

Medicines from Chinese Treasures

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Today China is the only country in the world still making significant quantities of medicines containing rhino horn. Having exhausted its own supplies by the eighth century, it became a major importer. The rhino horn medicines are both consumed locally and exported. Notwithstanding the fact that China joined CITES in 1981, rhino horn has continued to come into the country, principally from North Yemen, Hong Kong, Macao and Taiwan, with smaller quantities smuggled in from Singapore and Thailand. The manufactured medicines go mainly to South East Asian countries.

At the end of 1988, the Chinese CITES Management Authority, under the Ministry of Forests, demanded that all import/export corporations and drug factories register their stocks of rhino horn.

Table I
China's 1989 Rhino Horn Stock Registration

| Establishment | Amount in kg |
|--|----------------|
| China National Corporation of Traditional and Herbal Medicine (based in Beijing) | 3,405.8 |
| Tianjin Medicine & Health Products Import/Export Corporation | 407.0 |
| Guangdong Drug Corporation | 1,550.2 |
| Yunnan Drug Corporation | 989.6 |
| Beijing Drug Corporation | 469.3 |
| Tianjin Drug Corporation | 435.2 |
| Shanghai Drug Corporation | 410.9 |
| Liaoning Drug Corporation | 242.2 |
| Jilin Drug Corporation | 202.2 |
| Qinghai Drug Corporation | 101.0 |
| Xinjiang Drug Corporation | 75.0 |
| Hubei Drug Corporation | 45.9 |
| Gansu Drug Corporation | 30.5 |
| Tibet Drug Corporation | 10.0 |
| Others | 1,500.0 |
| Total | 9,874.8 |

**Although the word 'Corporation' is used in the names of the above establishments when translated from the Chinese, all but the first two would be classified as 'factories' in English usage.*

Source: China Endangered Species of Wild Fauna and Flora Import/Export, Administrative Office,

Table II
Average Consumption of Rhino Horn per Year

| Establishment | Amount in kg |
|----------------------------|--------------|
| Beijing Drug Corporation | 150 |
| Shanghai Drug Corporation | 150 |
| Guangdong Drug Corporation | 100 |
| Tianjin, Drug Corporation | 100 |
| Others | 150 |
| Total | 650 |

Source: China National Corporation of Traditional and Herbal Medicine.

Details of the results obtained in December 1989 are in Table I. The total amount held was 9,875 kg; however, this does not include rhino horn in retail medicine shops, museums or private ownership. The industrial stocks are undeniably the largest in the world, and more importantly are still being used to make medicines. Between 600 and 700 kg of rhino horn are being used each year and, if demand continues at the same rate, the drug factories have enough supplies to last at least 15 more years (Table II). As far as conservationists are concerned, since some of these rhino medicines are getting onto the international market they are further encouraging the demand for rhino horn. At the Ottawa CITES meeting in 1987 member states including China, were requested to ban all internal trade in rhino products. Hong Kong and Macao, two major importers of Chinese manufactured medicines, have complied, but China has not, arguing that the horns being used were acquired before joining CITES.

In order to exert control over the export of rhino horn medicines China has, however, recently changed its law. As from the end of 1988 all exports of these medicines require a permit from the Chinese CITES Management Authority. No such permits have been issued. Instead, traders especially from South East Asian countries have been buying the medicines wholesale and taking them out of the country. Personal luggage is not usually examined. As an example, on my three trips to China in 1985, 1987 and 1990 none of my baggage was ever opened when I entered or left the country. In addition, some Chinese corporations exported some medicines without asking for permits in 1989.

In April 1990 when I went to China as a guest of the CITES Management Authority in Beijing, I visited a number of import/export corporations and also drug factories which make rhino horn medicines. At the Beijing Tong Ren Tang Pharmaceutical Factory, first established 320 years ago and now the most famous in the country, a manager stated that in 1970 a five-year study was initiated for the purpose of finding the best substitute for rhino horn. The research by various institutes and involving scientists from Tong Ren Tang was completed in 1974 and water buffalo horn was shown to be almost as effective as rhino horn. Consequently, that year the factory started to use water buffalo horn as well as rhino horn. At about that time the China National Corporation of



These magnificently carved rhino horn antiques which were photographed in a Chinese warehouse may be pulverized, like many others have been, for making into medicines.

Traditional and Herbal Medicine had a stock of 14 tonnes of rhino horn. A major supplier of horn to medicine factories, this corporation now has under four tonnes. The fact is that ten tones were consumed in the making of medicines in the late 1970s and the 1980s decade despite the use of water buffalo horn in some of the products by one of the most important medicine factories.

The Tong Ren Tang Pharmaceutical Factory today manufactures three febrifuge patent medicines containing rhino horn: An Kong Niu Huang, Zi Xue San and Jufang Zhi Bao; the first of these is for adults and also reduces inflammation; the latter two are for lowering fevers in children. When I asked why buffalo horn could not be substituted in these medicines, I was told that expensive stocks had to be used and that overseas Chinese still believed rhino horn to be superior and would not buy such drugs if it was omitted. In visits to drug factories in Tianjin and Guangzhou the answer was always the same. The overseas Chinese are portrayed as scapegoats for continuing to demand rhino horn as an ingredient in patent medicines. They are in fact the major buyers and provide large sums of foreign currency required to recoup the expense of stock purchases and to make profits.

On this trip to China I was given the unique opportunity of visiting the official rhino horn storerooms. No other foreigner nor even the staff of the Chinese CITES Management Authority had ever been inside these storerooms which contain vast amounts of rhino horn. The largest quantity is made up of small cut pieces, most of which are the remains of African horns which were used in North Yemen for making dagger handles. The next most common form of rhino horn is powder, also from North Yemen, either imported directly or via Hong Kong. The only other country which uses rhino horn powder in quantity is South Korea where Chung Shim Won balls are made. Elsewhere, pharmacists who sell rhino horn prefer having recognizahle pieces so that their customers can see what they are getting is genuine. Except in the storeroom of the Guangdong Drug Corporation in the suburbs of Guangzhou there are few whole horns. Many of these are of Indian rhino origin while others are Sumatran back horns, really small protrusions, knob-like in appearance. The latter are referred to as Buddha's eyes by the employees. I saw almost no full horns or large parts from African white or black rhinos. The few which do exist in China are usually found in markets and medicine shops. In February, 1990, Andrew Laurie saw African horn for sale retail in Chengdu, Sichuan province, for US \$3,936 or 18,500 yuan per kg and Sumatran horn for US \$24,468. It was not possible to ascertain what percentage of the chips, powder and full horns were Asian compared with African. However, in the Guangdong Drug Corporation storeroom the manager estimated 10%, adding that Asian horn was far superior medically to African. Personally, I believe that of the almost 10 tonnes of rhino horn in the official stores less than 10% is of Asian origin because so much comes from North Yemen where only African horn is made into dagger handles.



In the Tong Ren Tang pharmaceutical factory in Beijing, An Kong Nui Huang balls are being made, some of which contain rhino horn.

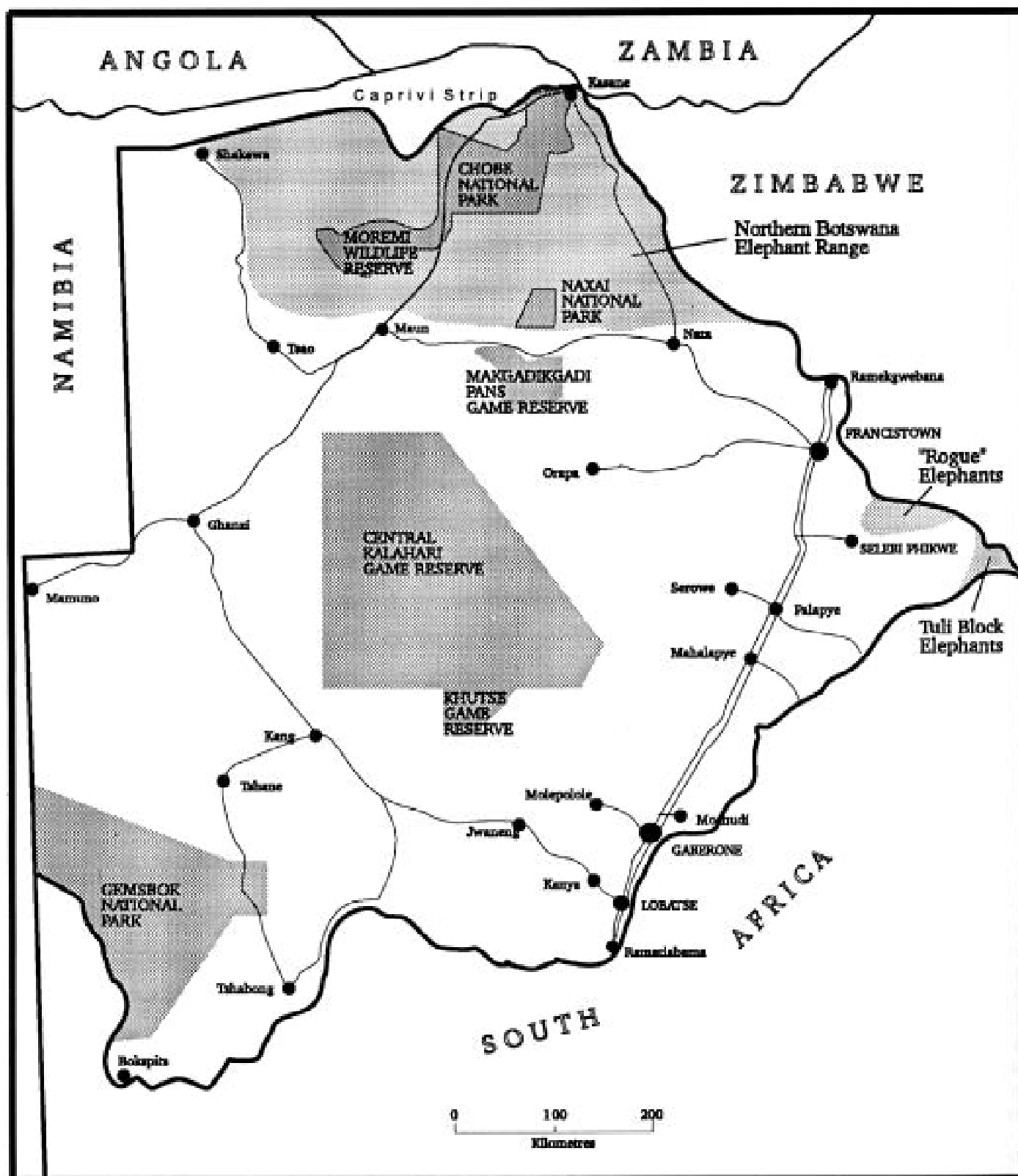
Inside locked rooms in godowns in Tianjin, Beijing and Guangzhou one sees a jumble of 25kg sacks, plastic bags, crates and boxes containing chips, powder, whole horns, together with the most amazing form of stock to be used for making medicine, that of antique rhino horn carvings. In the storerooms I visited in Tianjin, Beijing and Guangzhou, all had sacks heedlessly piled together, full of antique plates, cups, libation bowls, brush holders and figurines. I even saw quite a few Sumatran, Indian and Javan carved horns. The Buddhist figures on some small dishes lend me to believe they originated in Laos or Cambodia. All the rest were carved in China; none had been worked in Africa. The antiques were mostly intact and in excellent condition but some were damaged and chipped. Our visit produced a few more casualties. Since we had specifically asked to see all the rhino horn stocks, bags of these antiques were tipped in front of us onto concrete floors, producing more nicks and scratches. Whenever we finished examining the antiques, they were simply gathered together and dumped into sacks, with no attention paid to preventing pieces from damaging one another. The storeroom staff obviously had no idea of the true value of these magnificent works of art carved in the Ming (1368-1644) and Ch'ing (1644-1911) dynasties by master craftsmen probably attached to the workshops of the Emperors.

The trading corporations and medicine factories have been purchasing rhino horn antiques from every possible source since the Revolution in 1949. Some have come from Chinese private collectors while others have been supplied by racketeers dealing in items stolen from the museums. In fact, there are very few rhino horn antiquities to be seen in any of China's museums today. There is no way of telling how many of these valuable works of art have been ground down into powder by the drug corporations. The policy of the Guangdong Drug Corporation is to use the powder, chips, and full horns first, then damaged antiques and finally, the perfect works of art. However, even this corporation has admitted to having already pulverized antique rhino horn cups. It seems that in practice whatever is handiest is used.

There is little doubt that the primary purpose of the drug corporations is to earn as much foreign currency and as large a

Botswana's Problem Elephants

C.A. Spinage



Republic of Botswana

profit as possible. They are ignoring an option which would increase their profits, help with rhino conservation, preserve for posterity examples of China's cultural heritage, conform to CITES regulations and be internationally welcomed: namely, the auction of these superb antique rhino horn carvings on the world market.

As early as 1963 when the population was judged to be much smaller than it is today, Child considered that the elephants in northern Botswana were exerting a destructive effect on woody vegetation along the Chobe River riparian strip. Particularly affected were mature *Acacia erioloba*, which were killed by ring-barking. This view was upheld by subsequent workers such as Sommerlatte², Simpson³ and Moroka⁴. Sommerlatte estimated an average of 5,746 elephants to occupy the 11,000 km² Chobe National Park from 1973-1975, whereas by 1987 the number had increased to 12,220.⁵ For an area of 22,500 km², Sommerlatte estimated 12,035 elephants, whereas 17,817 were reckoned to be present in 1983.⁶ Beginning in 1980, aerial surveys suggested a population of 39,511 elephants in the 8,000 km² range of northern Botswana, which by 1989 had risen to almost 60,000, implying a mean annual rate of increase of 5%. Approximately 23% of the range lies in protected areas where, in 1987, 42% of the elephants were found in the dry season and 26% in the wet season.⁷ The Table shows various estimates made during the 1980s.

The total numbers also fluctuate according to the season when the count was made, for an estimated 10,000 elephants move into Zimbabwe in the dry season.⁸ But a similar annual percentage increase has been experienced in this contiguous Zimbabwe population, in spite of a culling programme.⁹

Table
Elephant Population Estimates for Northern Botswana
1980-1989, (80,000 km²)

| Year | Estimate |
|---------------|----------|
| 1980/81 | 39,511 |
| 1984 | 42,792 |
| 1985(i) | 50,000 |
| 1987(ii) | 44,670 |
| 1989(ii)(iii) | 63,500 |

(i) rounded estimate

(ii) mean of wet and dry season counts

(iii) wet season was 75% of area corrected for whole area

The Department of Wildlife and National Parks in Botswana has proposed a cropping programme to maintain the Botswana population at around 60,000 by removing a number equal to the estimated 5% annual increase. This would create an overall density throughout the 80,000 km² range of 0.75 elephants/km². The chosen total population number does not relate to the maximum permissible elephant density which would arrest the decline in mature tree survival and permit tree regeneration, but is lower than that calculated by Fowler at which an elephant population might come into self-regulating equilibrium, namely a density of 0.93/km².¹⁰ Rather the total is based upon the logistics of cropping and pragmatic considerations regarding tourism.

History of the Chobe Elephants

Within recorded history the Chobe area of northern Botswana has always been favoured by elephants. When he hunted from the Shinamba Hills in the southeast of the present park in July

1853, Chapman found elephants to be very numerous there, meeting one herd of 500 cows.¹¹ But in January 1855 at Shinamba he reported:

After travelling [eastward] 30 miles over ground that two years ago was covered with spoor. I fell in with nothing . . . I continued . . . till March . . . Our search for elephants continued without success. They seemed to have all migrated into the tsetse country.

Although he supposed that they had migrated northwest, a major movement in the dry season is west-east into the Hwange area of Zimbabwe; but one cow elephant radio-collared in the Shinamba area in March 1987, did move directly northwest to the Linyanti, while a cow marked to the east of Shinamba and a bull marked to the southeast, also moved northwest.¹² Clearly these movements from the Shinamba area are of very long standing.

When Selous arrived at the Chobe River in 1874 he found elephants, but not apparently in large numbers, and they appeared to be wary.¹³ He noted:

A little after midday we crossed the spoor of a large herd of elephants that had come down to the river to drink during the preceding night. As I knew from former experience, that the elephants about here seldom stood except at long distances from the river . . .

and later:

This was one of the largest herds of elephants I have ever seen; I am afraid to say how many of them there were, but I think there must have been from 100 to 200 at least.

In 1891 the first game law was introduced in the then Bechuanaland Protectorate, and in 1893 licences for elephant hunting. There is little record of hunting at this time for the great days of the ivory scramble were already over. Only 305 lbs of ivory were exported to South Africa by rail in 1936 and none the previous year when recording began. After this date ivory exports were lumped with Miscellaneous animal products¹⁴ and can no longer be traced.

In 1932 all game was protected in the Chobe district, this prohibition lasting until 1943. It appears to have been fairly effective, as contemporary references indicate.

The Government Veterinary Officer reported in 1935: The natives say elephants and buffalo were common in the thick bush about Kataba and Kasinka last year, This has not been the case for many years. There is no doubt that game has very largely increased in the last few years. Elephants were in large herds along the Chobe River all last winter as they used to be in Selous' time - the seventies.¹⁵

The Kasane Resident Magistrate was driven to inquiring whether he could shoot an elephant in self defence if needs be. He wrote:

At present it is most difficult to be able to plan with certainty to go from Kasane to Kazangula (*sic*) in the afternoon. I have on three or four occasions had to turn back because of elephants on the road. They are quite peaceful . . . They are not a menace but merely a nuisance.¹⁶

I got into Kasane . . . from Kachikau. There were elephants from Kabulabula to Kasane. They have dug the road to pieces and I could smell and hear them all the way.¹⁷

Komana's forest, probably the present Chobe Forest Reserve, had earlier been referred to as the breeding place of the elephants by another Resident Magistrate.¹⁸ However Child reports that one man living along the Chobe noted that in 1933 there was a well-known herd of 20 to 25 head between Kazungula and

Kasane but that otherwise the species was scarce along the river.¹⁹ This does not fit with the Resident Magistrate's reports, or was he making a fuss about only 25 elephants? Child further reports that elephants had been unknown to the bushmen living around the source of the Ngwezumba for several generations until about 1945. Then within a single year the whole area to the north, as far as the Chobe, filled with elephants which came from the direction of Masame, moved towards Lesuma and then across to the Chobe west of Kasane. A Lozeides who moved to Seron-della in 1946 and who did not see an elephant in the region until 1949 is quoted by Simpson who also recorded that the movement was eastward, starting west of Kachikau and Ihaha.²⁰ Between 1930 and 1954 Botswana recorded one its worst drought cycles. In the 1940s, summer rainfall along the Chobe river, as measured at Kasane, was very low with the moving average well under the long term mean of 677.5 mm (n=66). However, the rainfall for 1945 at Kasane was only 14.5% below the long term average compared to a shortfall of 58% at Tsabong in the extreme south of the country, while in 1946 it was 17.8% above average, so that this may have accounted for the alleged influx of elephants.

Little hunting seems to have followed the dropping of protection in 1943, which was due to concern at the eastward spread of tsetse, for in 1953 the Officer in Charge of the Francistown police noted that no ivory in that year had been exported on permit and he suspected that it was being smuggled out. In Ngamiland, however, 44 licences were issued by the tribal chief for elephants in 1952- 1953.

Following complaints from the 'Chobe Concessions', which was exploiting the timber in the Chobe area in 1952, the compound manager was authorized to shoot the bull elephant in each herd that was causing trouble in the Concession. It was proposed to withdraw the permission the following year because the manager went shooting unaccompanied by a member of the police and because he appeared to be selecting the best bulls, as the tusks were up to over sixty pounds which is high for this part of the world. He is recorded as recently exporting 305 lbs of ivory, but this would only amount to three or four elephants. It was stated that there should be no shooting of animals which allegedly do damage miles from anywhere in the forest of the Concession. Thus it appears that there was little, if any, elephant hunting in the area.

In 1960 the Chobe Game Reserve was declared, and in 1967 it became a national park. Child states There is general agreement among local people, living as far apart as Gweta, the fringe of the Okavango, Kachikau and in the eastern Caprivi, that its elephant population has increased very rapidly, especially during the last ten years.²¹ In 1966, for example, they were reported for the first time from areas to the eastern Makarikari, where they have not been known for many years. Child believed that this was due to immigration from an overpopulation of elephants in the Hwange area, but rainfall was above average in these years and that may have accounted for the movements. Child also provides evidence

for an increase in elephants on the Caprivi side by reference to the rapidly rising number of garden raiders shot after 1962.

Simpson considered that counts of elephants along the water front showed a build-up in the five years to 1971, although his figures were not comparable with those of Child. 22,23. According to Sommerlatte ~ the 20,000 cattle population in the Kachikau Enclave and along the Chobe river front collapsed to virtually nil due to outbreaks of trypanosomiasis and streptothricosis and this opened up the area to occupation by elephants.

The drought of the 1980s seems to have had no effect upon the population, although the total amount of rain falling at Kasane from 1978 to 1984 was 20% less than that between 1929 and 1935, a previous bad drought cycle.

Thus the elephant population in this area has probably been increasing relatively undisturbed since about 1914. Hunting increased in the sixties and from 1979 to 1982 a total of 1,515 licences was issued. Probably over 500 licences a year had been issued prior to 1979. Hunting was stopped in 1983 because of an alleged decline in tusk weight, although Melton showed that there was no real evidence for this with the apparent decrease being within the range of normal statistical variability. ²⁴ For 1979 to 1982 the average tusk weight was 17 kg while the mean largest tusk weight of 33.8 kg included a greatest value in 1981 of 39.6 kg. A trade sample of 2,375 tusks imported into Hong Kong between 1974 and 1978 had a mean weight of 14.05 kg which is very high for a trade sample. In 1864 to 1870, William Finaughty's 316 tusks averaged only 11.48 kg. For American hunters between 1968 and 1978, the mean for 65 tusks was 22.42 kg but this was possibly the result of very selective hunting.²⁵

Dynamics of the Chobe Elephant Population

Using the logistic curve relating the rate of increase of a population to an assumed maximum population level, and assuming that the maximum rate of increase has been sustained over a long period of time, it can be shown that the present rate of increase of the population may be accounted for by reproduction alone. There is no necessity to invoke immigration from other regions (it is not known where the figure of 20,000 sometimes quoted as the total population in 1979 comes from), although that is not to suppose that there may not have been an element of immigration from either Angola or Zambia, or both of those countries. Population simulation using a rate of increase, r_m , of 0.071, based on the formula of Caughley and Krebs and close to the figure of 0.07 given by Calef as the maximum possible, suggests that the ecological carrying capacity, K , of northern Botswana would be about 135,000 elephants, or 1.7/km².^{26,27} This rate of increase provides a close fit to the observed population totals between 1981 and 1989. Using a rainfall/biomass regression and assuming a rainfall of 600 mm since the intensity falls off west of Kasane, at the same unimpeded rate of increase and to the exclusion of all other animal biomass, one could expect a total of 186,000 elephants, or a density of 2.3/km² by the year 2214, or 95% of this number, namely 176,600, in the year 2048.²⁸ If the rivenne belt, say up to ten km from water, could accommodate the same density as that formerly observed in the Murchison Falls/River Nile strip and if the population continued to increase at r^{max} there could be a total of 225,000 elephants in the early part of the twenty-second century with 213,750, or 95% of this total, by the year 2044. These

postulated densities are comparable with the 2.1/km² previously recorded in Uganda's Queen Elizabeth National Park which has a mean annual rainfall of 669.5 mm, and densities estimated at 4.6/km² for open country and 12.5/km² close to the River Nile in Uganda's Murchison Falls National Park which has a mean annual rainfall of 1200 mm. A density of 12/km² was recorded in 1,000 km² of the Linyanti area in the 1987 survey. However, the Chobe population does not appear to be increasing at these rates. The closest fits to the observed increase relative to the logistic curve are given by either an *rm* of 0.05 and an asymptote of 475,000 or an *rm* of 0.071 and a total population of 135,000, giving 5.9 or 1.7 elephants /km² respectively. The second fit seems to be the more likely and reaches the asymptotic level in the year 2204, or 95% of it, 128,250, in the year 2043. Neither fit is significant at the 95% level of probability.

The situation has been complicated by the culling of elephants in Zimbabwe, but these animals represent a mean annual off-take over 29 years of only 3.2% per annum, close to the maximum sustainable yield, while hunting in Botswana accounted for about 1.5% of the population annually. Nevertheless, the best fit of the logistic model is for an *rm* of 0.071. Reducing this to account for the removal of hunted and culled animals has negligible effect upon the predicted rate of increase. The model suggests that the population in Botswana could start to reduce its rate of increase in the year 2010, at an estimated density of 1.3/km², so that the level of 1.7/km² would not be reached until after the year 2030.

Botswana proposes, however, to attempt to keep the population at approximately 60,000, representing an overall density of 0.75/km². It would appear from the model that changes in vegetation due to the destruction of mature trees may have started in the

early 1960s at a density approaching 0.2/km² and this agrees with Child's observation of damage in 1963.²⁹

Martin *et al* postulate that in Zimbabwe specified woodland species will persist at an elephant density of 0.5/km² closed canopy at 0.25/km².³⁰ In Botswana, discounting heavily settled sections and assuming that the elephants may move up to 30km from permanent water, there is approximately 7,500 km² available to them along the Linyanti—Chobe river fronts and 9000 km² in the northern Okavango delta region. Thus to maintain a density overall population of no more than 8,250. Preserving the population at 60,000 is equivalent to sustaining a density of some 3.6/km² within reach of permanent water or, even if there is dispersal over the whole 80,000 km² range subsequent to good rains, an overall density of 0.75/km². To achieve an overall density of 0.5/km², the population would have to be held at 40,000.

Excessive destruction of mature trees and loss of canopy cover in the Chobe-Linyanti riparian strip are inevitable unless the elephant population is reduced to the very low level of some 8,250 for the entire range. Such a reduction would be counterproductive for tourism, and it is arguable whether trees are more desirable than elephants especially as there is extensive closed canopy woodland away from the waterfront. Maintaining the population at its current level will prevent woodland regeneration which also depends upon fire, rainfall, and, in some areas, frost. We may assume that periods of accelerated tree growth roughly correspond to peaks in rainfall and that droughts considerably retard what is at best a slow process. Good rains also help by enabling the elephants to spend less time near the waterfront but the converse is equally true.

Even if left to increase to 135,000 or more, there is little likelihood of a disaster such as that in Tsavo when an estimated 5,000

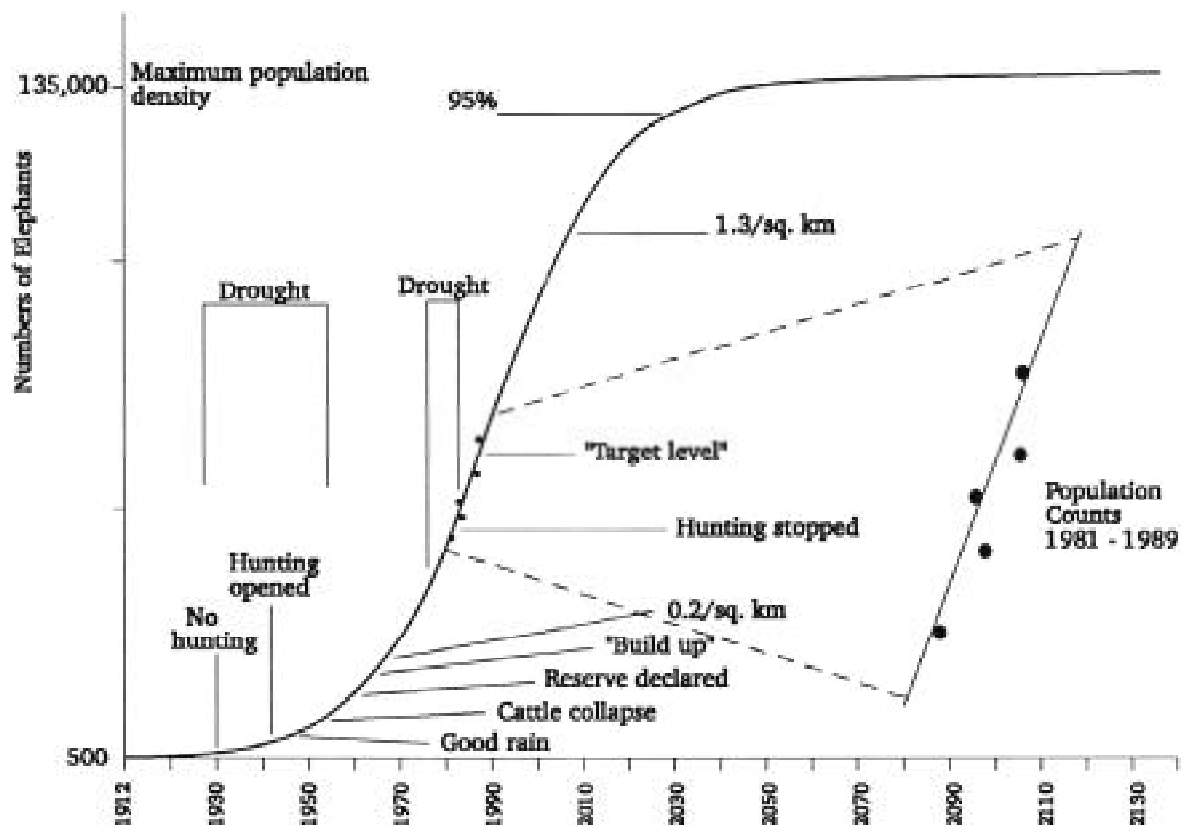


Figure: The logistic model drawn with *rm*=0.07 land showing the fit of population counts over the last nine years

elephants died in a drought year. This is because the elephants at Chobe and Linyanti are probably supported in large measure during the dry season by the extensive flood plain grasses which remain green throughout: in Tsavo's semi-arid ecosystem there was no food resource close to the permanent water. Increasing competition for sustenance would more likely lead to a decline in reproductive ability and a slowing of population growth. A further increase in the present population will lead to increasing conflict with the adjacent agricultural areas unless elephants disperse south and southwest of the Okavango Delta where presently the density is very low. It is not known why the delta is under-utilized by elephants: none has been recorded there nor were any shot during the tsetse control operations.³¹ However, hunting was encouraged close to Maun in the east from 1939, followed by organized game extermination from 1942 to 1967, and so possibly the disturbance factor has kept them away. Should elephants colonise this tract in any number they will come into conflict with the veterinary cordon fence designed to separate the buffalo Foot and Mouth disease carriers to the north from the cattle south of the barrier.

At Savuti, in the southwest of the park, a different situation pertains to that found along the Chobe-Linyanti rivers. The Savuti Marsh is an area of about 100 km containing open grassland in the centre and bordered to the west by a woodland of *Acacia erioloba* and *A. luederitzii*. The area is a marsh in name only. It was wet until the late 1880s when the Savuti River stopped flowing. It remained dry until 1958 when the river flowed again and refilled the marsh. The water supply was more or less continuous until 1981 when again the flow stopped: the marsh finally dried up in 1983. The acacia trees are characterized by being uniformly mature, evidently having grown up in response to the original drying-out of the marsh. But many were drowned by the re-flooding and this has resulted in increased pressure on the woodland remaining on the periphery of the former marsh area. The estimated 3,000 elephants from the Linyanti region which use this area and the surrounding 100 km² or so, mostly in the dry season, are hastening the trees' destruction by ring-barking.³² Hence the forest of dead trees, like that created by the *A. tortilis* woodland flooded by Lake Manyara in the sixties, is only partially attributable to elephants. Regeneration of the acacia trees, it seems, would take place only in a much wetter ground-water phase. A large area of *A. hebeclada* scrub in the south is not touched by elephants at all, possibly because the clay on which it grows is riddled with treacherous sink holes.

Problems of Another Kind

In the east of the country there is a separate population of elephants which poses a problem of another kind. This population, of unknown size, comes from Zimbabwe, regularly breaking through the border veterinary cordon fence. Furtive, aggressive and with no protected area to retire to, the animals maraud through a relatively densely settled area, disappearing whenever attempts are made to track them down. The following extracts from a resident's 1989 letters speak eloquently for themselves:

. . . I will deal with my home village, which is Tobane. At Tobane in the past elephants found a home belonging to a resident east of Tobane, these elephants brought her house down at her cattle-post and threw out her belongings.

At our cattle-post at Tshutshumane, the same elephants found the herd-boy's bag of sour milk, brought the sack down and spread milk all over, unprovoked by anyone.

After the disastrous drought, the elephants found a field with a good harvest and devoured all the produce.

At my late uncle's place they brought down the kraal and almost brought down the hut with some property.

The latest incident, these elephants came to our cattle-post and brought down the kraal and [the] calves were panic stricken and fled into the bush.

. . . the animals after doing all havoc and being satisfied, left for an unknown place.

. . . everybody after the effects of drought did all to plough, oily to feed the aggressive elephants which ate all [the] produce and went into residence[s] to devour what was kept there.

Gentlemen, when you banned elephant hunting way back in 1983, it was my pleasure and everybody's that these animals would not be provoked by hunters, they would remain calm and keep peace with us. However, this is not the situation, these elephants are very aggressive and feel they've been licensed to harass us together with our property.

. . . If at all the concept of conservation has all these after effects, the policy has driven off feeling for humans for [that of] wildlife by those charged with the responsibility to implement this. I personally view your department as an enemy to mankind . . .

. . . . Even if it is worldwide said [the] African elephant is almost going to extinction, should human beings suffer for [the] preservation of these animals

And:

. . . . I have seen very good articles on preservation of African elephants, and the major role played by these creatures. However, a look is only made at this but human beings' life is threatened and nothing is done. Is this what the Government wants? Is it the whole thing behind conservation?

. . . . Fear is mounting that if these animals cross [the] Motloutse [River], anyway which they do but do not travel to the fields, should this occur there will be weeping and gnashing of teeth, and this will occur because elephants are licensed to do as they please

The Tuli Block Elephants

Not far to the east of where the rogue herd operates, are an estimated 550 to 600 elephants in the Tuli Block, concentrated mainly in the private Mashatu Game Reserve at the junction of the Shashi and Limpopo rivers, but ranging over about 300 km².

Although some assert that this is all one population with the rogue elephants referred to above, the behaviour of the rogues is quite different to that of the Mashatu elephants, and a connection therefore seems unlikely. In 1941 these elephants comprised a remnant herd alleged to number 40 to 50 and General Smuts, Governor of South Africa, created a sanctuary for them on the South African side of the frontier and requested the Bechuanaland Protectorate Government to do the same on their side.

The Chief, Tshekedi Khama, refused to consider the idea of a sanctuary on his tribal land saying that the elephants were already protected and only shot when they damaged plantations. General Smuts urged the Government to press the point, fearing that the land would be sold to farmers, but Chief Tshekedi Khama would not reconsider his decision. The outcome was that the sanctuary on the South African side was soon re-gazetted as farmland while the elephants on the Botswana side became so numerous that in 1956 a Game Control Unit was set up to control them, the unit eventually becoming the Department of Wildlife and National Parks. Today, protected in a private game reserve, this population also has exerted a considerable destructive effect on the riparian woodland and many large mature trees have been killed by ring-barking while no regeneration is taking place. So far the Government has hesitated to authorize any reduction in numbers, since this could be politically misconstrued while elephant hunting is prohibited in the country. With an estimated total of 590, the density is about 0.6/km². There is some suggestion that the population has remained much the same size in numbers since 1976, but these elephants come into increasing conflict with surrounding farmland. Although partly restrained by electric fencing, this can only be a temporary solution unless the population reacts rapidly with a decreased rate of recruitment due to shortage of food, as perhaps it may now be doing. However, to reach a total of 590, as recorded in 1976, without immigration the population would have had to number around 250 head in 1940. Since elephant

populations have often been underestimated by a factor of ten, it is quite possible that there were five times as many elephants in 1940 as was thought to exist. The reason why this population may be stabilizing at the relatively low density of 0.6/km² could be the scarcity of perennial grass in the area. Formerly so heavily overgrazed by cattle that livestock rearing became uneconomical, the area was turned over to hunting before becoming a private game reserve: the entire populations of wildebeest and zebra died recently in the drought due to the lack of grazing. The elephants must therefore depend principally upon browse.

The Future

Whatever may be the criticisms levelled at the logistic curve as expressive of population growth in the elephant, certainly the population in northern Botswana is heading for a much higher level than presently exists; and with an observed 6.4% of calves in the population it must be increasing at a near maximum rate.³³ Limitations of habitat will eventually come to bear on this rate of increase, at density levels that we may suppose have been witnessed elsewhere in Africa. But the unstable Kalahari sands which occur in the area, will not have the same resilience to vegetative loss as the fertile soils of, for example, Uganda's Queen Elizabeth National Park with its similar rainfall. The consequences to this habitat of uncontrolled, or even inadequately controlled, growth in elephant numbers could be catastrophic.

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