How Many Elephants are Killed for the Ivory Trade?

I.S.C. Parker and *Esmond Bradley Martin*

After careful examination of trade and other statistics, notably in Hong Kong and Japan, which are the two major importers of African elephant ivory, the authors calculated average tusk weights and estimated the number of elephants involved in Africa's raw ivory exports. They conclude that previous estimates of the number of African elephants killed have been exaggerated.

Over the past decade many people have been alarmed, and rightly so, by estimates of how many African elephants are being killed every year. The Chairman of the IUCN/SSC African Elephant Group, Dr Iain Douglas-Hamilton, gave the largest estimate in a statement to the World Wilderness Congress in South Africa in 1977, when he said, 'In all, ivory leaving Africa in 1976 may have come from anything between 100,000 and 400,000 elephants',[2] but in a later statement, in 1979, Dr Douglas-Hamilton said that ivory leaving Africa represents between '50,000 to well over 100,000' elephants a year.[3] These estimates have not been supported by published data. This article presents data which suggest that the estimates are too high and rely too much on guesstimates.

In 1979 one of us (I.P) completed a survey of the world ivory trade for Dr Iain Douglas-Hamilton on behalf of IUCN and the US Fish and Wildlife Service. This indicated that total exports of raw ivory from Africa had been of the order of 991,000kg in 1976, 827,000 in 1977, and 816,000 in 1978. Since then, we provisionally estimate, using figures based upon annual trade statistics published by importing countries, these exports fell to 681,000kg in 1979 and 680,000kg in 1980. There will, of course, be an additional element of illegal ivory smuggled, but this is likely to be small, for by far the most widespread method of getting illegal tusks out of Africa has been to 'legalise' them. By bribery and other devices, legal documents have been obtained to cover their export, so that the tusks arrive at their overseas destinations quite openly and indistinguishable from ivory of legitimate origin. We therefore hold that while the trade statistics of the importers may not cover every tusk entering their countries, they are sufficiently accurate to indicate the overall order of Africa's exports.

Average Tusk Weight

It follows that, if we know the average weight of tusks leaving Africa, the number of elephants involved can be computed. In 1977 it was suggested that the average weight of tusk might be 4.81kg.[5] This was based on a single but large sample of 43,877 tusks extracted from the books of the Tanzanian Government's Ivory Room in Dar-es-Salaam, and covered the preceding eight years' entries (an average of 5484.6 tusks per year). The main source of this ivory was elephants shot on control in the defence of crops and property, which automatically subjects it to bias. Since the findings of Nicholson in 1956[10] it has

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been policy on control to try to shoot female elephants, which would produce a low average tusk weight. Further, we know from the records of the Uganda Game Department, which pursued a similar policy on elephant control, that the average weight of tusk obtained on control differed markedly from both the average weight of those taken on licence, those found as a result of natural mortality and those confiscated.[1] Consequently a 'national' average tusk weight is unlikely to be the same as a 'control' average tusk weight. The ivory sample examined by Douglas-Hamilton and Davitz did not contain tusks taken on licence nor all those recovered in the national parks. In addition we now know from trade sources that some of the larger tusks obtained on control in Tanzania in the period covered were 'siphoned' out of official channels before ever reaching the Ivory Room. We do not accept that a single sample in which there are known biases, from a single country, should be used as the basis for an average tusk weight for a continent.

Hong Kong Market

The best location from which to obtain an average tusk weight from Africa is at that point in the trade system where the greatest number of tusks arrive from the greatest number of countries. This is undoubtedly Hong Kong. It is possible that anyone seeking average tusk weights in such a market place might be deliberately fed high weights in order to reduce the number of elephants apparently involved in trade. Given the adverse publicity that the trade has received in western media this is understandable. If the data are to be reliable, they must derive from an impartial source. One such would be the import licences which have to specify what tusks they cover. In 1978 one of us (I.P) was able, by examining the import licences, to obtain the weight of 22,260 tusks brought into Hong Kong during the preceding year. The sample included tusks from all Africa's ivory-producing countries of consequence and was truly continental in scope. The average was 9.65kg.

This was a significant advance over the previous estimate of 4.81kg, but we were still not happy about accepting it as truly representative. We knew from ivory traders that Japan was the second largest importer of raw ivory in the world and only took tusks of high average weight. A substantial proportion of Japan's ivory was traded through Hong Kong, and this would have been covered in the Hong Kong average tusk weight. However, the balance which Japan imported through Europe or direct from Africa might have been sufficient to raise the Hong Kong figure as a world average.

Japanese Market

In 1980 one of us (E.B.M) visited Japan and obtained the average weight of more than 200,000kgs of tusks imported during the preceding 12 months. It was 16.00kgs.[9] As the sample from which it derived exceeded 70 per cent of the country's total ivory imports, we have no ground to doubt the veracity of this estimate. Further examination of the uses to which ivory is put confirmed the Japanese demand for large tusks.

Between 1976 and 1980 Hong Kong and Japan imported 83 per cent of Africa's exports of raw ivory, so we have no qualms about accepting averages derived from their imports as an acceptable (if not overwhelming) sample upon which to base an estimate of the overall average tusk weight leaving Africa. Given Japan's average of 16kg, the overall average must be higher than the

Hong Kong average of 9.65kg. However, there are complications in determining just how much of Japan's ivory has come directly from Africa or Europe and how much through Hong Kong. Rather than risk the introduction of error from inadvertent double-counting, we prefer to use the lower Hong Kong average tusk weight for computing a conservative estimate of the number of elephants involved in international ivory trading.

Not all elephants have two tusks. Some are congenitally deficient of one or both; others lose one or both in accidents. From information gained in elephant cropping programmes and control work we have calculated that the average elephant possesses 1.88 tusks. Combining this figure with our estimates of annual African exports of raw ivory we make the following estimates:

Year	Ivory Exported (kg)	No. of Tusks (av. 9.65kg wt)	No. of Elephants
1976	991,000	102,694.3	54,625
1977	827,000	85,699.5	45,485
1978	816,000	84,559.6	44,979
1979	681,000	70,569.9	37,537
1980	680,000	70,466.3	37,482

In only one year, 1976 did the number exceed the lowest previous estimate of 50,000, and there are no grounds for supporting estimates of 100,000 or more.

However, differences between sets of estimates are of little consequence. The central issue to which we must address ourselves is what do the latest estimates mean for elephant conservation? Unfortunately, this is still a field for speculation rather than hard analysis. Broadly the higher average tusk weight provides a more optimistic assessment of the current situation, as fewer elephants are involved. It is also apparent that, over the past five years, the upward trend in ivory exports has been arrested and may now be on a plateau or even descending. This too is ground for some optimism. But what the exports represent as a proportion of Africa's elephant populations is not clear.

In 1979 Douglas-Hamilton estimated that Africa had a minimum elephant population of 1,343,340.[4] The data for this figure have yet to be explained or published satisfactorily, and there are grounds for believing that the populations may be very much higher than this – if only because the figure given was the minimum estimate; what was the maximum estimate? There are also grounds for believing that the population may be smaller than that suggested. For example Kingdon[7] in his outstanding work on East African mammals and their evolution, indicates a smaller African elephant range than that indicated by Douglas-Hamilton.[4]

Major Cause of Decline

For argument's sake let us accept the published figure of 1,343,340 extant African elephant as a basis for considering what current export levels might mean. The highest estimate of 54,625 elephants in 1976 is 4.1 per cent of the estimated minimum; that of 1980 – 37,482 elephants – is 2.8 per cent of the estimated continental population. Both these proportions are within the theoretical capacity for an elephant population to sustain; the elephants of the Addo National Park in South Africa, for example, increased at 8 per cent a year.[6] However, for sustainable offtake the elephants need a constant range,

and we know, on the basis of human increase, that elephant ranges are diminishing. The question is whether the current elephant offtake is in fact the product of this human increase – and therefore unavoidable for the most part – or whether it is largely independent of this cause? (Incomplete research indicates that human increase is, in fact, the major cause of elephant decline. On this we may report later).

Natural Deaths

However, not all elephant deaths come about at the hands of man. Animals are not immortal! When they die many will leave ivory for the wanderer to happen upon. Further, tusks do not decompose quickly and are 'on offer' for several years after the elephant's death. We can give a theoretical idea of the magnitude of this source of ivory. In stable man-free circumstances it is not unreasonable to postulate an annual elephant mortality rate of 7 per cent (which would be balanced by births). Elephant mortality is very high among the very young and Dr Richard Laws's research showed that as much as 50 per cent of annual deaths may be of immatures too small to carry ivory.[8] This means that only 3.5 per cent of the population will die annually and leave tusks. However, 3.5 per cent of 1,343,340 elephants is 47,017 deaths, which at 1.88 tusks apiece, would produce 88,392 tusks. At an average weight of 5kg this would produce 441,960kg of ivory, and at an average of 10kg it would make 883,920kg available. These figures indicate that if all such ivory could be recovered, it would be sufficient to meet most of or even exceed the current world demand.

Of course it is extremely unlikely that ivory from natural mortality could ever be recovered *in toto*. Some elephants die in swamps and their tusks sink from sight rapidly; others in the depths of dense forest are covered with litter within a year or so, and yet others fall so far into the wildernesses that there is scant chance of a human finding them while they are still commercially viable. Yet even so, found ivory represents so great and easy a source of tusks that it must contribute substantially to the world ivory trade. From I.P.'s examination of over 5000 tusks in Hong Kong we believe that the contribution of found ivory to the overall African exports may exceed 20 per cent. At the time this was disputed on the grounds that it was not possible to differentiate found from killed ivory, but since then the criteria used have been tested on a sample of 90 tusks of known origin. Only three were incorrectly identified as to whether they were found or shot – an error of 3.3 per cent, which gives some ground for confidence in the 20 per cent estimate. Of course some of the found ivory may well have come from animals shot, wounded and lost by hunters, and in such cases tusks identified as deriving from natural mortality will be put in the wrong category. But, the important point is that whatever ivory derives from natural mortality diminishes that proportion which is obtained by human hunting, legal or illegal.

Conclusions

To conclude: the statistics concerning the ivory trade indicate that presently the number of African elephants involved are fewer than 40,000 each year and a very small proportion of the estimated 'standing crop' of elephants. Of the elephants involved not all are killed by men; some ivory, possibly a substantial amount, comes from natural deaths. Again, of elephant deaths a proportion are legal – that is brought about within man's laws – and it is not inconceivable that

these will be found to be as many as 10,000 a year. All these factors reduce estimates of illegal elephant killing very substantially. In sum the number of elephant deaths accounted for in the ivory trade is so much less than has hitherto been suggested that we need an explanation. We do not claim that the situation *vis-à-vis* elephant conservation is satisfactory – nor that it is unsatisfactory – but our findings give grounds for less pessimism over one aspect – the ivory trade.

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Ian Parker, P.O. Box 30678, Nairobi, Kenya.

Dr Esmond Bradley Martin, Villa Langata, P.O. Box 15510, Mbagathi, Nairobi, Kenya.

Where One Death Counts

Poachers in Sabah have killed one the world's rarest animals, a Sumatran rhino *Didermoceros sumatrensis*, in the Silabukan Forest Reserve, where the 8-10 animals are the only viable Sumatran rhino population in Sabah and probably in all Borneo. With such numbers one animal counts. Total numbers of the species are put at under 300. The poachers hacked off the head and removed the toenails. This forest reserve has been handed over by the Government to the Sabah Foundation mainly for timber extraction, and studies show, says Rodney Flynn, that when logging starts rhinos go. The Game branch of the Sabah Forestry Department is reported to be 'establishing immediate protection of the area'.

In Malaysia the main Sumatran rhino population is in the Endau Rompin National Park, where Rodney Flynn suggests a 'realistic estimate' is 20-25 rhinos. But the lack of young suggests 'serious trouble'. 'The low density of animals may be preventing an adequate mixing of adult males and females'; low quality diet may be another cause. He thinks translocations may have to be considered.

The largest number of Sumatran rhinos is in Sumatra's Gunung Leuser National Park, where numbers are put at between 50 and 100.