

Letter from the Desk of David Challinor
October 2000

A clear image of either the pre-European East African savannah or the tall grass plains of the American west remains elusive. All that exists today are sketchy reports by the early explorers who traveled through minuscule portions of the wild and unexplored (by Europeans) landscape. Lewis and Clark, for example, meticulously recorded their river journeys and the scenes they saw beyond the river banks. Their accounts are tantalizing and have been carefully gleaned by recent scholars for additional bits of information. In less than a century after the arrival of the white man, the landscape they had seen in both our American west and the African savannah had been inexorably changed and will doubtless never revert to what it looked like when first seen by Europeans. This month's letter will consider some of the causes for these changes, particularly in East Africa, and why the oft depicted plains we still see there have been so radically altered by factors not immediately apparent.

My first exposure to the East African savannah was through the black and white documentaries produced by Martin and Osa Johnson; their films enjoyed modest popularity in the late 1920's and early 30's. My most vivid memory is that of endless lines of porters, balancing enormous loads on their heads and marching single file through the waist-high grass. Even then I wondered how the Johnsons could have assembled so many people to do what must have been incredibly hard work. A reasonable explanation is now evident from knowledge about what happened to their culture. The grainy films that showed the vast herds of zebra and wildebeest in migration evoked a vivid sense of adventure in natural history devotees such as myself, and my subsequent trips there as an adult have continued to fuel my initial excitement and fascination.

A recent article in "New Scientist"¹ reported that the Serengeti and adjacent Masai-Mara ecosystems we see in popular nature films is a landscape as artificial as New York's Central Park. The great kingdoms of East Africa that thrived in the 18th and early 19th centuries had established monarchies and vibrant cultures, but by the end of the last century had succumbed to a tiny, unwittingly introduced micro-organism -- the rinderpest virus. This animal pandemic could easily be the greatest catastrophe ever to strike the continent, rivaling that of the AIDS virus that is today decimating the population of this hapless land.

The assault of the rinderpest virus evidently originated in 1887 when an Italian army sortie from Eritrea into the central Ethiopian highlands brought in cattle infected with the virus in the army's cattle train. The Italian's livestock had been imported from Europe where they had evidently acquired the virus. This virus, a close relative of the ones that cause measles in humans and canine distemper, is native to the grasslands of central Asia. The cattle trains of invading armies frequently had spread the disease westward into Europe with devastating consequences. Cattle mortality was usually above 90 percent and no hoofed stock, either wild or

¹ Pearse, Fred. "Inventing Africa," New Scientist, no. 2251, pp. 30-33, Aug. 12, 2000

domestic, was immune. The starvation resulting from the loss of so much livestock often caused greater human mortality than the direct slaughter by the invading hordes.

Rinderpest spread so rapidly in Africa that it reached its Atlantic coast by 1903. Within a year of the Italian sortie, the disease had followed the oxcart trails south through the Rift valley and then westward across the Sahel (the southern flank of the Sahara desert). Heretofore, the Sahara had been an impenetrable barrier against the virus because camels were the only animals that could cross it and they, not being cloven-hoofed, were immune to the disease. It is hard to imagine the devastation caused by the death of so much livestock. The once prosperous tribal cultures based on cattle ownership collapsed. The few cattle that survived were fought over in desperate attempts to avoid starvation. The weakened populace fell victim to smallpox, cholera and other local diseases as well as to new ones brought by the Europeans. We can only estimate the human losses from the sparse accounts that exist, but there is good evidence that one in three Ethiopians died between 1888 and 1892 from a combination of starvation from rinderpest mortality in their cattle which was exacerbated by a drought. The results of this pandemic had ramifications well into the 20th century and could easily explain why Martin Johnson was able to recruit so many porters. There was still, 20 years later, a paucity of food and jobs. Masai folklore records the terrible destruction of 1891 when virtually all their cattle died along with wildebeest and Cape buffalo, two species used to supplement their meat diet in hard times.

The political and economic consequences of the pandemic were also grave. The disappearance of the prosperous pastoral societies gave the arriving Europeans free rein to control the now almost deserted countryside. The British took over Kenya and the Germans what is now Tanzania. In southern Africa, the now cattleless Zulus migrated to the cities and especially to the gold mines, where they still work today.

The devastation of the pastoral cultures was compounded by the spread of the tsetse fly, a brush dwelling, blood sucking fly that harbors the trypanosomes that cause sleeping sickness, a scourge throughout most of tropical Africa. Even today sleeping sickness is probably second only to AIDS as an impediment to African development. The connection between rinderpest and the spread of tsetse flies is not immediately apparent but exists nonetheless. When cattle crowded the African plains, they kept the small trees and brush under control by their grazing and browsing. With their disappearance, brush began to spread, creating an ideal habitat for the tsetse. As in the case of most plagues, the rinderpest abated and the wild hoofed stock recovered, thereby furnishing a ready food source for the blood sucking fly. However, even when cattle populations slowly recovered, the herdsmen were understandably reluctant to return to their former pastures because of the threat of sleeping sickness. Thus the post-rinderpest East African plains maintain a higher percentage of wildlife grazers and more brush than in the pristine times before the European arrival. The new national parks now preserve a landscape inexorably altered by rinderpest and tsetse flies.

Recent good news, however, is that a campaign to control rinderpest, begun in the 1980's by the Organization of African Unity (OAU), has now confined the virus to two small areas, one in southern Somalia and the other in the south of Sudan. The virus was completely cleared from India in 1995, an accomplishment that might be one of veterinary medicine's greatest triumphs. In 1992 the United Nation's Food and Agricultural Organization (FAO) organized a campaign to rid the world of this disease by 2010, and the odds are good that they will reach this goal.

Large ecosystems have been permanently altered elsewhere by the thoughtless introduction of alien plants as well as by viruses. A similar transformation to that of the Serengeti occurred in the dry areas of Gujarat and Rajasthan in northwest India. Only a few years before rinderpest was accidentally introduced into Africa, mesquite (*Prosopis juliflora*) was brought to India (1877) from the New World to stabilize the sand dunes in these two Indian states. The introduced trees took well to their new surroundings and soon covered many of the dunes encroaching on farm land. As is often the case, the original hopes of beneficial results were offset by costs not initially contemplated. About 50 years ago in Gujarat's Rann (desert) of Kutch, about 3,000 acres of mesquite were planted annually to stem the spreading desert. As is the case in our own southwest where the tree is native, the grass that grows around the mesquite in India is also overgrazed. This prevents the grass from accumulating enough fuel so that when it catches fire, as it inevitably does, it cannot burn hot enough to kill the mesquite seedlings. The combination of cattle eating seed pods and the purposeful planting of this tree has caused it to spread out of control. The hard coating of the seed, when passed through a cow's acid digestive system, becomes so thinned that it readily germinates when excreted. The introduction of mesquite has changed the dune landscape of the Rann of Kutch almost beyond recognition. The dunes that used to be a crucial wintering site for the Houbara bustard (a game bird the size of a turkey) are no longer suitable as they are now too thickly carpeted with mesquite. Other animals, however, such as nilgai (the largest Indian antelope) and the smaller (Thompson's gazelle sized) chinkara, have adapted to the new thickets and use them for protective cover. The once welcome mesquite, however, has become a local pest. Although its wood is excellent for fuel, it is so thorny that most villagers will go out of their way to find the less thorny native acacias. Thus, one of the prime reasons for mesquite's introduction as a fuel supplement has been defeated. It seems unlikely that mesquite can ever be eradicated in this part of India as conditions for its spread are too ideal, but perhaps some control of its expansion may be possible. In other words, the tree does have some good points, such as its ability to stabilize dunes and to fix atmospheric nitrogen in the soil, but these attributes may not always offset its disadvantages.

These two examples from Africa and India are but a fraction of those that illustrate how human introduction, unwittingly or planned, of foreign organisms can change an entire landscape. The world's few landscapes that have remained relatively constant are usually maintained by human effort, with many different incentives. For example, the hill towns of Tuscany have survived intact for several hundred years because of their attraction for tourists. The

same can be said for the picturesque Alpine valleys of Switzerland and Bavaria, which still remain farmland thanks to generous government subsidies. A record of past landscapes exists in paintings that date back centuries. For example, Winslow Homer's hunting scenes in the Adirondacks, painted at the turn of the century, show the hills heavily cut over, quite unlike the thick forest canopy that is there today. Landscape change is normally inevitable, but isolating the causes can be challenging. At first glance, the advent of rinderpest in Africa appeared to have little connection with how the Serengeti looks today, but further research often reveals unexpected explanations for landscape change.

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