Uganda: elephants, people and fire in Murchison Falls National Park and north Bunyoro district

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Abstract

This is an historical essay on the environmental changes mediated by elephants, people and fire in Uganda's Murchison Falls National Park and Bunyoro District from before the colonial era to the present. It draws heavily on Thomas and Scott (1935) and on Laws, Parker and Johnstone's Uganda work up to 1970 and unpublished observations thereafter. In the space of a century, areas of woodland and forest changed to open, treeless grassland, back to woodland, and finally to treeless farmland. These changes were brought about by elephants and people both interacting and independently, to which fire while exerting profound secondary influences on the biota, was ancillary. In Bunyoro elephants replaced people and people in turn replaced elephants, in the processes reducing the diversity of life about them. Against the received wisdom of the times that forest and woodland recovery is slow, there is evidence on how fast their physiography if not the specific components, can re-appear.

Résumé

C'est un récit historique concernant les changements environnementaux induits par les éléphants, les gens et les incendies dans le Parc national de Murchison Falls en Ouganda et dans le district de Bunyoro avant l'ère coloniale jusqu'à nos jours. Il s'appuie fortement sur le travail de Thomas et Scott (1935) et celui de Laws, Parker et Johnstone en Ouganda jusqu'en 1970 et des observations non publiées par la suite. En l'espace d'un siècle, les zones de savanes boisées et forestières se sont transformées en herbages ouverts et sans arbres, en forêts et finalement en terres agricoles sans arbres. Ces changements ont été provoqués par les éléphants et les gens interagissant et indépendamment, auxquels les incendies, tout en exerçant des influences secondaires profondes sur le biote, étaient accessoires. Au Bunyoro, les éléphants ont remplacé les gens et les gens ont à leur tour remplacé les éléphants, réduisant ainsi la diversité de la vie autour d'eux. Contre la sagesse reçue de l'époque que la remise en état des forêts et de la savane boisée est lente, il existe des preuves sur la rapidité avec laquelle leur physiographie, sinon les composantes spécifiques, peuvent réapparaître.

Assembled notes

In the half century preceding Uganda becoming a British Protectorate in 1894, there was political turmoil in what became the Bunyoro District peopled mainly by the Banyoro. Questors coming up the Nile from Khartoum for ivory and slaves to carry it, followed by Imperialists arriving to suppress slavery and claim the land for the Khedive of Egypt, left deep imprints on an environment in which there was no stasis. At the same time and for the same reasons, East Africa's Swahili Coast was sending feelers across Lake Victoria, through the Baganda

touching the Banyoro. They, too, were followed by Imperial interests that would result in British rule. This was documented by among many, Baker (1866 & 1874), Gordon (1876), Lugard (1893) and Schweinfurth et al. (1888).

The area that is the subject of this paper is illustrated in (Figure 1; see colour plates: page ii). Bunyoro is bounded in the north and east by the Victoria Nile, in the south by the Kafu River and in the west by Lake Albert. That part of Murchison Falls National Park (MFNP) south of the Victoria Nile lies within Bunyoro. That sector on the opposite bank of the Nile lies administratively in Gulu district, but for the purposes of this paper is treated as within Bunyoro.

Baker (1866 & 1874) described both. Regarding the more densely settled Bunyoro, were the following excerpts: -

"…thickly populated and much cultivated … "…forest interspersed with villages … "… parklike land … the grass above seven feet high … the country choked with vegetation …"…the country was the same as usual, being a vast park overgrown with immense grass."

Vandeleur (1897) and Owen (1905) described > 50 villages south of the Victoria Nile in what would become MFNP, the largest of which–Kisoona–in Baker's (1874) time contained some 3,000 huts. Churchill (1908) describes the view from Igisi Hill as he travelled through what became MFNP thus: -

"In every direction spread a wide sea of foliage, thinning here into bush, darkening there into forest, rising and falling with the waves of the land, and broken only by occasional peaks of rock."

Botanically amateur, these descriptions nevertheless agree broadly with the patches of forest surrounded by a diverse *Vitex-Phyllanthus-Sapium-Terminalia* woodland later described by Langdale-Brown et al. (1964). Grasses were widely distributed, but extensive treeless grassland was not a feature of Bunyoro. People were numerous and widely distributed. Elephant occurred, but seemingly were only abundant further south in central and southern Bunyoro.

In 1901 the Uganda Government was confronted by a rising epidemic of sleeping sickness (*Trypanasomiasis*), which by 1905 had accounted for 200,000 people of an area that had held 300,000 along Lake Victoria's northern shore. With population losses of over 60% and the epidemic spreading into Bunyoro, drastic action was taken Cook (1945), Thomas and Scott (1935). The disease's vector was the riverine-loving tsetse *Glossina palpalis* and to break contact with it, people were widely evacuated from lakeshores and tsetse habitats.

Evacuated areas of North Bunyoro are illustrated in Fig 1. In 1913 2,098 km^2 of the depopulated land south of the Victoria Nile, and 1,935 km^2 along its northern bank were declared the North Bunyoro-Gulu Game Reserve (NBGGR) and closed to people. In 1952 most of this was redesignated as MFNP. Budongo Forest Reserve (BFR) of 427 km^2 in the southwest corner of the game reserve was also denied to human occupation.

After 1924 Uganda was divided into areas where elephants would be preserved and those where they would be eliminated (Swynnerton 1924, Anon 1925). Ivory exports from this elimination show that between 1925 and 1959 34,782 elephants had been shot (Parker 1979) of which > 14,000 came from Bunyoro (Laws et al. 1975). These figures are minima as they do not include victims of poaching, which the Game Department acknowledged was widespread (Parker 1979). Largely through deliberate policy, elephant range in Uganda declined from approximately 70% of the country in 1925 (Brooks & Buss 1962) to less than 5% (Parker 1979) in 1960.

The process of elimination and confinement North Bunyoro is described by Laws (et al. 1975) and illustrated in Figure. 2. (See colour plates: page ii). By 1967 this had been largely achieved. In effect, people formerly resident in MFNP and its surrounds moved south to where elephants had been abundant, and the elephants went north replacing the people. Medical policy to defeat trypanosomiasis was complemented by agrarian policy to remove elephants from farmed land. Conservation policy was met by making NBGGR and BFR space where elephants could be conserved. Three policies–medical, agricultural and fauna conservation–complemented one another but conflicted with forestry policy because BFR produced commercially valuable mahoganies *Khaya antotheca, Entandrophragma angolense* and *E. cylindrical* which elephants damaged. Trials to grow them in plantations and reliance on natural regeneration failed because elephants destroyed too many saplings. Consequently foresters wanted elephants out of BFR (Laws et al. 1975).

Eggeling (1947) assumed from its dominance that Uganda ironwood (*Cyanometra alexandri*) was the BFR's climax species. It was also assumed the mature stands of this species were centuries old (Johnstone pers. com.). Analysing Forest Department data from Budongo, Laws et al. (1975) noted ironwood saplings were not browsed by elephants as frequently as other species, concluding that the ancient ironwood climax may thus have been elephant-induced.

Foresters also disliked elephants in BFR because they chiselled bark off mahogany buttresses, allowing fungii to invade the exposed wood causing rot. In due course the living tree covers chisel scars with new cambial tissue and bark, which in turn become embedded and hidden within the bole. The position of elephant-induced scars relative to growth rings along the radii of mahogany stumps allowed Laws et al. (1975.) to posit intensified use of mahoganies in BFR between 1780 and 1810 (Fig. 3). Why is unknown, but this dendrochronological evidence gives a glimpse into the past (the approach holds promise for investigating elephant influences). From late in the 19th century, there was a similar rise in elephant mahogany scarring in BFR (Fig. 3) which was reasonably attributed to the animals seeking sanctuary from rising hunting pressure for ivory (Parker 1979), pressure from rising human numbers and, after 1924, the policy of confinement.

As early as the mid-1930s confinement within a contracting perimeter of their range as illustrated in Fig. 2 coincided with elephants damaging woodland in NBGGR (Pitman pers. com.). Subsequently Buechner and Dawkins (1961) and Buss (1961) confirmed elephants were causing this woodland loss. Declining tree cover enabled the grassland to expand and by 1967 much of NBGGR south of the Victoria Nile, now MFNP, was open *Hyparrhenia filipendula* grassland with taller *Pennisetum purpureum* on the higher better watered ground. In the environments described by Baker (1874) and Churchill (1908) the extent of fire was limited within the matrix of forest patches and dense woodland that were not readily flammable. In 1967 with the constraint removed, the frequency of fire may or may not have increased, but a single fire instead of burning relatively few km^2 could now cover > 100 km^2, reawakening debate over whether fires and not elephants were the primary cause of woodland loss.

The dominant woodland trees in North Bunyoro were *Terminalia glaucescens* and *Combretum binderanum* (Laws et al. 1975) both with thick, fire-resistant, corky bark. Those ring-barked by elephants died and were then removed by fire. Some not completely ring-barked did not die immediately, but large numbers with exposed wood became vulnerable to fire, which then killed them. Damaged trees that escaped burning regrew bark over exposed wood, regaining protection from fire. Evidence of this is apparent in Figure 4 in a cross-section of a *Terminalia* bole taken at breast height. (See colour plates: page iii). Assuming the concentric growth rings are annual, the tree was between 58 and 65 years old when felled in 1967 (discrepancy between estimates may lie in lack of photographic clarity). The scars from bark loss typical of elephant feeding and re-covered by new growth, are clear to see. The scars in the figure's left appears to have been made 13 years before felling, ergo in 1954, while those in the right in 1950. Where the sample was collected is indicated by the red dot in Fig. 2 and lies within the zone vacated by elephant by 1959. With caution interpreting such slim evidence, the scars were made in the era just before elephants left the area fitting chronologically with their displacement. Other *Terminalia* in the same place were felled and examined cursorily. All had similar internal evidence of recovery from debarking. Incomplete as they and the mahogany data are, they are reported here to stimulate use of dendrochronology for its self-evident value in interpreting elephant presence in past environments.

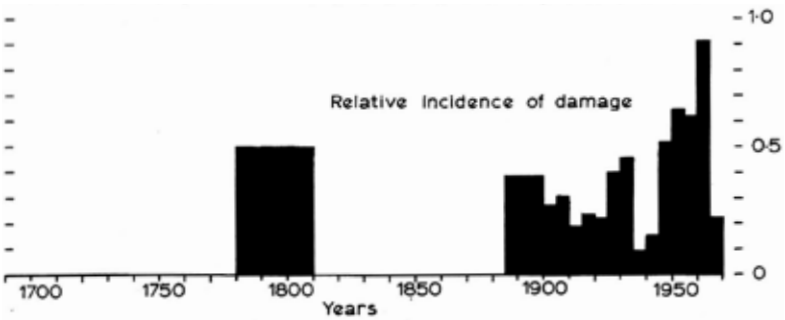

Figure 3. Illustrating the relative incidence of mahogany buttress scarring relative to the average level between 1700 and 1960.

Annually from the 1930s Uganda's Foresters had burned around the entire periphery

of BFR as soon as grasses were flammable, rationalising that such 'cool' burns damaged the forest edge less than later 'hot' burns when the grasses had dried out. Particularly striking was that once elephant left BFR's south-western edge, not only did the *Terminalia* recover but forest commenced expanding into the surrounding woodland despite annual burning (Laws et al. 1975). In contrast along the northern edge of BFR under the same annual burning regime, where elephants were still present the forest retreated (Laws et al. 1975).

Parallel with this strong evidence that elephants and not fire were primary tree removers, the Warden of MFNP (Wheater pers. com.) tested the point inside the park. North of the Nile at Chobe in 1967, Wheater established six one acre plots in open *Hyparrhenia* grassland. An elephant-proof ditch surrounded one set of the three, while the other was unditched. All were surrounded by a firebreak to protect them from unplanned burning. Within each set one plot was not burned, one was burned early by 'cool' fire and the other late in the season with a 'hot' fire. Figure 5 is a photo taken in 1969 just before Spence and Angus (1971) made a quantitative and qualitative study of these Chobe plots. (See colour plates: page iii).

The three ditched plots ungulates could not access showed striking changes in vegetation. Actually some Uganda Kob (*Kobus kob*) had jumped into one of these on one occasion, and two bull elephants had dug a way both into and out of the ditch on another. However these exceptions apart, the barrier had been effective. Tree saplings had appeared in all three, with greatest density and diversity in the unburned plot, somewhat less diversity in the early burn though saplings were striking in their vigour, and fewer again in the late hot burned plot and where scorched saplings were still alive.

From a distance the three unditched plots were difficult to differentiate from the surrounding grassland. Examined closely, none had tree saplings, the unburned plot showed most litter and flammable material on the ground, the early burn seemed to have attracted more animal use, and the late burn showed more bare ground. After only two years the ditched exclusion plots were showing dramatic tree growth despite fire, while the unditched plots had produced no tree growth at all. Monitoring further development ended with the rise of Idi Amin.

Nevertheless in 1976 with colleagues Richard Bell and Iain Douglas-Hamilton, I visited MFNP. We could not locate the unditched Chobe plots. However the ditched three stood out dramatically as a rectangle of dense woodland from the surrounding grassland (Figure 6; see colour plates: page iii). The ditch was still effectively keeping out ungulates and the annual burning regime had been kept up.

Subjectively, the diversity of trees in the unburned plot was higher than in either the early or late burns– and some lianas were apparent. The most prominent of the emergent trees was *Vachellia* (previously *Acacia*) *sieberiana*. The nine-year exclusion of elephants and other ungulates confirmed unequivocally the peri-Budongo results: fire slowed but did not stop tree reappearance.

Four years later in 1980, ditch maintenance had ceased so elephant had gained access to the plots and the Director of the Uganda Institute of Ecology, Dr Edroma, was photographed with evidence of tree debarking (Douglas-Hamilton et al.1980).

In MFNP, in the five years 1971-1976 elephant south of the Nile were reduced from 9,364 (Laws et al.1975) to < 200 in 1976 (Parker and Douglas-Hamilton 1976), the speed of removal facilitated by the open grassland habitat, which made detection and approach easy. Many areas I had known as open grassland in 1970 were now covered in dense thicket. Budongo's northern fringe had expanded with a dense ecotone, concealing under tall trees a 400 m airstrip I had built in grassland outside the forest in 1967. Inside the park the Rabongo forest relic close to the hill of that name was now, like the Budongo itself, expanding outward and its once broken canopy closed up.

In 1980 Douglas-Hamilton (et al. 1980) reported widespread human activity in MFNP south of the Nile mapping 48 poachers' camps and *"numerous burnt patches where the poachers had set fire to the long grass."* While the intent of the report was to document unlawful activity, ancillary to this the small, widely scattered fires were evidence in themselves of how the recovery of trees and thicket was now inhibiting fire very significantly. If the open grassland of 1967 had prevailed, the evidence would have been not of small scattered fires, but great swathes of burned areas.

In 1998, 22 years later, on an aerial reconnaissance with Alan Root, Budongo's forest had expanded between three and six km from its estimated edge in 1967, linking up with the formerly isolated Pabidi

forest to its north-east. Within the Park, thicket dense enough to inhibit fire was now widespread with abundant emergent trees. Driving on the ground through these thickets and new woodland, tsetse flies that had been eliminated along with their shade by elephants before 1967 were now abundant pests. The evidence was unequivocal. The massive reduction of elephants from MFNP south of the Nile and their greatly diminished numbers north of it had borne out the contention that elephants had been the key influence in converting forest and woodland to grassland in Bunyoro and MFNP north of the Victoria Nile.

Two decades on in 2017 it is clear from Google Earth that change has continued. While much of the Park south of the Nile may not be as uniformly or densely vegetated as when Baker (1874) or Churchill (1908) described it, it has returned a long way towards those descriptions.

North of the Nile at Chobe, the ditched plots that had stood out so clearly from grassland in 1976 were no longer ditched and difficult to find among the tree growth that had replaced the open grass that once surrounded them. The airstrip alongside the plots in open grassland in 1976 was now a canyon between trees up to 10 m tall (Figure 7; see colour plates: page iii).

By 2017 outside MFNP and BFR, humans have returned en masse to North Bunyoro. Whereas in 1980 Douglas-Hamilton et al. (1980). noted very extensive illegal hunting in the park, they nonetheless stated that the

"... map of human activity (p. 103) shows that to the south of the Nile there has been no encroachment in the Park or the surrounding Bugungu and Karuma Game Reserves."

In the intervening 38 years since then, the game reserves have become settled and the western, southern and eastern borders of the Park are now demarcated by cultivated land (Figures 8a, 8b & 8c; see colour plates: page iv). Here and there some tillage has taken place in the park and tracks from the settlement into it are clear. In the south-western sector of BFR, forest expansion has been reversed and the reserve's border is also delineated by tilled land some of which now intrudes across the boundary (Figure 9; see colour plates: page iv). BFR exhibits broken canopies and evidence of logging on a greater scale than previously seen.

Summing up this review, land heavily peopled in the 19th century, was depopulated by anti-sleeping sickness policy, the humans moving into areas where elephants were numerous and in the area vacated were replaced by elephants. In a period of little over 50 years, elephants then rendered a once heterogeneous flora with much woodland and forest to open *Hyparrhenia* grassland. As shown by Laws (et al. 1975) it proved nutritionally inadequate and the population had been declining for at least two decades. However, this decline had not been sufficient to stem the loss of most forest and much woodland fauna and flora. Moot is the degree to which human-induced compression had brought this about. Idi Amin's misrule anticipated any planned reduction of elephant numbers, which by 1976, south of the Nile, had fallen to approximately 2% of those present in 1967. On a scale altogether unpredicted, this reduction proved that elephant and not fire were the proximate cause of tree loss in MFNP.

Between 1900 and the present, Uganda lost its once widely distributed and abundant elephants. Those remaining are in small protected places: principally the country's national parks. Between 1924 when Swynnerton (1924) submitted his appraisal of the situation regarding elephants and Uganda's independence from Britain in 1962, i.e. 38 years, this came about largely through deliberate policy. While there always was an illegal offtake, Uganda did not consider it a particular problem because such reduction as it may have brought about was in line with the policy of restriction and elimination. The reason for that strategy was to protect and facilitate agriculture and its development coupled to human increase. Yet while it had largely and coincidentally run its course when Uganda became independent, human increase has continued exponentially. Consequently Bunyoro's small putatively protected sanctuaries such as the Bugungu and Karuma Game Reserves have been largely settled by farmers who now abut against the Park borders.

If elephants are to survive, two issues stand out. The first is ability to enforce laws which are already in place and prevent trespass and settlement in national parks. Primarily a social issue of effective governance, and there are examples elsewhere of success, it is not insoluble. Of course this is whether Ugandans want that result.

The second arises out of the unequivocal evidence of what the presence or absence of elephants does to the biota wherein they live. Uganda has experienced

elephants replacing humans and, vice versa. Both dramatically reduce biodiversity within short periods. Perhaps the unexpected finding from the Uganda evidence was how fast both woodland and forest can reappear in the absence of elephants and people. The presence of elephants as components of diverse and complex biotas in what, by elephant standards are small areas, may be an insuperable problem. Influencing all floral and faunal species within them they are evolutionary engines that drive change that was never anticipated in the founding concept of national parks. Alone this surely calls for re-appraising what can or cannot be achieved within them? What happens in Uganda may be the bellwether for elephant fortunes in the face of expanding humanity elsewhere.

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