanzania and Kenya are heavily involved in the ivory trade as a source and exit of large-scale ivory than any other country in Africa. Also this

reflects the shifts in poaching patterns from Central and West Africa to Southern and Eastern Africa (CITES et al., 2013). Current poaching trend in Africa remains far too high, and could soon lead into extinction by 2020, if the present killing rate of 7.4 percent continues, which is higher than the natural population growth rate of not more than 5 percent. But, according to (CITES et al., 2013), the situation is particularly acute in Central Africa where the estimated. The Ivory trade in Ethiopia has been practiced since 1899 when enormous numbers of elephants were killed for profit. Ethiopia is identified as having the largest unregulated ivory market in Eastern Africa (Blanc et al., 2003).



Fig. 3 Illegal Poaching of African elephant in Eastern Africa (Blanc et al., 2003).

3.4.2 Human-Elephant conflicts

Local communities that heavily rely on natural resources, also benefit from the ecological services provided by African elephants. Their efficiency in seed dispersion maintains the forest habitat for all animal species including humans. Human populations are greater in these moist, forested areas of Africa than the arid zones, primarily because of the accessibility of resources including water and fertile soil. Villages with dense populations tend to establish in the most protected areas of African countries, which usually lie along the perimeters of wildlife reserves (Jones et al., 2007). This provides natives with everything they need to survive off the land but it also puts them in close proximity to the local wildlife. Settlement and human activities, including livestock grazing, in wildlife corridors and other important habitats is leading to increased isolation of elephant populations in many protected areas and contributes to high levels of HEC throughout Eastern Africa.



Fig. 4 Human-elephant conflict in Eastern Africa (Jones et al., 2007).

4 Conclusion

The African elephant (*Loxodonta africana*), the largest living terrestrial mammal on the earth, are capable of surviving in nearly any habitat that has adequate quantities of food and water, such as woodlands, deserts, swamps, and bush lands. African elephant is found in Eastern Africa, which includes Sudan, Ethiopia, Somalia, Kenya and Tanzania, Uganda. African elephants in Kenya are increasing due to the law of illegal hunting (poaching). However, in the rest the counties, population number of African elephants are dramatically decline in response to Settlement and human activities, including livestock grazing. There must be a provision for compensation by governments for the loss of resource caused by elephants. Governments should also give much more consideration to control anthropogenic activities and Special trainings to the local community to stand against illegal hunters.

References

- AfESG. 1999. Review of African elephant conservation priorities. A Working Document of the IUCN/SSC African Elephant Specialist Group (Second ed). IUCN, Gland, Switzerland
- AfESG. 2006. IUCN SSC African elephant Specialist Group. <http://www.iucn.org/themes/ssc/sgs/afesg/aed/index.html>. Viewed 01 October 2009
- African Elephant Status Report. 2016. African Elephant Specialist Group in Eastern Africa.
- African Wildlife Foundation. 2022. Elephant Conservation Progress Report.
- African Wildlife Foundation. 2014. Response to Tackling Poaching and Illegal Wildlife Trafficking in Africa.
- Allen-Rowlandson TS. 1990. Aerial survey of wildlife resources in Ethiopia: January–February 1990. Unpublished Report. Ethiopian Wildlife Conservation Organization, Addis Ababa, Ethiopia
- Babji. 2024. Elephant Population. PopulationU, Research Papers on Population Dynamics and Social Affairs. <https://www.populationu.com/gen/elephant-population>
- Blake S, Deem E, Mossimbo F, Walsh P. 2009. Forest elephants: tree planters of the Congo. *Biotropica*, 41(4):

459-468

- Blanc J. 2008. *Loxodonta africana*. The IUCN Red List of Threatened Species. e.T12392A3. IUCN, Gland, Switzerland
- Blanc J, Thouless C, Hart J, Dublin H, Douglas-Hamilton I, Craig G, Barnes R. 2003. African Elephant Status Report. IUCN/SSC African elephant Specialist Group. IUCN, Gland, Switzerland
- Blanc JJ, Barnes RFW, Craig GC, Dublin HT, Thouless CR, DouglasHamilton I, Hart JA. 2007. African Elephant Status Report 2007. An Update From The African Elephant Database. Occasional Papers of the IUCN Species Survival Commission. IUCN, Gland, Switzerland
- Boitani L. 1981. The Southern National Park A Master Plan. Ministry of Wildlife Conservation and Tourism, Southern Region. Juba-Sudan and Dipartimento per la Cooperazioneallo Sviluppo, Ministerodegli Affari Esteri. Roma, Italia
- CITES, IUCN and TRAFFIC. 2013. Status of African elephant populations and levels of illegal killing and the illegal trade in ivory. A Report To The African Elephant Summit. Gaborone, Botswana
- Daniel A, Edward A, Kennedy A. 2021. Elephant Population Status, Distribution and Conservation Threats in Kibale National Park, Uganda, Eastern African Journal of Environment and Natural Resources, 4(1): 68-78. doi: 10.37284/eajenr.4.1.499
- Dejene SW. 2016. The African elephant (*Loxodonta africana*) in Ethiopia: A review. European Journal of Biological Sciences, 8(1): 8-13. <https://doi.org/10.5829/idosi.ejbs.2016.8.01.1112>
- Douglas-Hamilton I. 2009. The Current Elephant Poaching Trend. Pachyderm, 45: 154-157
- Ethan Smith. 2023. Best Places To See Elephants In Tanzania - The Elephant Guide. Tanzania
- Ethiopian Wildlife Conservation Authority (EWCA). 2015. Ethiopian Elephant Action Plan. Ethiopian Wildlife Conservation Authority, Addis Ababa, Ethiopia
- EWCO. 1991. Elephant Conservation Plan, Ethiopia. Unpublished document. Addis Ababa, Ethiopia
- Fay M, Elkan P, Marjan M, Grossmann F. 2007. Aerial Surveys of Wildlife, Livestock, and Human Activity in and around Existing and Proposed Protected Areas of Southern Sudan, Dry Season 2007. Unpublished Report. Wildlife Conservation Society in Partnership with the Government of Southern Sudan.
- Feldhamer G, Drickamer S, Vessey J, Merritt C. 2007. Mammalogy: Adaptation, Diversity, Ecology (3rd ed). The John Hopkins University Press, Maryland, USA
- Gobush KS, Mutayoba BM, Wasser SK. 2008. Long-term impacts of poaching on relatedness, stress physiology, and reproductive output of adult female African elephants. Conservation Biology, 22: 1590-1599
- Hakansson NT. 2004. The human ecology of world systems in Eastern Africa: The impact of the ivory trade. Human Ecology, 32(5): 561-591
- Jones T, Rovero F, Msirikale J. 2007. Vanishing Corridors: A Last Chance to Preserve Ecological Connectivity between the Udzungwa and Selous-Mikumi Ecosystems of Southern Tanzania. Final Report to Conservation International. Tanzania
- Jyoti P, Bibhuti P, Lahkar L, Hemanta K, Hilloljyoti S. 2020. Population estimation of Asian elephants in a tropical forest of Northeast India. Gajah, 52: 15-23
- Kingdom J. 1997. The Kingdom Field Guide To African Mammals. Academic Press, London and New York, USA
- KWS. 2012. Conservation and Management Strategy for the Elephant in Kenya 2012-2021 Kenya Wildlife Service. Nairobi, Kenya
- Okello J, Wittemyer G, Rasmussen H, Arctander P, Nyakaana S, DouglasHamilton I, Siegismund H. 2008. Effective population size dynamics reveal impacts of historic climatic events and recent

- anthropogenic pressure in African elephants. *Molecular Ecology*, 17(17): 3788-3799
- Omondi P, Bitok E, Kagiri J. 2004. Managing human-elephant conflicts: the Kenyan experience. *Pachyderm*, 36: 80-86
- Said MY, Chunge RN, Craig GC, Thouless CR, Barnes RF, Dublin HT. 1995. African elephant Database 1995. Paper presented at the IUCN Species Survival Commission. IUCN, Gland, Switzerland
- Shoshani J, Hagos Y, Yacob Y, Ghebrehiwet M, Kebrom E. 2004. Elephants (*Loxodonta africana*) of Zoba Gash Barka, Eritrea: Numbers and distribution, ecology and behaviour and fauna and flora in their ecosystem.
- Sintayehu W. 2014. Report on Ecology and Conservation of Elephant In Ethiopia Project Report. Haramaya University, Ethiopia
- Spingale C. 1994. Elephants. T. and A. Poyser, London, UK
- Stephenson PJ. 2007. WWF Species Action Plan: African elephant, 2007-2011. World Wide Fund for Nature, Gland, Switzerland. Studies from Africa and Asia. Fauna & Flora International (FFI), Cambridge, UK
- Tanzania Wildlife Research Institute (TAWIRI). 2013a. Aerial census of large animals in the SelousMikumi ecosystem – population status of African elephant, 2013. Arusha, Tanzania
- Tanzania Wildlife Research Institute (TAWIRI). 2013b. Aerial census of large animals in Ruaha-Rungwa ecosystem – population status of African elephant, 2013. Arusha, Tanzania
- TAWIRI. 2010. Tanzania Elephant Management Plan 2010-2015. Tanzania Wildlife Research Institute, Arusha, Tanzania
- Tchamba M.N.1996. History and Present Status of the Human-Elephant Conflict in the conflict in the Waza-Logone region, Cameroon, West Africa. *Biological Conservation*, 75: 35-41
- Thouless CR, Dublin HT, Blanc JJ, Skinner DP, Daniel TE, Taylor RD, Frederick HL. Bouché P. 2016. African elephant Status Report 2016: An update from the African elephant Database. Occasional Paper Series of the IUCN Species Survival Commission, No. 60 IUCN / SSC Africa Elephant Specialist Group. IUCN, Gland, Switzerland
- Walpole M, Linkie M. 2007. Mitigating Human-Elephant Conflict: Case Studies from. Africa and Asia. Fauna & Flora International (FFI), Cambridge, UK
- Wasser S, Brown C, Mailand S, Mondol W, Clark C, Weir B. 2015. Genetic assignment of large seizures of elephant ivory reveals Africa's major poaching hotspots. *Science*, 349(6243): 84-87
- Wilson D, Ayers P. 1976. White Gold: The Story of African Ivory. Heineumann and London, UK
- Yirmed D. 2010. The Ecology and Conservation of the Relic Elephant Population in the Horn of Africa. PhD Thesis, University of Melbourne, Australia
- Yirmed D, Renfree R, Barnes R. 2006. The undisclosed facts about the relic elephant population in the horn of Africa. Proceeding: Biological Society of Ethiopia, 16th C.R. Annual Conference and Workshop. Addis Ababa, Ethiopia