Chapter 7
The Ecohistory of Tanzania's Northern Rift Valley – Can One Establish an Objective Baseline as an Endpoint for Ecosystem Restoration?

Herbert H. T. Prins and Joost F. de Jong

Abstract Often conservationists suffer from the 'shifting base line syndrome'. We illustrate this by elucidating the natural history of Tanzania's northern Rift Valley over the past centuries. White rhinoceros and possibly the sable antelope went extinct five centuries ago. Two centuries ago Maasai cattle started competing with plains wildlife, but a reset took place through diseases. Wildlife's zenith was around 1935, before commercial agriculture arose and before people and livestock had recovered from devastating epidemics. Elephant populations recovered from the ivory trade; wildlife benefitted from the expanding range of the tsetse fly. From the 1920s until the 1980s, cattle numbers soared and most fresh water became monopolized by farmers or pastoralists. Unlike in the Serengeti grasslands, the great herbivore migrations that could have developed after the rinderpest eradication were not attained in the grasslands of the northern Rift Valley: in fact, the wildebeest and zebra migrations to a large extent disappeared. It appears that conservationists who have fallen victim to the shifting baseline syndrome are content with the current impoverished natural state. Consequently, with the memory gone and baselines shifted, it is likely that the true natural state of the ecosystem of the northern Rift Valley will not be restored.

Keywords White rhinoceros *Ceratotherium simum* · Political ecology · Ecosystem restoration · Conservation success · Shifting baseline · Maasai/Masai

H. H. T. Prins (✉)
Department of Animal Sciences, Wageningen University, Wageningen, The Netherlands
e-mail: herbert.prins@wur.nl

J. F. de Jong
Wildlife Ecology and Conservation Group, Wageningen University, Wageningen, The Netherlands

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7.1 Introduction

Pauly (1995) called attention that each generation of fisheries scientists accepts as a baseline the stock size and species composition that occurred at the beginning of their careers, and uses these to evaluate changes. Pauly called it a 'shifting baseline syndrome', because as a result lower targets for 'normality' are consistently set. This shifting baseline syndrome bedevils ecologists and conservationists because they suffer from a paucity of early studies to compare the present state of an ecosystem to earlier, less impacted states (*cf.* Knowlton and Jackson 2008) and hence they cannot know how (a) natural state(s) of an ecosystem should or could look like.

Pauly's observation explains the worrying accommodation of conservationists to the present states of ecosystems that undergo and have undergone human impacts (e.g., Prins 1992; Prins et al. submitted; *pace* Rohde and Hilhorst 2001). If one would desire to restore areas, a fundamental problem is then knowing the appropriate baseline for restoration or for rewilding attempts (Jepson 2016). Often, it is difficult to establish which species have been lost (Venter et al. 2014); even more arduous is to assess how numerous populations were in the past. Yet, the desired endpoint for restoration critically hinges on knowing both the original (i.e., prior to significant human impact) flora and fauna plus their densities so that the desired trophic structure can be determined (Sinclair et al. 2018).

In the African conservation context, most attention is given to the battle to prevent the (local) extinction of species, but much less to the restoration of lost splendour. Partly, that is because too many ecologists apparently do not recognize what has been lost already – not only in areas subject to agricultural conversion, but also in the protected areas. For many years, researchers warned that because parks were becoming "islands in a sea of cultivation" they lose species (*pace* Prugh et al. 2008). History speaks for itself: the reality of eastern and southern African parks is a loss of mammal species during the last century (Prins and Olff 1998). Often, historical sources are insufficient or biased (e.g., Venter et al. 2014). Reconstructing population sizes is even more operose but also more perilous than determining which species were lost. A case in point is the Greenland – Spitsbergen Bowhead whale (*Balaena mysticetus*) population that currently stands at a few hundred individuals but was historically about 50,000 animals (Hacquebord and Leinenga 1994; Allen and Keay 2006). We do not know with much precision how many American bison (*Bos bison*) there were prior to their wholesale slaughter first by Native Americans and then by European settlers, but they were more numerous than perhaps could be imagined today. This shifting baseline syndrome demonstrates the importance of long time series of population counts (e.g., Prins and Douglas-Hamilton 1990; Kiffner et al. 2017; Dornelas et al. 2018). For the northern Gregory Rift of Tanzania (hereafter "Tanzania's Rift Valley"), we can, however, guestimate what was lost because of the high quality of the historical sources.

The natural history of wildlife of Tanzania's Rift Valley is entangled in the history of the local inhabitants and the western colonizers. For millennia this area has been inhabited by groups of people of various ethnicities and by cultural entities.

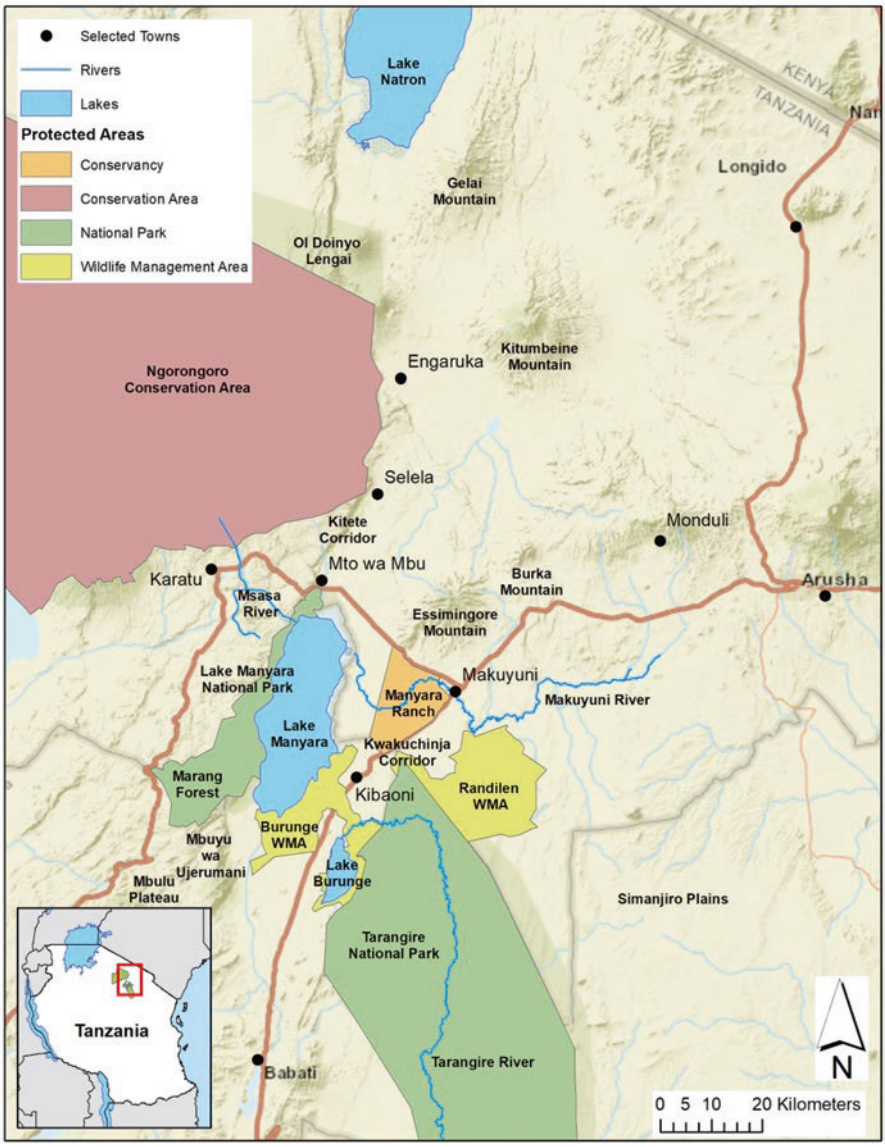

Fig. 7.1 Map of Tanzania's northern Rift Valley with locations of names mentioned in the text. (Map created by Jason Riggio)

Here, we reconstructed the natural history of wildlife of Tanzania's Rift Valley, which includes the Tarangire Ecosystem that is the focus of this book (Fig. 7.1), and discuss current conservation efforts and prospects.

In so doing, we (i) show how drastically species, communities and population abundances can change over the course of few human generations; (ii) show how

complex the history of wildlife populations is, even in the last few centuries; (iii) illustrate how sparsely knowledge that exceeds two generations is passed on, and hence how easily the previous state (or even a natural state) of an area is forgotten; (iv) illustrate how cumbersome it is to reconstruct the previous state; (v) discuss how the aforementioned points lead to shifting baselines among conservationists; and (vi) argue that the amalgamation of shifting baselines with a well-intended appreciation of the needs of local people leads to celebration of an impoverished natural state as a conservation success.

7.2 The End of Prehistory in the Rift Valley

What did Tanzania's northern Rift Valley look like before settlement by modern pastoralists and agriculturalists? Rock art and archaeology provide a clue. An insightful archaeological site is Engaruka (Fig. 7.1) (and an unnamed site closer to Mto wa Mbu [Gillman 1944] which has not been investigated yet). At Engaruka, irrigated agriculture was carried out until about 1670 CE at a (for Tanzania and Kenya) unprecedented scale of 20 km^2, but then decreasing water yields from the Mbulu Plateau diminished agricultural output. Extensive dry-stone walling was employed to create channels and fields (Sutton 1984, 1990). For its demise, failing agriculture at that time can be ruled out (Lang and Stump 2017), so perhaps it was warfare with the very first of the nomadic pastoralists (possibly Maasai) coming into the Rift Valley that led to its final abandonment (Sutton 1984, 1998). This large settlement of perhaps 5000 people (Sutton 1984) likely had a negative impact on especially black rhinoceros (*Diceros bicornis*) and African elephant (*Loxodonta africana*) in the area of the Escarpment (note that in northern Tanzania, the Rift Valley is bounded by one escarpment, at the West only).

Approximately contemporary with Engaruka culture is the unique collection of rock art from Kondoa and Singida (at the southern edge of the area under scrutiny in this chapter) represented by some 500 sites with about 5000 paintings. This naturalistic art tradition stretched towards Manyara and Arusha (Bwasiri and Smith 2015). The most common depicted animals were cattle (*Bos* spp.), giraffe (*Giraffa camelopardalis*), greater kudu (*Tragelaphus strepsiceros*), common eland (*Taurotragus oryx*), and 'indeterminate antelope'; less so African elephant, black rhinoceros, plains zebra (*Equus quagga* a.k.a. *E. burchellii*), blue wildebeest (*Connochaetes taurinus*), African buffalo (*Syncerus caffer*), hartebeest (kongoni; *Alcelaphus buselaphus*), waterbuck (*Kobus ellipsiprymnus*), reedbuck (*Redunca arundinum* or *R. redunca*), roan (*Hippotragus equinus*), sable (*H. niger*), and Suids; further felids, hyena (apparently *Crocuta crocuta*), baboon (*Papio cynocephalus*) and ostrich (*Struthio camelus*) (Masao 1976; Bwasiri and Smith 2015). Probably, they were made by local hunter-gatherers (like today's Hadza or Sandawe: Bwasiri and Smith 2015). In those recorded by Leaky (1983), it appears that not only black but also white rhinoceroses (*Ceratotherium simum*) were depicted. White rhinoceroses were recorded in recent fossil sites of northern Tanzania (Geraads 2010),

suggesting that this grazer had rather recently been lost from this ecosystem. Its extinction may have coincided with the expansion of Bantu-speaking people into the areas east of the River Nile about 2000 years ago (Moodley et al. 2018). It also matches the arrival of pastoralism in the Rift Valley (Prins 2000 and references therein) and the establishment of the current climate in this region. Indeed, white rhinoceros remains have been found near Lake Nakuru in Kenya just north of the Tanzania's Rift Valley (Gifford-Gonzalez 1998). The Grévy's zebra (*Equus grevyii*) had disappeared from northern Tanzanian grasslands earlier (Faith et al. 2013) even though one vagrant individual was seen in the Rift Valley between Manyara and Essimingore in 1960 (Warden's Reports 1960). Sable (also depicted in the rock art) nowadays occur further south although the habitat at some places in the northern Rift Valley still may be suitable (Boitani et al. 1999, pp. A-956 ff.).

Of course, East Africa being the cradle of mankind, hunter-gatherers had been present in the watered parts of northern Tanzania for a very long time. The last stage was a microlithic culture lasting some 40,000 years (see, e.g., Diez-Martín et al. 2009). Microlithic tools were used by hunter-gatherers but, later, also by pastoralists (Goldstein and Shaffer 2017). Before the eighteenth century, the foot of the escarpment was settled by the "il Datwa lol Orokishu" (likely Iraqw), the "il Datwa lol Kuroto" (likely Mbugwe) and the Sonjo (Fosbrooke 1948). They were agropastoralists practicing some irrigation. Around 1850, Maasai invaded the Crater Highlands and eliminated the Barabaig from the Ngorongoro Crater (Fosbrooke 1972). Around 1806, the Maasai defeated an ethnicity named "Il-Adoru" in the Rift Valley; 'Manyara' was probably an "Il-Adoru" name Fosbrooke (1948). Local oral history also recalls that ancestors of the Iraqw lived on the northern shores of Lake Manyara in the early 1800s. Their leader was Moya (a son of Chief Tipe), after whom Manyara was named. An Iraqw elder in 1982 equated those "Il-Adoru" with the "Hhay Lori", a clan of the Iraqw, now living around Mbulu town (Mr. Tseama Pissa pers. comm.), as eponymy of Lori, who was the brother of Chief Tipe.

Fosbrooke (1972) suggests that these "Il-Adoru" were either Datooga or Barabaig (note that the "Hhay Jorojik" – one of the clans of the Iraqw – is an incorporated group of Barabaig). Chief Tipe's people at the time lived in the Rift Valley, from Magara to Kondoa (pers. comm. Messrs. Tseama Pissa and Sjabaan Swalleh 1984; for caveat see Rekdal 1998). According to them, the Mbugwe (a Bantu-speaking tribe) came from Kisange and pushed northward. Hence these Iraqw settled on the plateau to the west of the escarpment above Magara (where many lived already before; see Widgren and Sutton 2004) (Fig. 7.1). The lineage of these chiefs is Tipe – Jandu – Bea – Banga – Isara – Nade – Shauri. Shauri was chief from 1961 to 1964 and then became the local Chairman of the ruling political party. Assuming an average generation duration of 25–30 years, Tipe became chief sometime between 1774 and 1809, agreeing with Fosbrooke's (1948) reconstruction of the 1806 Maasai victory. The oldest stand of *Vachellia* (formerly *Acacia*) *tortilis* in the area dates from about 1780 (Prins and Van der Jeugd 1993). These trees may have germinated when the Iraqw withdrew their livestock from the Rift Valley floor. Knowledge about a changing species composition or numbers of large herbivores is lost: conclusions about a shifting baseline (apart from the local extinction of Grévy's zebra,

white rhinoceros and possibly sable in addition to some modification of the landscape by cattle and small stock) cannot be drawn from prior to 1800 yet.

In the arch between Lake Manyara and Mount Monduli, another pastoral ethnicity was supplanted by Masai coming from the north at the beginning of the nineteenth century (Fosbrooke 1948). It appears Maasai did not penetrate much further south than the present-day boundary between the Acacia steppe and the Miombo woodlands. Those who penetrated further south were recalled by their "spiritopolitical leader" (the Laibon) (Fosbrooke 1948). This other agropastoral ethnicity may have been the Kavim or Lumbwa; yet it is also possible that they were a section of the Maasai that had been defeated in one of the internecine wars of the early nineteenth century (see Fosbrooke 1948). The name "Lumbwa" is perhaps merely a derogative name for people of Maasai affiliation who practice agriculture (Barton 1923) and thus not an ethnicity. They dug deep wells (at the southern end of the Simanjiro Plains), smelted iron and made pottery. As compared with earlier times, it is now much more appreciated that pastoralism cannot develop without barter with agriculturalists who produce surplus. We thus would not be surprised if the "purely pastoral lifestyle" of the nineteenth century Maasai developed because agriculturalists increased their production, perhaps stemming from the adoption of maize from the New World. Indeed, before the building of railroads (1893 in Tanganyika; 1896 in Kenya) and roads for motor cars (between 1890 and 1910: for cars in Tanganyika see Grace 2013), caravans of (male and female) porters brought maize from the coast, and it became a staple only around 1880 in the interior of East Africa (Miracle 1965).

Little is known about the impact on wildlife populations of feeding the caravans carrying ivory and transporting slaves from the interior to the coast. Fouquer (1966) estimates that annually 50,000 wild animals had to be shot to provide food for the caravans that carried the ivory for *just the London market alone* (Fouquer 1966). He quotes 500,000 porters every year passing through Tabora (Fouquer 1966). On average, a porter carried 25 kg (Beachey 1967). Considering that other important markets were Antwerp and Bombay but also towns in China and Japan, the slaughter of wildlife must have been enormous. Therefore, the second half of the nineteenth century experienced appreciable reductions in wildlife numbers in the Rift Valley. While published knowledge of the interior of East Africa was still scant before the explorers of the 1880s (see Goodrich 1849; in contrast to West Africa: Levtzion and Hopkins 2000), Arab traders went far into the interior, and often stayed there for years on one trading-cum-slave buying expedition (Osgood 1854). Already then it was predicted that the elephant would go extinct from indiscriminate killing (op. cit. pp. 55). Some information was published about the abundance of wildlife species, e.g., African buffalo (Goodrich 1875, pp. 490). When the elephant numbers diminished at the coast, the first ivory traders went into Masailand in 1840s; Maasai at that time were heavily engaged in the trade with about 1000–1500 tusks a year (Beachey 1967). The export though Zanzibar was ~220 tons in 1859 (reflecting c. 4000 shot animals), and stayed at about that level until 1890 after which it declined to about 65 tons (reflecting c. 1500 shot animals) per year (Beachey 1967). The killing

moved farther and farther into the interior (see Steinhart 2000), leaving depleted African elephant populations behind. This must have happened in Masailand too.

7.3 The Great Rinderpest of 1887, Smallpox of 1889 Followed by Cholera

With outside traders, colonizers and invading armies opening the interior, the Rift Valley became exposed to virulent diseases from overseas. The outbreak of the rinderpest epidemic (killing specifically ruminants) was associated with a particular lunar eclipse thus allowing it to be dated to 1887. The disease arrived with a British invasion army from India (Prins and Van der Jeugd 1993; Roeder et al. 2013) or an Italian invasion army (Spinage 2017). It nearly coincided with or was followed by a smallpox epidemic that killed numerous Maasai (Paterson 1909; Marieni Ole Kertella in Hanley 1971). Smallpox epidemics had been occurring regularly (Imperato and Imperato 2014; *cf*. Marieni Ole Kertella *ibid*.). The early nineteenth century form was mild, but aggressive strains were imported through Muscat in 1857 (Issa 2006). The smallpox epidemic of 1890 raged at least as far as Uganda (Peters 1891). Also a virulent cholera strain, which came from India through the dhow trading network and pilgrimage to Mecca, spread along the caravan networks (see Christie 1876; see more on the caravan network of the Arabs for instance Peters 1891, pp. 364; Unangst 2015; Beachey 1967). The northern Rift Valley, however, lay far to the north of the major trade link (between Bagamoyo and Tabora and later Ujiji: *ibid*. pp. 52 ff.) and it took years before cholera reached northern Tanzania in 1870; people died within hours after the first symptoms developed (Issa 2006). The extent of human mortality and resulting depopulation of northern Tanzania will never be known, but must have been vast (see Kjekshus 1977).

The famine of the 1890s decimated the Maasai. Some sections could survive because they turned to (irrigated) agriculture, e.g., the Engaruku section of the Maasai (Fosbrooke 1972). Peters (1891, pp. 143 ff) still encountered them "insolently" in central Kenya, as did Thomson a bit earlier (according to Peters 1891, pp. 222) and in December 1889 they still had large herds of cattle (Peters 1891, pp. 229 ff.). However, when Thomson reached Engaruka, he described the same skull-littered landscape in 1895 (cited in Mack 1970) as Merker encountered in 1895 (1910, pp. 348). Baumann (1894) reckoned that two-thirds of all Maasai died, while Unangst (2015, pp. 40) even reckons three-fourths. Many survivors were sold into slavery by neighbouring ethnicities (Merker 1910, pp. 349). Then internecine war between two factions of the Maasai broke out. It is not unlikely that Waller (1978, pp. 77, 1990, pp. 93) correctly concluded that the Masailand was mostly depopulated at the beginning of the twentieth century. Although tragic from a human perspective, this must have had a positive effect on wildlife recovery after the rinderpest and on the spread of the tsetse fly (*Glossinia* spp.) from the pockets of no-man's land described below. The Rift Valley of 1900 was not a 'Paradise Lost' but more a charnel house for man and beast.

7.4 Recovery After the Devastations of the Nineteenth Century

Many wild animal species had become rare at the end of the nineteenth century. The Germans were the first to set up game laws and reserves in East Africa in 1896, limiting the shooting of elephants to bulls carrying sufficiently large tusks (Beachey 1967). Such regulations are typically promulgated when huntable wildlife populations ("game") had declined. During the very early 1900s, the Rift Valley experienced favourable conditions. The valley was free of epidemics, there were no droughts, the tsetse fly had not expanded its range yet, wildlife protection laws came into force, and low densities of humans and their livestock allowed for fast recovery of wildlife. Empty lands soon became filled with wildlife, showing power of population growth.

At the same time however, livestock recovered as well. Patterson (1909, pp. 179) described "*where ten years ago only a very few cattle, sheep and goats were to be seen, now there are thousands*". Of course such a fast rebound is not possible through natural fecundity and undoubtedly livestock raiding played a role too. Yet it is important to realize that the void of the Rift Valley grasslands was more-or-less simultaneously filled by the expansion of wild and domestic herbivores: if the growth of both would go unabated, competition would set in.

There is a hint in the older literature that zebra (being non-ruminants and unaffected by the rinderpest) may have been released from competition during those post-rinderpest years, because Patterson (1909, pp. 168) stated that zebra "*are, alas, now looked upon as little better than vermin and … sportsmen are permitted to shoot them by the score*". According to reports by hunters, black rhinoceroses were very common all over East Africa (e.g., Harrison 1901; Roosevelt 1909; Stigand 1909; Radclyffe Dugmore 1910; Meintertzhagen 1957). Stigand (1909) did not even consider rhinoceros a suitable species for "gentlemen" to hunt: they were too docile and he compared it to as if one were shooting a cow! Or as Ahlefeldt Bille (1948, pp. 246) observed "*they are all too easy a mark … and about as exciting to shoot as the lock of a barn door*". There had been a good market for rhinoceros horn (for the manufacturing of cups and boxes) and rhinoceros skins; the latter was made into shields for Bedouin warriors because these were "impervious to the stroke of a sword" (Osgood 1854, pp. 179). The Baluchi soldiers of the Sultan of Zanzibar also used these shields (pers. comm. A.H.J. Prins; HP found one in 1982 in Mto wa Mbu).

African buffalo started rebounding in the early years of the 1900s, even though their behaviour was nearly exclusively nocturnal at the time (Radclyffe Dugmore 1910, pp. 14). Common eland also rebounded (Radclyffe Dugmore 1925, pp. 257). Other antelope species had recovered even faster (Patterson 1909; Stigand 1909). Johnson (1928, pp. 267) describes the Serengeti: "*tens of thousands of* [wildebeest]; *Thompson's gazelle more numerous than I had ever seen them before; hundreds of Grant's gazelle* [Nanger grantii], *topi* [Damaliscus lunatus] *and kongoni* [= hartebeest]; *ostriches*; *innumerable zebra …*". By the end of the 1930s, many of the wild herbivores were not considered to be threatened with extinction anymore. For the

Convention for the Protection of the Fauna and Flora of Africa (promulgated in 1936: Anon. 1936) some species were considered to be very vulnerable (Class A). Impala (*Aepyceros melampus*), Hunter's antelope (*Beatragus hunterii*), greater kudu and lesser kudu (*Tragelaphus imberbis*) were (still) considered in need of some protection (Class C) but buffalo, plains zebra, white-eared kob (*Kobus kob leucot*is), lechwe (*K. leche*), puku (*K. vardoni*) and indeed white-bearded (= blue) wildebeest were not (CCTA 1953, pp. 43 ff, pp. 128 ff). We think it is safe to deduce from this that these species had recovered well after the rinderpest devastation. In the first decades of the twentieth century, the recovering wildlife populations must have been free from pastoral competition (Prins 1992; Voeten and Prins 1999) because Maasai and livestock numbers were so depressed.

However, Maasai also recovered in numbers starting in the first decades of the twentieth century. Prior to the First World War, the Germans considered them so marginal, that they set aside a tribal reserve for them only to the south of the Moshi-Arusha-Mbugwe line (Fosbrooke 1948). The British removed them from much of their previously occupied lands in the Kenyan Rift Valley far to the north where Samburu now live, far to the northeast where now is Amboseli NP, and from the Ngong Hills into the "Masai Reserve". According to the Treaty between the Maasai and the British government of Kenya Colony (see for the Treaty Text Appendix 2 in Hanley 1971 or the Agreement of 1904 and Appendix 3 for the Agreement of 1911), the Maasai did this "voluntarily" (but see Hughes 2003). They were settled to the north of the border between Deutsch-Ostafrika and Kenya Colony, to the north of the Ngorongoro Highlands and Loliondo (so, some 500 km to the south from where they came from), resulting in much suffering (Hughes 2003); this area was then named the "Masai Reserve" in which people with other ethnicities were not allowed to settle or graze their livestock. Yet, tsetse encroached on this Maasai Reserve too making a sizable part of the Reserve inhospitable to the livestock of the Maasai but offering very good land for wildlife (Ahlefeldt Bille 1948, pp. 70, 104). After the First World War, when Deutsch-Ostafrika was taken over by the British, there was Maasai resettlement across the border but also within present-day Tanzania, and people left their "*native reserves*" (see Fosbrooke 1948). For instance, the Purko section of the Maasai, which at the end of the nineteenth century herded their livestock in the Lake Baringo area, now live between the Serengeti NP and the Crater Highlands (Homewood and Rodgers 1991, pp. 46) (again, some 500 km south from where they lived a few generations ago). They had penetrated even further south into the Ngorongoro area but were removed by the British in the 1920s again (Fosbrooke 1948). At the end of the 1930s, the Monduli, Longido and Ngorongoro areas became practically vacant, after which the Moibo sub-section of the Kisongo proceeded to occupy them (Fosbrooke 1948; *pace* Homewood and Rodgers 1991 (pp. 44 ff)).

It is likely that the Kisongo section of the Maasai, which now claims the lands between Lake Natron, Monduli, the Pare Mountains all the way south to the Nguru Mountains and from there back to Lake Manyara (Homewood and Rodgers 1991, pp. 47) did not have a continuous presence in that area since the end of the nineteenth century (*pace* Homewood and Rodgers 1991) but moved into a vacuum that had been created with the (near) disappearance of another group of Maasai; they may

have persisted along the Pangani River further to the east (see Fosbrooke 1948). It is thus not inconceivable that the "unknown pastoral people" that had occupied large parts of the present-day Rift Valley (Fosbrooke 1948) were simply Maasai from prior to the rinderpest, the small-pox epidemic, cholera and the Maasai internecine war.

The cattle numbers of the Maasai could recover fast because of cattle raiding from Iraqw agropastoralists on, for instance, the Mbulu Plateau (Fig. 7.1). Apparently, these people were less severely hit by the rinderpest and subsequent epidemics than the Maasai. Indeed, when the Roman Catholic 'Society of the Missionaries of Africa' started their post in about 1906, there were about 200,000 Iraqw and some 350,000 cattle (Fouquer 1955; before that time next to nothing was known about this area: Rekdal 1998). Maasai raided to a great extent (pers. comm. Messrs. Sjabaan Swalleh and Tseama Pissa) into the 1980s (pers. comm. Mrs. Margaret Gibb; the 1st author encountered a raiding *moran* party armed with spears in 1983 outside of Karatu; *cf*. Marieni Ole Kertella in Hanley 1971, pp. 286) and may even have continued until the 2010s (pers. comm. C. Kiffner).

For wildlife, the recovery must have depended on their natural rate of increase. In the absence of large predators, one would expect for a Thomson's gazelle (*Eudorcas thomsonii*) a rate of increase of some 50% per year, but for an African buffalo only 8% per year (based on the relationship between body mass and intrinsic rate of increase for mammalian herbivores). Supposing that the rinderpest in 1889 had caused a mortality of 90%, then it would take only 12 years for the Thomson's gazelle to have recovered but about 30 years for the buffalo. Recovery must have been even slower because predators were not susceptible to the rinderpest (Stevenson-Hamilton 1974). It is likely that by 1930 wildlife had recovered well, thus explaining the lack of concern by the delegates of the Convention for the Protection of the Fauna and Flora of Africa in 1953 (NCCA 1953) referred to above. Indeed, on a single hunting permit one could at the time in Tanganyika shoot an unlimited number of lions (*Panthera leo*), leopards (*P. pardus*), hyenas (*C. crocuta* and *Hyaena hyaena*) or zebras. For other species one needed itemized hunting permits (Johnson 1928, pp. 16; pers. comm. Mr. Adam Seif). Arbuthnot (1954, pp. 51) counted wildlife when he was between Lake Manyara and Mt. Essimingore (on a hill close to Makuyuni – perhaps where Manyara Ranch is presently) in 1927: "*On this particular morning, we differed in our guesses by several thousand* [after counting in clusters of 50 animals]*, for animals were grazing over the veldt in all directions. We stood for a long time. Figuratively knocked off our feet in amazement of the staggering amount of game, perhaps hundreds of record specimens that were grazing somewhere on this limitless plain*". Our experience with counting yields an inter-observer difference of some 15%, which in Arbuthnot's words is "*several thousand*". In other words, Arbuthnot and his party are likely to have counted some 40,000 grazing animals in 1927 at this single place.

We posit that the best benchmark for setting a 'baseline' to compare with the present-day wildlife would be 1935. Since that year the ever-growing human population and its associated livestock started negatively impacting wildlife populations, as did the ever-increasing hunting pressure. Later, the War Effort did much damage to wildlife and wilderness too; the War Effort was a concerted action by the Administration of Tanganyika to increase local food production during the Second

World War. Talbot and Talbot (1963) stated that already in the early 1960s the Rift Valley was severely modified since the 1910s through overgrazing and desiccation, and that movements of wild animals were getting severely restricted. They also stated that the area to the southeast of Lake Natron, which had been a game reserve in the German days, was by the early 1960s overutilized by Maasai. Grassland was converted into thorny bush. The overstocking by Maasai cattle was surmised to have led to differential mortality in wildebeest, resulting in a sex ratio of 1 wildebeest male per 2 females and a low calf survival at the end of the 1950s (Talbot and Talbot 1963). The zenith of the Rift Valley's wildlife was definitely over in the 1960s.

7.5 Tribal No-Man's Land and Sleeping Sickness

The term "*tribal no-man's land*" is an important, yet little known concept. These lands frequently formed the nuclei on which during the colonial era forest and game reserves could 'crystallize'. These are literal no-man's lands, on the border between the military, or cultural or economic sphere of influence of some society or other (e.g., Gupta 1971; Coates 2014). Now and then, a raiding party may have entered but cultivation did not take place, and rarely livestock herding. Frequently, memories of the former existence of these tribal no-man's lands have gone with increased pacification. However, at the beginning of the previous century, many of these tribal no-man's lands were still very present in the landscape and important to understanding the spread of trypanosomiasis by tsetse flies that lived in these no-man's lands but not elsewhere (see Ford 1971; Kjekshus 1977).

In the Rift Valley, two of these tribal no-man's lands are known to us from oral history. The first lay to the east-southeast of Lake Manyara, from the Rift Valley escarpment to approximately Lake Burungi. To the north roamed Maasai, and to the south Mbugwe. The Mbugwe (a Bantu-speaking group) were no match for the warmongering Maasai but were renowned for their effective witchcraft and throwing of spells (pers. comm. Mhoja Burengo; see also Gray 1963; Mesaki 1995). Maasai are not known for using witchcraft but force; for more on their culture see Merker (1910) and Spear and Waller (1993). The tribal no-man's land was penetrated sometimes when Maasai went cattle raiding but there were neither Maasai *manyattas* (semi-permanent multi-family fenced traditional Maasai homesteads) nor Mbugwe huts in the area. This tribal no-man's land extended further east from Lake Burungi into the direction of the Simanjiro plains. The old caravan route towards Mbuyu wa Ujeromani ("the German baobab") on the Rift Wall ran through this no-man's land (Wakefield and Johnston 1870).

Another old trade route from the coast to the interior ran to the north of Lake Manyara (as reported by Wakefield and Johnston 1870; see J.L. Krapf's 1849 map: Beard 1988) and was pointed out to the 1st author in 1982 as running up the escarpment near to Msasa River. Both routes were frequented by "Arabs" from the coast. Their previous campsites are marked by *Tamarindus indica* trees (pers. comm. Mohenjo Burengo; Sjabaan Swalleh). Possibly, large baobab (*Adansonia digitata*) trees are indicative of Arab staging sites like they are on the coast (pers. comm.

A.H.J. Prins) but suggesting that they would be indicative of ancient settlements in Tarangire is without base for the interior (*pace* Årlin 2011, pp. 63). This trade route passed through the second tribal no-man's land, which was between the plateau on top of the escarpment and Lake Manyara itself. To the north and east of the lake lived pastoral Maasai, but on the plateau above lived Iraqw (a.k.a Mbulu) people. Old Iraqw men told us how they as young men would hunt black rhinoceros in what is now Lake Manyara National Park (further abbreviated as LMNP). A group of about 20 men would descend the escarpment, and set themselves up in a double picket line at two sides of a game trail leading upslope. The swiftest runner would stalk a black rhinoceros and entice the rhinoceros to chase him up the slope towards his mates. The rhinoceros would then be stabbed from both sides (pers. comm. Sjabaan Swalleh). The meat of the calves was especially delicious (pers. comm. Tseama Pissa). Further to the south, Barabaig would sometimes descend into the area at the foot of the escarpment (pers. comm. Tseama Pissa). There was no recall of any Maasai *manyatta* in the present day LMNP to the south of where now is Mto wa Mbu. A group of Maasai elders in 1982, who were then about 60 years old, recalled hunting for small animals and birds to the north of Ndala River but no *manyattas*. They also recalled women collecting raffia palm (*Phoenix reclinata*) fonds and palm sap for making wine but no herding.

A third tribal no-man's land may have been between the Pangani river, Naberera and Tarangire. This is the area that we believe Hemmingway (1936) hunted in (Fig. 7.2).

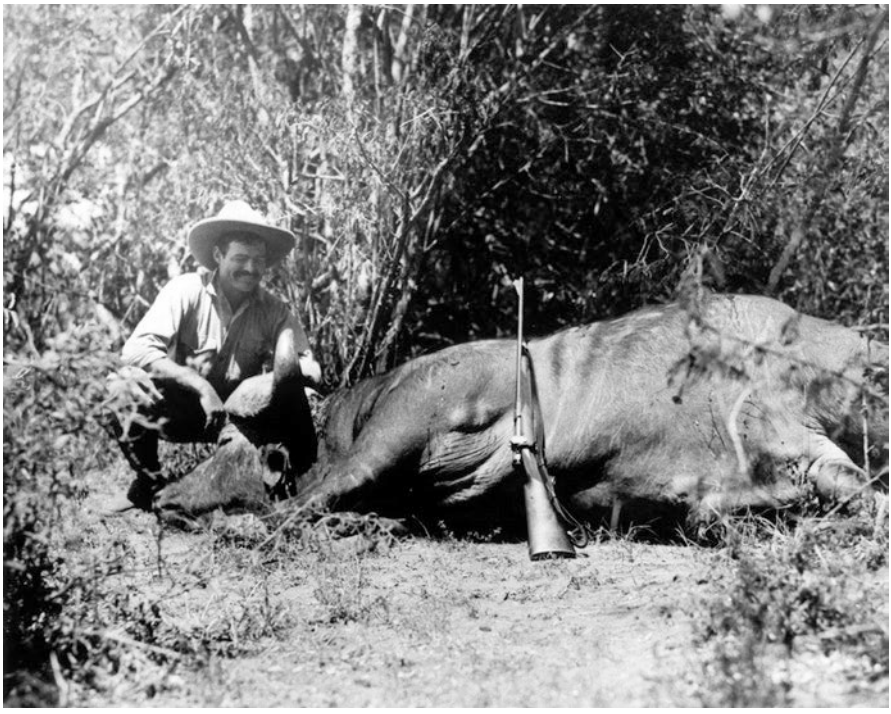

Fig. 7.2 Ernest Hemmingway with a buffalo shot in 1933. (Ernest Hemingway Photograph Collection/John F. Kennedy Presidential Library: public domain)

These tribal no-man's lands became foci for tsetse fly infestation and sometimes sleeping sickness and trypanosomiases (Ford 1971). Tsetse then kept livestock out, and so did sleeping sickness: trypanosomiases (a.k.a. nagana) prevented ox ploughing, or donkey populations to build up and sleeping sickness reduced labour available for hoeing. Details are in the chapter of **Bluwstein** (Chap. 2). Nagana killed for instance about 800,000 pack animals during World War I in Tanganyika (Ahlefeldt Bille 1948, pp. 145). To the north of Lake Manyara, tsetse flies made their appearance sometime at the beginning of the twentieth century. The Maasai who had by now many thousands of cattle there lost more and more grazing opportunities "*due to the insidious spread of the tsetse fly. No less than three species of this malevolent insect now* [1940] *occupy land which was formerly the home of thousands of head of cattle, and today only three Masai bomas remain. Unless the fly can be eradicated it seems likely that once again 4/5th of Lake Manyara will be tenanted only by waterfowl and big game*" (Watermeyer and Elliott 1943). Near Mto wa Mbu the fly was observed in 1921 (Radclyffe Dugmore 1925, pp. 30). Also in the Mbugwe area to the south of Lake Burungi, sleeping sickness arose, after tsetse moved into the area around 1925 (Årlin 2011). From 1942 onward there were outbreaks of sleeping sickness, and the government initiated clearing campaigns and forced people to move (Årlin 2011). In 1948, the Mbugwe were even reported to be dying out (Harris 1951) perhaps from sleeping sickness. In 1966, most of this resettlement out of the area was fulfilled (Årlin 2011, pp. 97). Sleeping sickness foci proved to be persistent in the 1950s (Glover 1967). The disease is often fatal (Baldry 1972), and new medicine has not been developed (Brun et al. 2010). It still has not been eradicated (Jelinek et al. 2002) despite attempts by Tanzania National Parks (Muse et al. 2015) The human trypanosomiasis was not found to the West of Tarangire anymore (Salekwa et al. 2014).

7.6 Establishing the Baseline for Lake Manyara National Park

In the northern part of Tanzania's Rift Valley (Prins 1987), there are presently two protected areas, namely LMNP and Tarangire National Park (hereafter TNP). IUCN (2021) defines protected areas as "*Large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area*", and gives as two of the objectives (i) "*to manage the area in order to perpetuate, in as natural a state as possible, representative examples of physiographic regions, biotic communities, genetic resources and unimpaired natural processes*", and (ii) "*to maintain viable and ecologically functional populations and assemblages of native species at densities sufficient to conserve ecosystem integrity and resilience in the long term*". Here the baseline discussion, as flagged by Pauly (1995), becomes pertinent. How close is LMNP still to its baseline? The IUCN definition suggests that one ought to take as baseline the natural state of an ecosystem, or some state closely resembling it. However, can one know such a state in the East African environment where people have been operating since the dawn of time?

Actually, LMNP is at present far from "the natural state" and perhaps there is even more than one "state". When Otto Baumann traversed what is now LMNP in 1892, his map was so reliable that we could locate the three mapped hot springs, although only two were known by the park management in 1981. Intriguingly, while Baumann was charged to make an inventory of marketable products and timber, he failed to signpost the groundwater forest directly to the south of Mto wa Mbu despite taking the caravan route up the escarpment towards his discovery of the Ngorongoro Crater a few weeks later (Watermeyer and Elliott 1943). Presently, the forest holds good stands of *Celtis africana* (white stinkwood) much of which was felled for timber in the 1950s (see Loth and Prins 1986) as was *Milicia (Chlorophora) excelsa* (African teak; Greenway and Vesey-Fitzgerald 1969). Baumann came from the southern end of the lake through Mbugwe land fully occupied by people then (Watermeyer and Elliott 1943). Yet, Baumann mapped the present groundwater forest as "umbrella acacias". We offer three explanations for this discrepancy. First, he suffered from malaria those weeks (*dixit* his diary). Second, he was distracted by raiding Maasai (Watermeyer and Elliott 1943). Or third, there was indeed no forest. Perhaps some tectonic movement brought water-bearing layers to the surface, thus irrigating a few square kilometres and creating a new groundwater forest. Actually, the underground hydrology of this area is quite complicated (Loth and Prins 1986), and sudden cracks in the rift valley floor arise occasionally (pers. obs.). This option is supported by the description of "*abundant evidence of sudden and local terrestrial movement*" (Watermeyer and Elliott 1943). Forest in this wider area may have been lacking in temporal permanence (Butynski and De Jong 2020). The finding that Lake Manyara's gentle monkeys (blue monkey: *Cercopithecus mitis*) are morphologically undistinguishable from those of the Crater Highlands to the west and quite distinct from those further east (Butynski and De Jong 2020) provides more evidence that the forest may be young and that the monkeys expanded their range recently.

Unfortunately, Baumann (1894) did not give much information on the large mammal fauna. Importantly, though, he refers to many black rhinoceroses in the area but not to African elephant. Yet, at the end of the 1920s, elephants were present in the forest, where it was then too dangerous to hunt them (pers. comm. Adam Seif, who had been professional hunter's guide before WWII; Arbuthnot 1954). When the British started governing Tanganyika as mandated territory, they had closed hunting to foreigners at least until 1921 (Radclyffe Dugmore 1921). When the area became a Game Controlled Area in 1930, wildlife was so plentiful in what is thus presently LMNP, but also in other GCAs in northern Tanganyika, that one only needed a license for shooting lion, black rhinoceros, leopard, buffalo and elephant, but all other game was free till 1945 (pers. comm. A. Seif). Drinking water was plentiful, and rivers carried crystal clear water all year round while there were no signs of erosion (pers. com. Adam Seif; Radclyffe Dugmore 1925). This is in stark contrast with the situation since the 1980s, thus proving Rohde and Hilhorst (2001) erroneous: photographs from 50 years ago are not sufficient to prove that there was little environmental change.

The reduced discharge of river water into LMNP as a result of increasing human pressure on the Mbulu Plateau may have decreased the grass production in the park too. For instance, the *Sporobolus consimilis* vegetation of the 1960s (Greenway and

Vesey-Fitzgerald 1969) had nearly completely disappeared in 1982 (Loth and Prins 1986). Likewise *Odyssea jaegeri* had almost vanished between these two surveys, also indicative of less flooding, and *Chloris gayana* was much less prevalent. Even the papyrus swamp, which had been so important for common reedbuck (*R. arundinum*) in the past, was negatively affected (Warden's Reports January 1961). This was confirmed by the Maasai elders in 1982 referred to above.

The area became a Game Reserve in 1955 even though the Colonial Administration had considered turning it into agriculture; indeed, the area to the south of the Endabash River had been a ranch (until about 1960), and further south there had been coffee and papaya plantations (pers. comm. HRH Prince Bernhard, Mr. E.H. van Eeghen; who were landowners until about 1970). The proclamation of Game Reserve was done very carefully (pers. comm. Sir Hugh Elliott, former Permanent Secretary of Tanganyika Territory; Warden's Reports 1958). It comprised an inventory of usage and native rights, then an assessment of the annual value which was then multiplied by ten, a series of community meetings to find agreement with the local community, and thence a plan to pay out the capitalized value of those rights after which the extinguishment of native rights was promulgated. This was also done with the community of Mto wa Mbu, which, in exchange for this extinguishment, received a dispensary and a school. In 1960, the Game Reserve became a national park. Yet, the area of the park had lost large mammalian species between the 1930s and 1970s, and the vegetation changed. The protected area then extended further to the northeast then presently, all along the northern shore of the Lake. There, in 1959 and again in March 1963, a herd of 30 fringe-eared oryx (*Oryx beisa*) was seen. Black rhinoceroses were still common. In September 1959, blue wildebeest walked through the lake and were seen in their thousands. In November 1959 there were 3500, in July 1960 their number swelled to some 4500 and even up to 7000 were counted (Warden's Reports: July and September 1961; October 1962). Between the lake and Mt. Essimingore there were still numerous Grant's gazelle and Thomson's gazelle. A group of 150 elephants moved down from the Marang Forest on the Mbulu Plateau in March 1960, indicating there was still a seasonal movement of elephants at the time (Warden's Report April 1961).

In the 1960s, African wild dogs (*Lycaon pictus*) in LMNP and cheetahs (*Acinonyx jubatus*) were reported in LMNP. Hartebeest and eland moved down from the Karatu area (June 1961; August 1964) and also zebra still occurred on the Mbulu plateau (October 1964). Thomson's gazelle could be numerous (1000 counted in February 1962), and numerous zebra, eland and hartebeest were reported from the area immediately to the north of the Park (June 1965). In the 1930s, large groups of eland frequented what is now LMNP, and lesser kudu still occurred here (pers. comm. Mr. Adam Seif). This shows how LMNP was linked to the area South of the Ngorongoro Crater which was still full with wildlife even though agriculture was expanding fast since the War Effort and subsequent *ujamaa* (i.e., the cooperative economics that resulted in 'socialization' of agriculture in the 1970s and 1980s).

In 1970, the elephant population of LMNP still could range from the Mbulu Highlands above the escarpment, move up and down to the Marang Forest and range to the Magara Farms to the south of the park; however, they were believed to have been compressed later (Lake Manyara Elephant Meeting 1970) and it was

concluded that LMNP was too small to be ecologically viable for elephants unless it was managed. From Iain Douglas-Hamilton's (1972) dissertation research, it is clear that by then the elephants had become resident in LMNP. At the time, it was concluded that the high elephant density (some 5 per km^2) was the result of "*rapid contraction of the elephants' range over the preceding 50 years in competition with human settlement*" (Douglas-Hamilton 1973). With hindsight, we do not think there is any evidence for that conclusion. Indeed, the high density was maintained and even further increased in the years until poaching started in 1983 (Prins and Douglas-Hamilton 1990). We think the correct conclusion is that LMNP became a new ecological optimum for elephants, and because of the then-raging debate about overpopulation and overbrowsing by elephants as result of 'the Tsavo Drought', Douglas-Hamilton was coerced into this conclusion at the time (as stated by Owen 1970). Watson and Turner (1965) similarly referred to the compression of wildlife, especially of elephant and buffalo, but also without evidence and warned of the animals exceeding the 'carrying capacity' (*the* issue of those days) of LMNP. A thorough survey led to the conclusion that actually the park was in a healthy state and that there was no concern for overgrazing or overbrowsing (Vesey-FitzGerald 1973). The Warden's Reports of the 1960s did not provide any evidence of this 'compression' and animals moved in and out freely. Mwalyosi (1990) concluded that even if the compression idea held, it was of no serious consequence for the trees because the regeneration was high enough, which was confirmed by Prins and Van der Jeugd (1992, 1993).

In the early 1980s, elephants still moved up and down the escarpment to forage at night on the plateau (pers. obs.; Kalemera 1987) and movements (also of buffalo and lion) were still taking place via Mbulumbulu to and from the Crater Highlands (Prins 1987). Even though the Upper Kitete – Selela Corridor (now about 1 km wide only) is encroached upon and shrinking, it is still used by elephant and buffalo (Mangewa et al. 2009). Yet, reaching LMNP from the Crater Highlands gets increasingly difficult through the expanding town of Mto wa Mbu. Caro et al.'s (2009) assessment that this corridor was critically threatened must be right, but the predicted disappearance by 2018 has not come true (yet). Lohay et al. (2020) found that the Rift wall has also had a negligible influence on genetic differentiation of elephants between Lake Manyara and the Ngorongoro Conservation Area, indicating they are not only moving between these areas but likely still interbreeding as well.

Buffalo from LMNP still went to Mt. Essimingore (and were driven back) (Warden's Report March 1960) and then moved to Tarangire (*ibid*. May 1960) but then returned (*ibid*. July 1960). That interchange came to a stop somewhere in the 1960s (Prins 1996, pp. 72 ff.).

The sheer existence of LMNP was challenged from the first days. The northeast corner of LMNP was excised and handed over to Maasai in 1960; later, in the 1980s, it was converted to irrigated agriculture (financed by the World Bank). When a severe drought hit, the District Officer of Monduli asked for access to LMNP for Maasai to graze their cattle (Warden's Reports January 1961): access was denied. Intriguingly, poaching of black rhinoceros was substantial at the time (Warden's Reports 1960–1961). A senior ranger (Mr. Mhoja Burengo, pers. comm 1982) told

us that this was mainly for meat, which was distributed amongst the villagers. In later years, when horn harvesting became the sole reason for poaching of black rhinoceroses, only the kidneys were collected for consumption. All spearman were Iraqw from the Mbulu District. At the end of the 1960s, the total number of black rhinoceroses in LMNP had decreased from about a hundred to about 50 (Vesey-FitzGerald 1973) or fewer (Prins and Douglas-Hamilton 1990 and references therein). Black rhinoceros went extinct in 1986 in LMNP.

However, not only the black rhinoceros went extinct in LMNP: common eland, hartebeest, oryx, and Grant's gazelle are gone, and there is no substantial lesser kudu population anymore. It appears that the mountain reedbuck and common reedbuck are functionally extinct too while they were very common in the 1980s. It is likely that bat-eared fox (*Otocyon megalotis*) are extinct. In the early 1980s it still denned there and raised pups (pers. obs.) but a year-long camera-trapping survey in 2016 did not detect them (Steinbeiser et al. 2019). Perhaps one may add the African golden cat (*Caracal aurata*) to this list of species that went extinct. Of this species very little is known, and recently it has not been camera-trapped in LMNP; it was observed by the first author in 1983 on the lower edge of the Marang Forest (grey phase). Local farmers along the edge of the Ngorongoro forest near Karatu also identified it after viewing pictures, not confusing it with African wild cat (*Felis sylvestris*). The elusive African golden cat has quite a wide distribution in similar habitats in Kenya (Butynski et al. 2012).

The important message is that in LMNP all these species went locally or at least functionally extinct; but also that the vegetation changed, permanent rivers became ephemeral, and water quality decreased. The annual migration of blue wildebeest stopped in effect and the population became mostly resident the resident population still may still have some genetic exchange (Morrison and Bolger 2014); Grant's gazelles and oryx do not annually visit the park anymore; there is no more buffalo movement between Manyara and Tarangire and finally the elephants became to all extent resident. In other words, 70 years of preservation could not prevent or halt pervasive changes to species composition and ecosystem functioning, and LMNP is now far removed from its 1935 baseline.

Objections against these stark conclusions may stem from the fact that vagrants are still observed now and then, reminding one of the once-extensive movements of individuals. As such they actually serve as an archive of conservation failure. Yet at the same time, these vagrants may enable the revival of historical migratory routes (*cf.* Mooij et al. 2008) because if this knowledge is lost such revival may take perhaps a hundred-odd years (*cf.* Jesmer et al. 2018; Merkle et al. 2019).

7.7 The Shifting Baseline of Tarangire National Park

The other national park in the ecosystem is Tarangire National Park (TNP: ~2600 km^2). It is about twenty times larger than LMNP (of which the present-day Rift Valley bottomland is ~168 km^2). Did this park change as dramatically as

LMNP? It is worth quoting Vesey-FitzGerald (1972) at length "*Tarangire was a game reserve until recently, 1969. It has always been a dry season concentration area for animals moving in from a wide area in Masailand. Increasingly so in recent years the harassment of animals in Masailand has been mechanised; yearly wild fires from all directions sweep across the park. The existing situation is therefore one in which there is too much grass (of the wrong sort at the wrong time) for too few animals.*…. [thus maintaining] *fire subclimax grasslands …* [I]*f the prevailing fire impact is prevented, the course of succession will proceed through wooded to a woodland or forest formation. The animal impact is seldom evident on secondary grasslands; a grazing mosaic is seldom well developed. This is because at the onset of the rains when the new grass grows and is palatable, there is likely to be too much of it for too few animals. When the grasses mature they usually become fibrous and unpalatable and so are neglected, and other parts of the range will then be frequented…. The course of succession is truncated and maintained as a grassland formation by annual dry season fires. Frequently there is no animal community available to utilize the extensive fire sub climax grasslands that have been caused by overburning*". This shows that Vesey-FitzGerald (1972) was aware of the issues at stake in Tarangire. In other words, 'compression of wildlife' would have led to different vegetation rather than the dwindling of animal populations that in reality took place. But this insight does not help in formulating the baseline.

Lamprey et al. (1962) and Lamprey (1964) arrived at a total number of large wildlife for the resident game and migratory game combined that was anchored on the Tarangire River during the dry season of only about 20,000 large mammals, most of which were wildebeest and plains zebra; he estimated the density to be 60x lower than in the Serengeti at that time. He pointed out that the water of Mt. Meru was used for irrigated agriculture and the water of Mts. Gelai and Kitumbeini (Fig. 7.1) were depleted by Maasai cattle. Near European farms, there was heavy hunting, and livestock of pastoralists competed with the wildlife. His estimate did not include the resident Kirk's dikdik (*Madoqua kirkii*), steenbok (*Raphicerus campestris*), warthog (*Phacochoerus africanus*), waterbuck, impala or lesser kudu. Lamprey (1964) observed that the northeast corner of LMNP was an important cornerstone also for Tarangire, as was confirmed by the Warden's Reports from the time for LMNP. Yet, that part of LMNP had been excised and handed over to the Maasai for grazing in 1960. It is possible that Lamprey was underestimating, because Ecosystems Ltd. (1980) estimated a total number of wild large mammals of about 120,000, with the number of species as reported in Table 7.1. These animals were using some 20,000 km^2. The total number of large mammals in the Serengeti (about equal in size) was at that time about 2.2 million (Houston 1979) (Table 7.1). Yet, even with much better aerial survey estimates, the density of large mammals in Tanzania's northern Rift Valley was about 20x lower than in the Serengeti. Perhaps the vaccination of cattle against rinderpest (thus protecting wildlife: Sinclair 1979) had had a faster effect in the Serengeti where the interface between wildlife and livestock was much more limited, because it is noticeable how relatively more depressed the wildebeest and buffalo numbers were in the northern Rift valley (Table 7.1).

Table 7.1 Large mammals of Tanzania's northern Rift Valley and the Serengeti Ecosystem (both about 20,000 km^2) at the end of the 1970s

	Inside Tarangire N.P.	North of Tarangire N.P. (Lolkisale)	East of Tarangire N.P. (Simanjiro)	Total for the northern Rift Valley	Total for the Serengeti Ecosystem	Ratio between Serengeti and Northern Rift Valley
Zebra	0	1005	30,839	31,844	240,000	7.5
Impala	6422	7869	16,445	30,736	119,100	3.9
Wildebeest	397	0	24,066	24,463	720,000	29.4
Hartebeest	1092	2242	3359	6693	20,700	3.1
Topi	0	0	0	-	55,500	
Buffalo	101	450	5477	6028	108,000	17.9
Eland	936	193	4378	5507	24,000	4.4
Thomson's gazelle	593	0	3035	3628	981,000	270.4
Grant's gazelle	936	579	1736	3251	6000	1.8
Elephant	2891	0	0	2891	4500	1.6
Giraffe	819	115	1736	2670	17,400	6.5
Warthog	1014	309	603	1926	34,200	17.8
Oryx	40	443	551	1034	n.c	
Lesser kudu	162	0	157	319	0	
Common reedbuck	0	0	157	157	n.c.	
Greater kudu	0	0	39	39	0	
Gerenuk	0	0	39	39	0	
Total	15,403	13,205	92,617	121,225	2,330,400	19.2

Topi do not occur to the east of the Rift, and oryx are very rare to the west of the Rift. *nc* not counted. Waterbuck, greater kudu and black rhinoceros were already too rare to count. The data of Tarangire and the northern Rift Valley are from EcoSystems (1980); those of the Serengeti from Houston (1979). The overall ungulate density in the northern Rift Valley was about 20 times lower than that of the Serengeti

In their much-quoted book, Homewood and Rodgers (1984) optimistically and without quoting sources stated that there are no known cases of extermination of wildlife by pastoralists, and also that there was no evidence that livestock increased in numbers to the detriment of wildlife (*pace* Prins 1992; Scholte et al. 2021). That may be true, but we do assert that the one million odd cattle in the northern Rift Valley (Msoffe et al. 2011) must consume grass that then is no longer available for wildebeest, eland or buffalo (see Voeten and Prins 1999). The cattle numbers that Msoffe et al. (2011) refer to may be too high: for the Monduli District (which covers about 80% of the ecosystem, we think) the 1984 census reports 325,000 cattle, 223,000 goats, 165,000 sheep and 21,000 donkeys (Zwart 1995, pp. 16). In other words, if Maasai population numbers had continued to be as depressed as they were

in the early 1900s, the livestock numbers now would have been so low that in the grasslands of Tanzania's northern Rift Valley some one million head of wildebeest and zebra could have lived, bringing it on a par with the Serengeti. The ratio of metabolic weights of wildlife was only about 15% of that of livestock in the 1980s (Prins 1992), perhaps yielding an even higher estimate. Indeed, Homewood and Rodgers' (1984) argument that there was no sign of overstocking or land degradation is a red herring in a debate about competition between wildlife and livestock: wildlife is not outcompeted by livestock because the range is degraded – wildlife is outcompeted primarily because livestock, protected by herders and dogs, has access to water and grass and eat it.

In the very early 1970s, Tarangire was still a stronghold for black rhinoceros, with 250 reported (Borner 1981). Indeed, Jonathan Simonson (pers. comm.) recalled in 1981 that 15 years earlier one could see some fifty rhinoceroses between the entry gate and the Tarangire Safari Lodge (c. 9.5 km), but none could be seen by the 1980s. Yet, no one ever suggested that this poaching was done by Maasai. Apart from black rhinoceros, local extinctions have not been reported from TNP itself, but from the southern wildlife corridor between LMNP and TNP: eland, hartebeest, buffalo, oryx, lesser kudu, cheetah and leopard (Hassan 2007). In TNP itself, the migratory Grant's gazelle, Thomson's gazelle, zebra, eland, hartebeest and oryx are declining, and so are the resident bushbuck (*Tragelaphus scriptus*), reedbuck and waterbuck; yet the more or less resident African buffalo, African elephant, giraffe, and warthog are not (notwithstanding possible omission of individuals of the smaller species) (Stoner et al. 2007; *cf.* **Lee and Bond** Chap. 9; **Bond et al.** Chap. 8; **Foley and Foley** Chap. 10). Between the 1970s and 1990, there may have been an increase of zebra (from 16,000 to 22,000) and a decrease of wildebeest (from 14,000 to 11,500), but the other species were decreasing (Kahurananga and Silkiluwasha 1997). At the end of the 1990s, these large numbers of wildlife had declined to one to two thousand zebra, and a similar number of wildebeest, plus a couple of hundred buffalo, elephants and eland (Msoffe et al. 2007). Yet, they still refer to this ecosystem as "… *among the richest areas in East Africa regarding wildlife diversity and abundance, hosting large populations of wild herbivores including the largest population of elephants. During the dry season, huge herds of migratory species, mainly elephants, buffalo, wildebeest, zebras, and eland migrate to the permanent waters of the Tarangire River*" demonstrating the shifting baseline syndrome in all its glory. Nelson (2012) even suggests that the high migratory wildlife numbers (which in reality are a shadow of what they were and even more so of what they could have attained) are the positive effect of pastoralist grazing and burning practices (see **Bluwstein** Chap. 2; **Brehony et al.** Chap. 5).

7.8 The Best Benchmark for Nature Conservation in the Rift Valley Is 1935

Perceiving the afore-described complex history, what then should be considered to be the 'natural state' of Tanzania's Rift Valley? Around 1935, wildlife had recovered from the onslaughts of the rinderpest, and from the devastating impacts of feeding the trading caravans. The Maasai had not recovered fully yet from the smallpox and cholera of the 1890s. But the build-up of their numbers started and was augmented by the forced settlement of the Purko Maasai from the Baringo area. Around 1920, the settlement of Mto wa Mbu began (Watermeyer and Elliott 1943). White farmers started carving out their farms in well-watered places on Mt. Oldeani, along the southern Ngorongoro Crater, towards Mt. Essimingore and from there to Mts. Monduli and Meru (Fig. 7.1). With World War II, many of these farms were taken over by the Custodian of Enemy Property (e.g., Fuggles-Couchman 1944; Redfearn and Fuggles-Couchman 1945) through "war legislation in the colonial empire" (Dale 1940; yet Tanganyika was not a part of the colonies). In the Karatu area, large-scale wheat farming took place while wildlife was eradicated through shooting (pers. comm. Mr. Sjabaan Swalleh). Even though the war-time managers did extensive contouring of the farms, erosion started leading to clogged-up river courses (pers. comm. Mr. Sjabaan Swalleh, Mrs. Margaret Gibb). Indeed, the escarpment of the Rift Valley, once covered in heavy forest before the road was built up from Mto wa Mbu in 1933 (Radclyffe Dugmore 1925; Watermeyer and Elliott 1943; pers. comm. Adam Seif) became increasingly denuded of woody cover (pers. obs.). Many rivulets reported by Watermeyer and Elliott (1943) or Harris (1951) had dried up in the 1980s (pers. obs.). The village of Mto wa Mbu continued to increase in size, and many trees of the groundwater forest were ringbarked for charcoaling (Warden's Reports August 1961).

Yet, in contrast to Kenya, we have not been able to find published accounts of wholesale slaughter of wildlife in northern Tanzania. It may have been as bad as in Kenya, where Ahlefeldt Bille (1948) describes "*killing for fun had been carried out along the [asphalt] roads to a horrifying and almost unbelievable extent" … "[I]n the [Naivasha] Valley bottom … just like the Athi Plains … everything had been shot down during the war. Many districts all over Kenya had been used as training-camps and rifle-ranges for the armed forces, and thousands of head of game were killed to provide leather and biltong, the need for which was understandable*" … "*The South African troops in particular were the chief offenders. They could not bear to see a living animal anywhere without letting off any weapon handy, from pistol or rifle to machine gun*"… "*There were cases where exercises were held out on the plains with tanks and machine-guns, with zebras, wildebeeste, and gazelles playing part of the 'enemy'- the only difference being that the corpses would rot and the wounded were left to the hyaenas and vultures. Herds of giraffe and elephants were machine-gunned from the air. Comment is superfluous – one can only state the facts with a painful feeling of shame for one's own race*" (*op. cit.* pp. 49; pp. 71). Just to the North of Lake Natron, in Kenya, for the sake of creating grazing lands for

Maasai five thousand zebra and the same number of wildebeest were killed on contract (op. cit. pp. 218). Elsewhere, Boer settlers were actively eradicating game (op. cit. pp. 77), and large numbers of wildlife were killed for tsetse control. About one thousand black rhinoceroses (and other animals) were killed in what is now Makueni County (near Machakos, Kenya) "*just to procure land for the Wakamba – who always have lived in the same area on the most easy terms with the rhinoceros*" (*op. cit*. pp. 201–2). One must realize, we think, that in many countries during many times, armies feed off the land. In Tanzania, soldiers in the army camp near Monduli and the one on the southern slope of Mt. Essimingore were provided with zebra and antelope meat by the truck load at least in the 1980s and early 1990s (pers. obs. first author). Perhaps we will never know what the impact of this has been on the wild herbivores of the grasslands of the northern Rift Valley of Tanzania.

At the end of the 1930s, some mammal species were already declining in the northern Rift Valley of Tanzania, namely black rhinoceros, hippopotamus (*Hippopotamus amphibius*) and possibly common eland and African buffalo. This was caused in LMNP by hunting and the increasing occupancy of their habitat by cultivators from Mto wa Mbu. The area was still rich in buffalo, common reedbuck, warthogs, baboons, and vervet monkeys. Wildebeest ranged in their scores of thousands; giraffe, oryx, Grant's gazelles, and Thomson's gazelles in their hundreds on the plains at the northeast corner of the lake. Elephants were not permanent residents (yet). They used the Mto wa Mbu area in the wet season and ranged to the uplands (i.e., what is now Karatu District and the forests east of Ngorongoro Crater) in the dry season (Watermeyer and Elliott 1943). We are not aware of resettlement by elephants after the massive hunting for ivory at the end of the nineteenth century of the forest relics on Mts. Essimingore, Burka, Monduli, Gelai, and Kitumbeine (Fig. 7.1) during the 1930s or later. Yet, black rhinoceroses occurred here in the 1950s (Warden's Reports 1959, 1960).

At the end of the 1970s, no Thomson's gazelles and few Grant's gazelles had been observed (Ecosystems Ltd. 1980) and the very large herds of eland ("as numerous as cattle" pers. com. Mhoja Burengo; the same had been observed by Radclyffe Dugmore 1925) on the slopes of Essimingore and in the northeast corner of the lake were gone (Ecosystems Ltd. 1980). In 1980, no wildebeest were observed by EcoSystems to the north of the lake anymore, where the Warden's Reports (January 1961) had mentioned 3000 at that corner which grew in numbers to 7000 in September 1961. In 1983, the number of wildebeest were still estimated to be 43,000 in the Rift Valley but in 2001 only 5000 were counted by TAWIRI (Msoffe et al. 2011). This was either an undercount, or the figure of some 12,000 for 2011 (Morrison et al. 2016) was an overcount (confidence intervals are large with their type of surveys). The area to the north of TNP and LMNP became clogged up with agriculture; in 1984 there was 170 km^2 of agriculture in the Tarangire Ecosystem and in 2000 this had increased to 881 km^2 (Msoffe et al. 2011). Mwalyosi (1992) already warned that this unplanned agriculture negatively impacts the resources for cattle. Anyhow, we would not be amazed if the few animals that survived became resident in LMNP instead of migratory as they had been before (Warden's Report April 1961) even though "a few are remaining" in the Game Controlled Area in

between the two national parks (Lee 2018) and connectivity is severely compromised (Morrison and Bolger 2014). The erstwhile migratory population of wildebeest of LMNP became to a large extent resident, and then started increasing to about 1300 in 2011 (Morrison et al. 2016). This reminds one of the sedentary populations of the Western Corridor of Serengeti and the Ngorongoro Crater. Yet, the LMNP's wildebeest population (presently resident but 50 ears ago migratory) is much more vulnerable because the alkaline grasslands on which these animals depend (de Boer and Prins 1990) are as prone to flooding as before (Prins and Douglas-Hamilton 1990). They thus may easily go extinct like the wildebeest population in southwest Kenya (Ottichilo et al. 2000, 2001) and as they did, locally, in LMNP before but where they could recover because of good connectivity with the Rift Valley grasslands at that time (Prins and Douglas-Hamilton 1990).

So, in the smallest of the two parks, LMNP, a number of species went locally extinct: black rhinoceros, common eland, hartebeest, lesser kudu, wild dog, bat-eared fox and cheetah, Similar losses as those reported from LMNP have not been reported from the larger TNP.

In the 1970s, poaching of black rhinoceros started in Tarangire; where there had been some 250 in 1974, there were about 55 in 1977 and just 20 in 1980 (Borner 1981), after which they disappeared by 1985. In LMNP, poaching led to the same local extermination (Prins and Douglas-Hamilton 1990). The elephant numbers declined severely in the 1980s and 1990s: in Lake Manyara from about 500 to 60 (Prins et al. 1994); in Tarangire from 2334 in 1995 (Galanti et al. 2006) to 1938 in 2006 (Foley and Faust 2010). Both populations recovered to some extent (**Foley and Foley** Chap. 10), but elephants are rarely seen outside protected areas anymore (Kioko et al. 2013) while earlier at least some were migratory and many spent much of their time outside the park (Galanti et al. 2006; Pittiglio et al. 2014).

7.9 A Shifting Baseline in the Rift Valley

When Pauly (1995) called attention to the issue of shifting baselines in conservation, he offered a mirror to conservationists and went to the core of the issue: what do we want to conserve? In the Netherlands, a magistrate helped open the eyes of politicians and ornithologists to the fact that serially comparing the number of lapwings to that of the previous year, is not a good strategy for maintaining a viable population of lapwings, thus contravening the European Bird Directive (Council Directive 1979). The message is, of course, that for the lapwing population a proper baseline (although available) was ignored. In Tanzania, it apparently is hardly recognised that the shifting baseline syndrome is fully operational. LMNP and the area between LMNP and TNP lost several species. The corridor between the Ngorongoro Highlands and LMNP dwindled to a width of one kilometre. Large mammal populations of Tarangire are at approximately 20% of 40 years ago, the migration the Simanjiro Plains and the Gelai Plains is hampered, and large mammals to the north of Lake Manyara are an apparition of what they once were, with the numbers of

eland, oryx, Grant's gazelle, Thomson's gazelle, wildebeest and zebra a faint facsimile of the past. And the migratory herds probably never reached their full natural potential size in the last one and half century. We think we can reconstruct the wildlife status of Tanzania's northern Rift Valley between Lake Natron, the Simanjiro Plains and the Rift Escarpment as it was in about 1935. Presently, the possibility of using fossil material to assist in such a reconstruction is quickly improving, as was shown for the Laetoli Beds north of Lake Eyasi (Louys et al. 2015) and this would bring the benchmark to even surer footing. Yet it is important to realize the speed at which large mammal species are being locally lost, as was also demonstrated for the Lake Turkana area (Prins et al. submitted) and southeast Kenya (Butynski et al. 2015). Great efforts are carried out to incorporate local people in conservation, and perhaps now there is still time to maintain, reopen and restore corridors for wildlife. Appreciation of what has been lost is a double-edged sword, because on the one hand it may decrease the danger of setting the targets for conservation ever lower. Indeed, false baselines badly compromise conservation (e.g., Ekblom 2015; Didham et al. 2020; Saunders et al. 2020 vs. Hallman et al. 2021). Yet, on the other hand this knowledge of what has been lost may lead to defeatism and under-appreciation of what has been achieved and preserved, because we may live in the best of all possible worlds.

7.10 Concluding Remarks

The ideal state of the northern Rift Valley of Tanzania for wild animals would have been a false reality, namely, (a) no pastoralists competing for grass and water with wildlife, (b) no agriculture in the Crater Highlands or on the mountains thus plenty of water in the many rivulets along the rift wall, (c) no agriculture in the Simanjiro Plains, (d) no poaching or hunting, and (e) no alien diseases. This would have been represented by a combination of pre-Engaruka culture (so a maximum number of black rhinoceros – in the order of thousands), no pastoralists (so still white rhinoceroses and perhaps some 400,000 large migratory wildlife), no modern agriculture (so another 400,000 large migratory wildlife and 2000 hippopotamuses), no hunting and poaching (so with some 30,000 African elephants). Is any of this likely? Probably not (as foreseen by Radclyffe Dugmore in 1925), unless some major human disasters would take place which no one hopes for. That is why we call this a 'false reality'.

Is it possible to expand LMNP and TNP beyond what has been achieved? Again, very unlikely. All area on the Mbulu Plateau, and the lands to the north of LMNP and to the south are now taken by agriculturalists while further east lands are needed for pastoralism. Would it be possible to rewild the swamps to the north or south of Lake Manyara and destroy a town like Mto wa Mbu to re-create dry season havens? Again, utterly unlikely. To remove agriculture from around Mt. Kitumbeini (Schüßler et al. 2018), to allow elephants moving again to Amboseli? The resettlement of people in the Loliondo area to protect the watershed for the Serengeti

(Kihwele et al. 2021)? The British and the Dutch governments removed people from the Isle of Rum and the Eiland Schokland, respectively, some 150 years ago: that still rankles with the descendants even if it was done for health and prosperity at the time. The newly established Randilen Wildlife Community Area only saw after a few years some increase of giraffe and Kirk's dikdik, but no decrease of goats and sheep and no increase in zebra (Lee and Bond 2018). Likewise, the Manyara Ranch Conservancy, a failed government ranch that had been lying idle for decades from which pastoralists were excluded but with good wildlife in the 1980s (pers. obs.; pers. comm. Mr. P. Byrne then safari operator in that area) is now a multi-use area (Kiffner et al. 2016): it has a high density of cattle, sheep and goats but no settlements (yet). The simple reality is that with a poorly developed economy, people need land for their sustenance and for their livestock. That does not call for a moral judgement beyond the moral justness of looking after kith and kin. If one wants to conserve nature for the benefit of future generations, it would be preposterous to suggest doing that to the detriment of the current one. However, three issues have to be flagged, namely, (a) the shifting baseline syndrome, (b) people of good will barking up the wrong tree, and (c) a wish of excellent ecologists to publish excellent papers in very reputable scientific journals based on sophisticated models.

The shifting baseline syndrome operates when it is has been forgotten what has been lost (Pauly 1995). Excellent cases in point are, e.g., Rohde and Hilhorst (2001) but also Årlin (2011). Equally, Lee and Bond (2018) compare the situation in 2015 with that of 2012, and not with, say, 1950 thus illustrating the shifting base-line syndrome. Likewise, Kiffner et al. (2016) use a short baseline, and the success of the multi-use of the Manyara Ranch Conservancy is measured not against a long-term baseline but against adjacent areas that are even more heavily used. The ecosystem of the northern Rift Valley has changed beyond belief, and is far removed from a desired end point for restoration (Sinclair et al. 2018). We commend people of good will and what they stand for (e.g., Lee and Bond 2018; Lee 2018; Kiffner et al. 2020a, b). Yet, we do not agree that by comparing a depauperized area outside a park with a depauperized park (resp. Manyara Ranch Conservancy and Burunge Wildlife Management Area or Randilen WMA) it can be concluded that something good was achieved. Keeping people happy and wildlife protected in the same area simply may be too big a challenge (see Igoe and Croucher 2007; Moyo et al. 2016). Finally, top-notch papers are published on ecosystem restoration (e.g., Sinclair et al. 2018) and corridor design (e.g., Bond et al. 2017). Yet, such enchanting science on its own does not result in the reversal of political or economic trends. Land hunger goes unabated in agriculture-based economies like Tanzania's with its exponential increase of human population. Indeed, in the 1940s only about 5% of all Maasai-headed households in the Arusha Region were engaged in agriculture, but this became 100% in 1990 already (McCabe et al. 2010; **McCabe and Woodhouse** Chap. 4; *cf*. Yanda and William 2010 for socio-economic drivers). Hence, we posit, the conclusion must be that nature conservation must be achieved **within** the two current national parks. One must assume that migratory wildlife will be going extinct or must stop migrating. Again, this is no moral judgement: the once vast migratory systems of North America or Central Asia and Siberia are gone too, while

it is now predicted that the famous Serengeti migration system may collapse due to the offtake of nearly all water in the Mara River by Kenyan agriculturalists (Kihwele et al. 2021).

Conservation organizations and ecologists have talked too long about maintaining corridors (e.g., Borner 1985; Prins 1987; Mwalyosi 1992; Debonnet and Nindi 2017) but government fundamentally has not acted (see Riggio and Caro 2017) or was not transparent in its dealing with local people (Kicheleri et al. 2021). The Upper Kitete Wildlife Corridor (see Fig. 7.1) is now less than one kilometre wide (see above), the Kwakuchinja Wildlife Corridor is seriously encroached by farming (Martin et al. 2019), and the once open lands between the northern side of Lake Manyara and Tarangire is now a narrow corridor along Minjingu. Indeed, wildebeest do not vote but Maasai and other Tanzanian citizens do. To maintain some "rump populations" of wild large animals (see for the use of this term Dudley and Stolton 2020), some might conclude that the solution is to fence TNP and LMNP to prevent livestock coming in and wildlife going out, adding areas if and when becoming available as park (e.g., Manyara Ranch) and enabling local people to live without the burden of wildlife on their lands (Prins et al. 2021). Undeniably, this is land sparing instead of land sharing, a conclusion that was reached in, for example, South Africa long ago. The beautiful and adaptive migration strategies of large mammals will sadly disappear. So, then the hard work of restocking, predator control, disease control and vegetation management will start. Much later, perhaps, the piecemeal extension of the protected areas could continue (as in LMNP) or start (in TNP). A century of laissez faire led to extinction and ruin of a piece of paradise, but on these ruins a garden can be built. Many years from now, these could be the nuclei for rewilding.

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