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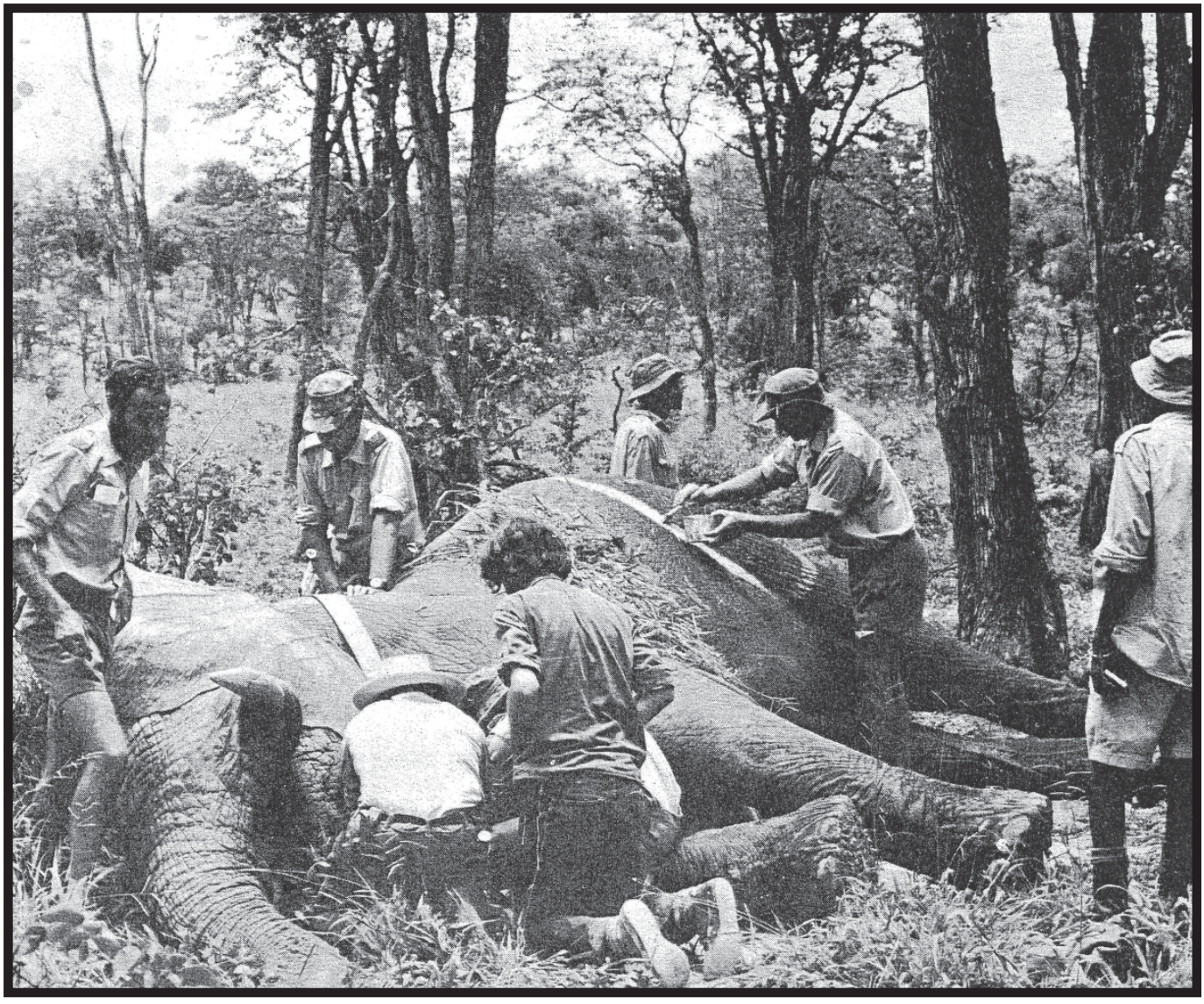

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# Recent U.S. Imports of Certain Products from the African Elephant

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## INTRODUCTION

For many years the plight of the African elephant (Loxodonta africana) has been the subject of engaged debate among various sectors of the U.S. public. At least one conservation organization was established solely for the purpose of protecting elephants, and in 1978, the concerns resulted in the listing of the African elephant as "threatened" under the U.S. Endangered Species Act. In addition, in 1977., 1979,1981, and 1983 bills were introduced in the U.S. Congress that would prohibit imports of elephant products (Anon., 1979; Anon., 1981; and Anon., 1983).

The Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have been equally concerned that elephant populations are declining, mainly as a result of poaching and illegal trade. However, the Parties have recognized that the African elephant still has large populations that, if properly managed, can sustain commercial exploitation, but that this cannot be achieved unless the substantial illegal trade, in raw ivory is eliminated.

Recognizing this, the delegates attending the fifth meeting of the Conference of the Parties (Buenos Aires, 1985) agreed to adopt an ivory export quota system for the African elephant, whereby the countries with elephant populations would set export quotas based on sound management principles, and the ivory importers would accept raw ivory only from countries that had agreed to this system (Caldwell, 1987). In addition, the Parties mandated the CITES Secretariat to form a special ivory unit to coordinate and monitor trade between exporting/reexporting and importing countries. This system, called the CITES Ivory Quota Control System, was endorsed by the U.S. delegation to the Conference of the Parties in Buenos Aires and entered into effect in January 1986.

It is premature to assess the effectiveness of the quota system, although some positive trends have been documented by Caldwell (1987). However, it is clear that the illegal trade in raw ivory remains extensive and elephant populations have continued to decline. The African Elephant and Rhino Specialist Group (AERSG) of the International Union for Conservation of Nature and Natural Resources (IUCN) has estimated that in 1986 — —the first year of the quota system —only 22% of the raw ivory trade was carried out within the system and that tusks from some 89 000 elephants may have entered the trade illegally (AERSG, 1987).

Based on this information and a report by Douglas-Hamilton (1987), the U.S. delegation to the sixth meeting of the Conference of the Parties (Ottowa, 1987) stated that a U.S. import ban on elephant products is under consideration. On 23 July 1987, Congressman Anthony Beilenson (D-California) introduced a bill (H.R. 2999) that, if enacted, would prohibit the import into the U.S. of any product from the African-elephant.

The purpose of the proposed "Elephant Protection Act" is to "eliminate the role of the United States in creating the world demand for elephant products, including but not limited to ivory," and to "encourage other nations to join in a ban on trade in such products." The proposed Act further states that the President or his delegate shall propose to CITES that all trade in elephant products by Parties be suspended until accurate data demonstrate that "large and healthy elephant populations have been re-established and are biologically stable over large geographic areas."

The following report on U.S. imports of elephant ivory and skins was written in response to requests for trade information made to TRAFFIC (U.S.A.) by the House Subcommittee on Fisheries and Wildlife Conservation and the Environment after Bill H.R. 2999 was introduced. The intention is to assess the U.S. role in creating or perpetuating a demand for elephant products.

## SOURCES OF INFORMATION

The principal sources of information for this report are U.S. CITES Annual Report data for the years 1983-1985, and U.S. Fish and Wildlife Service Law Enforcement "DECS' data for the years 1984-1986 and the first seven months of 1987, which come from U.S. Declarations for Importation or Exportation of Fish or Wildlife (form 3-177). These data are obtained from the Division. of Law Enforcement of the U.S. Fish and Wildlife Service (USFWS/LE) and are further processed on Micro Vax II and IBM computers at TRAFFIC. 'In addition, information has been retrieved from Customs import declarations for the years 1983-1986 and the first five months of 1987 received on microfiche from the U.S. Department of Commerce.

In order to eliminate possible data errors, certain transactions and entries have been verified with importing companies, USFWS/LE, and the CITES ivory unit. In addition, certain data have been excluded because they were either incomplete or fell under general headings (e.g. "trophy") that could not be converted into raw ivory, skin, etc. Hence, the results presented in this report should be regarded as minimum totals and treated with some caution as It is likely that the U.S. trade is larger than illustrated here.

## THE VOLUME AND PATTERN OF THE U.S. IMPORT OF ELEPHANT PRODUCTS

### Raw Ivory

According to USFWS/LE, the U.S. is not a significant market for raw ivory (C. Bavin, pers. comm. 29 May 1987). However, for the period 1983 through 1986 the U.S. imported a minimum of 16 827 raw tusks and an additional 18 187 kg of raw tusks (Table 1). The reported imports peaked in 1984 when they amounted to 9 078 tusks and 2 222 kg of tusks, and declined towards 1986; during the latter year imports amounted to only 855 tusks and 238 kg of tusks. This decline, particularly in 1986, coincides with the Introduction of the CITES Ivory Quota Control System,' but'it is uncertain to what extent this was the determining factor. In addition to the imports of tusks, the U.S. imported a small number of cut pieces of raw

**Table 1.** U.S. imports of raw ivory 1983-1986

| Year | Raw tusks (Apparent increase) | Cut pieces |
|---|---|---|
| 1983 | 5991 items | – |
| | 6 053.4 kg | – |
| 1984 | 9 078 items (+52%) | 103 items |
| | 2222 kg (-63 %) | 173 kg |
| 1985 | 903 items (-90 %) | 24 items |
| | 9 683.7 kg (+336%) | 340 kg |
| 1986 | 855 items (-5%) | 8 items |
| | 238 kg (-98 %) | 20 kg |
| Totals | 16827 items | 135 items |
| | 18 187.1 kg | 533 kg |

Source: U.S. CITES Annual Report Data and USFWS "DECS" data.

ivory amounting to 135 pieces and 533 kg (Table 1; 1983 figures excluded).

With some caution it is possible to convert the total amount of imported raw ivory (excluding the 135 Cut pieces) into the number of elephants this represents. Using' Parker and Martin's (1982) estimate of 1.88 tusks/elephant and Caldwell's (1987) calculation of the mean weight of 4.7 kg for tusks traded under the quota system in 1986 (which involved large amounts of stocks acquired during previous years), the number of elephants killed for the U.S. market during 1983-1986 is a minimum of 12 934.

A comparison of USFWS and Customs data for raw ivory imports shows a number of marked discrepancies both in the countries and amounts of ivory involved. Table 2 shows the imports that took place during 1984-1986 and which were cleared by USFWS compared to those reportedly cleared by Customs and documented under Customs tariff 1 906 000 (i.e. ivory tusks, crude, or cut vertically across the grain only). Table 3 shows only the raw ivory that was imported directly

**Table 2.** Comparison of import data for raw ivory obtained from U.S. Fish and Wildlife Service and U.S. Customs (Department of Commerce), 1984-1986.

| Year | USFWS import records (1) | Customs import records (2) |
|---|---|---|
| 1984 | 9 181 items | 0 items |
| | 2 395 kg | 9 749.5 kg |
| 1985 | 927 items | 0 items |
| | 10023.7kg | 5126kg |
| 1986 | 863 items | 0 items |
| | 258 kg | 3 524.1 kg |

Source: U.S. CITES Annual Report data, USFWS "DECS" data, and U.S. Department of Commerce data under tariff 1906000 ("Ivory tusks, crude, or cut vertically across the grain only").

(1) Records for "raw tusks" and"cut pieces" added together.
(2) Data converted from pounds (lbs).

**Table 3.** Raw ivory imported by the U.S. directly from African countries 1983-1986. Numbers in parenthesis are raw ivory imports registered by U.S. Customs.

| Country | 1983 (tusks only) | | 1984 | | 1985 | | 1986 | |
|---|---|---|---|---|---|---|---|---|
| Botswana | 58 | | 103 | | 25 | | 0 | |
| Botswana (kg) | 468 | (1 455) [1] | 68 | | 7 560 | (28) | 0 | |
| CAR | 0 | | 509 | [3] | 0 | | 4 | |
| CAR (kg) | 1 096 | | 0 | (52) | 0 | (189) | 0 | |
| Congo | 0 | | 0 | | 0 | | 2 | |
| Congo (kg) | 0 | | 0 | | 0 | 0 | (35) | |
| Cameroon | 4 | | 0 | | 2 | | 0 | |
| Ethiopia | 0 | | 0 | | 0 | | 5 | |
| Gabon | 3 | | 0 | | 0 | | 0 | |
| Kenya (kg) | 0 | (8) | 0 | (30) | 0 | | 0 | |
| Liberia | 2 | | 0 | | 0 | | 2 | |
| Malawi | 2 | | 3 | | 0 | | 0 | |
| Namibia | 2 | | 0 | | 0 | | 0 | |
| Nigeria | 8 | | 0 | | 17 | | 0 | |
| Senegal | 0 | | 0 | | 3 | | 0 | |
| Sierra Leone | 0 | | 0 | | 1 | | 0 | |
| Sudan | 22 | | 0 | | 0 | | 2 | |
| Tanzania | 18 | | 0 | | 17 | | 58 | |
| Tanzania )kg) | 591 | (61) | 260 | | 289 | (105) | 0 | |
| South Africa | 49 | | 80 | | 341 | [5] | 80 | |
| South Africa (kg) | 2814 | (2082) [2] | 488 | (3434) [4] | 38 | (2 460) | 84 | (580) |
| Zaire | 654 | | 249 | | 0 | | 590 | [6] |
| Zaire (kg) | 430 | | 1 250 | (5 934) | 0 | (987) | 0 | |
| Zambia | 1 | | 4 | | 4 | | 30 | |
| Zambia (kg) | 83 | (9) | 48 | | 0 | | 0 | |
| Zimbabwe | 178 | | 54 | | 193 | | 96 | |
| Zimbabwe (kg) | 70 | (1118) | 112 | | 933 | (1 133) | 0 | (143) |

Source: U.S. CITES Annual Report data, USFWS "DECS" data, and U.S. Department of Commerce data under tariff 1906000 ("Ivory tusks, crude, or cut vertically across the grain only").

[1] Includes 375 kg with the country of origin South Africa.
[2] Includes 1 000 kg with the country of origin Zimbabwe.
[3] Includes 500 tusks with the country of origin Zaire.
[4] Includes 86 kg with the country of origin Zimbabwe.
[5] Includes 2 tusks with the country of origin Zambia and 9 tusks with the country of origin Zimbabwe.
[6] According to USFWS, 132 of these tusks have been returned to Zaire.

from African countries during 1983-1986 compared to that reported by Customs. In general, there' is no or very little correlation between the two sets of data. In each of the three years examined, the reported total volume of the USFWS data is substantially larger than that reported by Customs. On a country basis there is some correlation, but the discrepancies in volume follow a similar pattern, i.e. the volume reported for individual countries by USFWS is almost always the larger. This tendency is difficult to explain but can perhaps be attributed to the fact that Customs data are less specific and the potential for error is greater.

A number of the transactions illustrated in Table 3 may represent violations of the U.S. Lacey Act. During 1983-1985, the most questionable are those imports of raw ivory from the Central African Republic (CAR) and Zaire. According to the CITES Secretariat (1983), CAR had an annual hunting quota of only 200 elephants during the period examined. In addition to the numbers found in Table 3, the U.S. imported more than 1 000 kg of raw ivory of CAR origin, re-exported from Hong Kong, Spain, and the United Kingdom.

Zaire did not issue any permits for the export of commercial

shipments of ivory from 1981 until the quota system was instituted in 1986 (Caldwell, 1984 and Douglas Hamilton, 1987); in fact, Zaire suspended exports of ivory on 18 August 1978 (CITES Secretariat, 1980). Despite this, the U.S. apparently allowed the import from Zaire of 903 tusks and 1 680 kg of raw ivory during 1983-1984; in addition, in 1983 and 1984 the U.S. imported from Hong Kong 4 938 and 7 233 tusks of Zairian origin, respectively. Douglas-Hamilton (1987) also reports that the U.S. imported ivory from Zaire in 1985. These imports are also evident in U.S. Customs data (Table 3).

During the period 1983 through 1985 a number of shipments of raw ivory were reportedly allowed entry into the U.S., despite the fact that they were declared as originating in countries where the African elephant does not occur or were exported from countries that were not Party to CITES at that time. These transactions may represent violations of both the U.S. Lacey Act and the U.S. Endangered Species Act. Some of the most notable examples are the imports of 425 tusks from India declared as originating in India (where only the endangered Asian elephant (**Elephas maximus**) occurs), and 9 tusks from Angola.

In 1986, the USFWS apparently did not follow the newly-instituted CITES Ivory Quota Control System, and this is reflected in the data (Table 4). A number of possible Lacey Act violations also appear, which might have been avoided if the Secretariat's ivory unit or the countries of export had been consulted, as prescribed in the ivory quota procedures. In addition, on a number of occasions the CITES ivory unit apparently requested information from the USFWS regarding certain shipments of ivory; this information was not provided by the USFWS (J. Yovino, pers. comm. 20 July 1987). Discussions with the ivory unit (J. Caldwell in litt. 12 May 1987 and pers. comm. 12 August 1987) reveal that at the very least, the U.S. imports from CAR, Liberia, Sudan and Zaire apparently took place outside the quota system.

As' in previous years, the most notable of these questionable imports are those from Zaire. In 1986, Zaire had a CITES export quota of 10000 tusks but only authorized export of

**Table 4** Comparison of reported U.S. imports of raw tusks from African countries in 1986 with exports authorized by these countries under the CITES Ivory Quota Control System (IQCS)

| Country | Tusks reported imported by USFWS | Tusks authorized for export to U.S. under IQCS | Explanation |
|---|---|---|---|
| CAR | 2 | 0 | Zero quota [1] |
| Ethiopia | 2 | ? | |
| | 3 | 0 | Entire quota exported to HK [1] |
| Liberia | 2 | 0 | Zero quota [1] |
| Sudan | 2 | 0 | [2] |
| Tanzania | 56 | 130 | Authorized for export by TZ [2] |
| South Africa | 79+ 84 kg | 63 | Authorized for export by ZA [2] |
| Zaire | 590 | 0 | Entire quota exported to HK/JP [2] |
| Zambia | 30 | ? | |
| Zimbabwe | 94 | 169 | Authorized for export by ZW [2] |

Source: USFWS "DECS" data, unless otherwise stated.

[1] Caldwell (1987)
[2] Caldwell in litt. and pers. comm.

* This country is not a party to CITES and the import should not have been allowed under the Endangered Species Act.

1 425 (Caldwell, 1987). All the authorized tusk exports went to Belgium (from where they were re-exported to Hong Kong and Japan) and Japan. While the U.S. imported a minimum of 590 tusks or an estimated 2 301 kg (1986 mean tusk weight of 3.9 kg from Caldwell, 1987) directly from Zaire, none of these were accompanied by the required CITES tusk data sheets. At least four of the shipments in question were accompanied by irregular permits, and the CITES ivory unit has expressed concern to this effect (J. Yovino, pers. comm. 19 August 1987). When the USFWS was informed by TRAFFIC about the possible illegal nature of the Zairian ivory imports, the import declaration packages were reviewed. Subsequently, the USFWS opened an official investigation of these imports (N. Roeper, pers. comm. 27 August 1987). In addition, the Zairian export documents were brought to Ottowa for discussion with the CITES ivory unit during the sixth meeting of the Conference of the Parties (N. Roeper, pers. comm. 27 August 1987).

Another shipment of 140 tusks from Zaire reportedly was cleared for import by USFWS on 13 July 1987. According to the CITES ivory unit (J. Yovino, pers. comm. 19 August 1987), Zaire so far has not authorized any commercial shipment destined for the U.S. in 1987. It is, therefore, likely that this shipment also took place outside the quota system, probably with a forged permit (reported as No. 238/87 in "DECS") (J. Yovino, pers. comm. 19 August 1987).

Other imported shipments cleared during the first seven months of 1987 amount to 188 tusks and 198 kg of tusks. Some of these, as during previous years, are small shipments and probably consist of hunting trophies; however, these are also covered by the ivory quota system and imports from countries with a zero quota or without the required documents should not be allowed entry. Such imports reportedly took place, for instance, from the Ivory Coast.

Other discrepancies in 1986 concern imports from South Africa, Tanzania, and Zimbabwe. These countries reported to the CITES ivory unit (J. Caldwell, pers. comm. 12 August 1987) that they had authorized the export of 63, 130 and 169 tusks, respectively (Table 4).

In 1986, the declared value of raw ivory imports reported by USFWS was $194 418. Compared to the international trade price for raw ivory, this seems to be a low figure. Douglas-Ham ilton (1987) reports that since 1982 the wholesale price of raw ivory has risen to over U.S. $100 per kg. Based on this information it seems likely that the true import value of the U.S. trade in 1986 was at least $430 000.

### Worked Ivory

In 1982, the U.S. was the second largest importer of worked ivo.ry after Japan, accounting for l7% of the minimum number of pieces reported in trade and 32% of the volume by weight (Barzdo, 1984). More than 1.6 million pieces and 58300 kg of carvings were imported that year. Since then, the reported imports have' increased considerably, peaking in 1985 when a minimum of 4 810 667 pieces, 27346 kg of pieces, and 9678 sets and 58 kg of sets of piano keys with a total declared import value of $24 362 513 entered the country (Table 5). The total declared value of worked ivory imported to the U.S. in 1986 was $17 574 775; this parallels the reported decrease in imports between 1985 and 1986 when the number of pieces and the volume by weight dropped 5% and 82%, respectively. The single largest supplier of worked ivory to the U.S. during the period examined was Hong Kong, accounting for more

**Table 5.** U.S. imports of worked ivory 1984–1986

| Year | Worked ivory | Apparent increase |
|---|---|---|
| 1984 | 4220933 items of carvings | +161 % [1] |
| | 23 790.1 kg of carvings | -60% [1] |
| | 6 207 sets of piano keys | |
| | 441 kg sets of piano keys | |
| 1985 | 4 810 667 items of carvings | +14% |
| | 27 346.7 kg of carvings | + 15 % |
| | 9 678 sets of piano keys | |
| | 58 kg sets of piano keys | |
| 1986 | 4577429 items of carvings | -5% |
| | 4 970 kg of carvings | -82 % |
| | 10 261 sets of piano keys | |
| | 6 kg sets of piano keys | |

Source: U.S. CITES Annual Report Data and USFWS "DECS" data.

[1] Compared to U.S. import figures for 1982 in Barzdo (1984).

than 90% of total imports. In 1982, Hong Kong was the supplier of 97% of the U.S. trade reported as pieces (Barzdo, 1984). In 1986, worked ivory imported by the U.S. directly from African source countries accounted for only 3% of the total reported trade. This trade was dominated by CAR, Congo, South Africa, Sudan, Tanzania, Zaire, and Zimbabwe; all these countries, except perhaps the Congo, are known to have domestic carving industries (e.g. Martin, 1986 and Martin, 1987).

It is difficult to estimate how many elephants were killed to supply the U.S. market for worked ivory products. Barzdo (1984) cautiously estimates the mean weight of individual ivory carvings in Hong Kong's trade for the years 1981-1982 to be 0.062 kg and states that this figure is likely to be a maximum. Based on this estimate and Caldwell's (1987) mean tusk weight of 4.7 kg, the U.S. consumption of imported ivory carvings in 1986 (which was dominated by products from Hong Kong) converts into some 285 tonnes of raw ivory or 32 254 elephants.

The trade in worked ivory is complex for a variety of reasons, one of them being the number of years that can pass between the time the elephant is killed until the ivory product reaches the final consumer. Therefore, it is difficult to assess the legality of the U.S. trade in these products in terms of the laws of the countries of origin. It is important to point out, however, that a number of African .countries have either prohibited the export of raw ivory or have not issued any export permits for raw ivory for several years. In 1986, 75% of the U.S. imports of ivory carvings were declared as originating in one of four countries: Congo, Kenya, Sudan, and Zaire (domestic manufacturing subtracted), all of which prohibited raw ivory exports well before 1986 (Caldwell, 1984). Excluding Sudan, which imposed the most recent ban (30 December 1983 (Caldwell, 1984)), these questionable imports still amount to 65% of the total trade in carvings. These imports may represent violations of the U.S. Lacey Act. Reports by Caldwell (1984 and 1987) document that, despite the export bans in Congo and Zaire, these countries (in particular the latter) have been among the main suppliers of raw ivory to Hong Kong's carving industry. It is assumed that Hong Kong holds considerable stocks of raw ivory (Caldwell, 1987), but it is unlikely that the turn-over in the carving industry is so slow that the industry is still producing from raw ivory stocks imported prior to 1981 or earlier.

However, Hong Kong's import of stocks from Belgium in 1983/84 and from other countries (Caldwell and Barzdo, 1986) may obscure the picture.

**Elephant Skins**

Table 6 shows the U.S. imports of elephant skins (i.e. "raw or partially processed skins/hides") during 1984-1986. Reported imports of "Pieces of Skin"' and "Large Leather Products"' have been left out as they may represent anything from tails and trunks to penis skins and skin pieces of foreheads, and are thus difficult to convert to number of elephants involved. During the three years examined, 1984 seems to represent the year of the largest imports; however, the different units used in this trade make comparison difficult. The overall trend is a considerable decrease towards 1986. Leather industry representatives in the U.S., who asked to remain anonymous, have confirmed this trend and attribute it to factors in the exporting countries; i.e. the demand has not decreased. The reason is simply that during 1983-1985, the world supply of elephant skins was artificially high because more elephants were culled in the main exporting countries, which were struck by drought. This situation has changed, and industry representatives predict a very "low" year in 1987.

In 1986, the U.S. reportedly imported 20 702 skins, 1 979 kg, 400 sq/metre, and 6 500 sq/feet of skin. However, according to the industry representatives, these data are not accurate. The unit "skin"' is misleading as in most cases one elephant skin is split into two or more large pieces. A large proportion of the "skins" are traded as "panels" or sides, and, therefore, one reported skin probably is only half a skin or less. D. Cumming, of the Zimbabwean Department of National Parks and Wildlife Management (in litt. 25 August 1987), reports that the number of skin panels taken from culled elephants in Zimbabwe usually is six plus the head panel and the trunk making eight or sometimes nine pieces per animal.

One industry source claims that an average skin piece imported by their company is 15 sq/feet, and that an adult

**Table 6.** U.S. imports of elephant skins 1984-1986

| Year | Skins imported | Apparent increase |
|---|---|---|
| 1984 | 21 937 skins | |
| | 7 797 kg | |
| | 126 664 sq/metre | |
| | 2 616 sq/feet | |
| 1985 | 37 937 skins | +73% |
| | 12762.4 kg | +64% |
| | 7376 sq/metre | -94% |
| | 5 181 sq/feet | +98% |
| 1986 | 20702 skins | -45% |
| | 1 979 kg | -85% |
| | 400 sq/metre | -95% |
| | 6500 sq/feet | +26% |

Source: U.S. CITES Annual Report data and USFWS "DECS" data.

southern African elephant probably contains between 40 and 50 sq/feet commercial skin. In addition, the unit "kg" does not give any idea of the number of elephant skins involved as the thickness of the skin often varies depending on the purpose for which the skin will be used. D. Cumming (in litt. 25 August 1987) further reports that the average weight of dry salted hide recovered per elephant from Zimbabwean culling operations is 60 kg, and that one kg of dry salted hide represents approximately 1.2 to 1.4 sq/feet of hide. Consequently, an average Zimbabwean elephant contains approximately 45 sq/feet commercial hide. In general, industry representatives seem to agree that the reported import figures are minimum figures and that the average annual U.S. import is around 500 000 sq/feet. Peak-years reportedly do not exceed 1 million sq/feet. Based on these estimates, the annual U.S. elephant skin trade may involve the skins from a minimum of 11 000 elephants. If these estimates are applied to the numbers in Table 6, then the reported skin trade in 1986 involved a minimum of 7 000 elephants. According to D. Cum.ming (pers. comm. 20 August 1987), this figure seems somewhat high. The culling operations in the countries that supply the U.S. market probably killed 7 000 elephants total in 1986, but the skins were not all exported to the U.S. Although the world trade in skins has not been analyzed, the U.S. net imports (re-exports subtracted) seem to rank at least at the same level as the imports into the European Economic' Community. Certainly, the two markets together seem to represent the major part of the world market in elephant skins.

The overall picture of the skin trade is quite different than that of the ivory trade. The international supply is almost entirely from the southern African region where controlled culling takes place. The trade is largely legal and there is no evidence of poaching for skins (D. Cumming, pers. comm. 20 August 1987).

In 1986, the countries supplying the U.S. market were Zimbabwe, South Africa, and Botswana, in that order. These countries all have well-managed elephant populations with very little poaching (Douglas-Hamilton, 1987). More than 80% of the skins were imported directly from the source countries, and the majority of the remaining were re-exported from countries in the European Economic Community. The trade in 1986 had a declared import value of $1 099 067, according to USFWS.

The majority of the elephant skins are manufactured in the U.S. by the boot industry in Texas. A minor proportion of the skins are re-exported to Mexico where they also are made into boots, and eventually imported back into the U.S. In 1986, these imports from Mexico numbered 9 948 boots with a declared import value of $247 266.

**DISCUSSION**

The U.S. trade in elephant products is significant in several ways. First, the total trade in all types of products represents an average annual declared import value of $29 million during 1984-1986. Worked ivory products constitute the bulk of these imports; in 1985, for instance, the reported value for these items was $24.4 million. Based on discussions with industry representatives, TRAFFIC estimates that the annual retail value of elephant products sold in the U.S. may represent at least $100 million.

Second, the U.S. is probably the world's largest importer of elephant skins. These imports come almost exclusively from southern African countries which have model elephant management programs, and are the products 'of carefully-controlled culling activities. These exports are extremely important to national and local economies; in Zimbabwe, for instance, the skin exports generate revenue for the government amounting to about 2 million dollars annually (D. Cumming, pers. comm. 20 August 1987), thus providing tangible evidence for political leaders of the benefits of controlled wildlife utilization.

Third, U.S. ivory imports raise serious concerns about the national enforcement system. An international ivory trade control system has been set up through CITES that closely tracks shipments of raw tusks worldwide and provides a clearing house for legal information on the ivory trade. While this control system offers a vital tool for U.S. enforcement of the much stricter Lacey Act, the U.S. has largely ignored this system, and in the process, several ivory shipments of dubious legality have been allowed entry. This is not the fault of the port inspectors; the USFWS authorities responsible for issuing directives to the field have apparently made elephant ivory a low priority. As an example, the Fish and Wildlife Service's Import/Export Manual, which provides guidelines and policies for inspections at the ports of entry, includes a special chapter on ivory and marking of ivory. This chapter, however, has not been updated since April 1983. The USFWS has apparently failed to notify port inspectors that an ivory quota system has been established, that individual quotas and ivory marking schemes have been set up for African countries, and that numerous changes-have taken place in the national legislation of many African countries.

Furthermore, the USFWS has failed to request importers and traders to register ivory stocks, as recommended under the ivory quota system. The significant imports of raw ivory during the 1980s may indicate that ivory stocks are being held for investment purposes in the U.S., and such stocks should not be re-exported under the quota system if they were not registered prior to 1 December 1986. This could possibly cause significant problems and economic hardship for U.S. ivory exporters in the future.

The U.S. is clearly an important player in the international ivory trade. With its considerable resources and enforcement expertise, this country could have a very positive impact on controlling the trade and conserving the African elephant. But the complexities of the ivory issue require an innovative and carefully-crafted approach. An excise tax on ivory products, for example, could provide significant revenues for improving wildlife trade controls and elephant conservation, and offer ample incentive for strengthening elephant management programs throughout Africa. Other alternatives to an outright ban that take into consideration .the needs and realities —of African nations and their elephant populations should also be explored.

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*Continued on P. 21*

# The Marketing of Elephants and Field-dressed Elephant Products in Zimbabwe

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## INTRODUCTION

This paper describes the marketing of elephants, **Loxodonta africana**, and their products in Zimbabwe, against a background of some of the philosophies influencing wildlife and protected area management in this part of Africa. Besides the obvious merits of conserving elephants as a species in their own right, success with the management of the species has come to symbolise the overall effectiveness of wildlife management programmes.

The elephant is an ecologically dominant animal of considerable economic importance which arouses conflicting emotions. While there is still much to learn about its biology, enough is known to irritate classical ecological and protected area management concepts. It is also well known to compete with man for space and, within large secure protected areas, can become a threat to biological diversity if populations build up to critical levels (Cumming, 1981).

As Parker and Amin (1983) have described, ivory trading had a marked influence on African politics for centures before the "scramble for Africa" took place between the major European powers, mainly during the 19th century. It is not surprising that this has left a deep-rooted, ill-defined and poorly understood mistrust of ivory dealings and their motives in many African minds. For hundreds of years the continent's elephant resources and its people, who were enslaved to transport ivory to the coast, were exploited by outsiders, chiefly from the East. Even now, some countries receive but a fraction of the value of their ivory exports (Martin, R., 1986). Management of elephants in Africa is complicated by emotionalism, lack of understanding and conflicts of interest. There is little reconciliation between the wishes of the rural people, who bear the social costs of elephant damage but who derive few tangible benefits from having the animals on their land, and those that would protect the species for aesthetic or financial reasons. This epitomizes the problems relating to resource allocation and accountability, discussed by Child and Nduku (1986) and elaborated by Child and Child (1986).

Zimbabwe's policy towards wildlife, outside protected areas other than Safari Areas, is that it is a component of the natural ecosystems in which it occurs and like other components should be used on a sustainable basis. Experience in this country has taught that the controlled economic use of wildlife is beneficial to the resource, provided the people who bear the social costs imposed by wild animals also benefit from them and have a say in their management. Where these principles have been ignored, as in the case of some Specially Protected Animals, the conservation of wild populations has run into problems.

Clearly, an ability to market legally acquired products from wild animals is central to this philosophy. Because elephants and elephant products are highly valued, their sale has a positive spin-off effect for other wildlife. Profits can be derived from elephant populations in several ways. The importance of non-consumptive uses is acknowledged fully, but is outside the scope of this discussion. Here consideration focusses on the marketing of products where management objectives include an element of consumptive use. Within this context it is sensible to seek the highest profits possible for the landholder.

## MARKETING

Elephants are a source of food and raw material for manufacture. Ivory is also a bullion and the species is an attractive hunter's trophy. As a trophy, a bullion and the raw material for artists and other craftsmen, ivory sells on at least three distinctive markets, each obeying its own forces, but all compete for the same scarce resource.

### Ivory

Ownership of and trading in ivory is strictly controlled in Zimbabwe. Legislation requires the individual marking and registration of every tusk and the licensing of all ivory dealers and ivory manufacturers. These stringent controls aim to curtail illegal practices but facilitate legal ownership and trade, thus allowing elephants to realise their comparative advantage in the competition for space. Domestic legislation is supported by strict adherence to CITES.

Ivory was sold by public tender for many years and the results of sales since 1961 are summarised in Table 1. These data have been updated and differ slightly from those presented by Martin, E. (1984). The tender system with its inherent need for secrecy is alien to the African concept of open government

**Table 1**. The value of ivory sold by Government tender in Zimbabwe

| Year | Month | No. Tusks | Total Mass (kg) | Mean Mass/ Tusk (kg) | Price realised US$ | Price realised US$/kg |
|---|---|---|---|---|---|---|
| 1961 | | 1 892 | 11150 | 5.89 | 47 158 | 4.23 |
| 1963 | | 1 695 | 11 342 | 6.69 | 44 341 | 3.91 |
| 1965 | | 3 105 | 16 240 | 5.23 | 106 481 | 6.56 |
| 1968 | | 3 156 | 13 990 | 4.43 | 86 176 | 6.16 |
| 1969 | | 2 731 | 13 299 | 4.87 | 63 641 | 4.79 |
| 1969 | 9 | 910 | 4 428 | 4.87 | 21 854 | 4.94 |
| 1970 | 11 | 922 | 4 504 | 4.89 | 23 139 | 5.14 |
| 1970 | 2 | 927 | 4 483 | 4.84 | 27 598 | 6.16 |
| 1972 | 10 | 928 | 4 480 | 4.88 | 42 344 | 9.45 |
| 1972 | 5 | 1971 | 8 930 | 4.53 | 91 021 | 10.19 |
| 1972 | 9 | 3016 | 8 891 | 2.95 | 105 805 | 11.90 |
| 1973 | 10 | 1171 | 1 422 | 1.21 | 14 592 | 10.26 |
| 1973 | 2 | c. 112? | 150 | c.1.34 | 2 357 | 15.71 |
| 1978 | 3 | 3 027 | 7 500 | 2.34 | 258 988 | 34.53 |
| 1978 | 5 | 443 | 3 000 | 6.77 | 121 153 | 40.38 |
| 1978 | 6 | 1 290 | 2 836 | 2.20 | 143 531 | 50.61 |
| 1982 | 8 | 114 | 1 726 | 15.14 | 133 330 | 77.25 |
| 1983 | 10 | 2 007 | 7 000 | 3.49 | 264 039 | 37.72 |
| 1983 | 1 | 319 | 1 000 | 3.13 | 37 179 | 37.18 |
| 1983 | 6 | 344 | 1 021 | 2.97 | 38 084 | 37.34 |
| 1984 | 10 | 1 871 | 6 298 | 3.37 | 252 908 | 40.16 |
| 1984 | 3 | 1 018 | 4 000 | 3.93 | 180 080 | 45.02 |
| 1984 | 7 | 653 | 4 000 | 6.13 | 274 000 | 68.50 |
| 1985 | 4 | 1 066 | 4 500 | 4.22 | 283 050 | 62.90 |
| 1985 | 9 | 768 | 4200 | 5.47 | 240.061 | 76.21 |

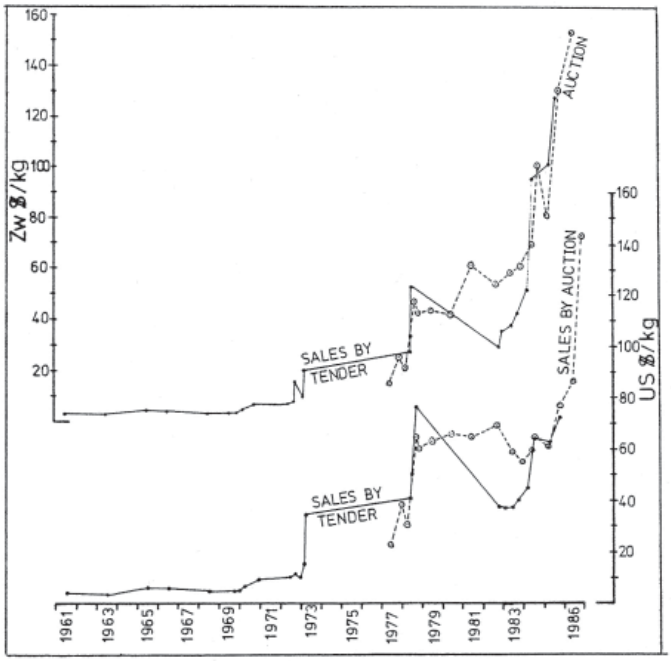
and, in the case of ivory, appeared to fuel the mistrust of ivory dealings already mentioned. This method of selling ivory was unavoidable, however, during the 15 years of economic sanctions against Rhodesia, prior to Zimbabwe's Independence.

Open auctions were initiated in 1977 (Table 2) in response to the demands of the domestic carving industry described by Martin, E. (1984). There is no long tradition of high quality carving in Zimbabwe, but during the past two or three decades a high degree of artistic excellence has emerged. using ivory or stone. Martin estimated that the annual wholesale value of worked ivory in mid-1983 was about US$4.55 million (ZW$8.0 million). He also estimated that this production was based on 15 tonnes of raw ivory, which in 1983 was worth about ZW$52 per kg or a total of ca. ZW$780 000 (Figure 1). Martin's estimates suggest an added value, at the wholesale stage, of some 5.8 times the price of raw ivory, increasing to about 10.2 times that value when the carved ivory retailed in Zimbabwe.

While early auctions we're restricted to domestic buyers, it soon emerged that there could be no objection to anyone participating in these public sales. Parcels of tusks are now classified as'"embargoed" and' may be exported only in a worked state, or "unembargoed", when they may be exported as raw ivory. To begin with the great majority Of both classes were purchased locally. This, and the fact that Zimbabwe does not permit the import of 'raw ivory, led Martin, E. (1984) to suggest that domestic prices were inflated due to the country's closed economy, the limited availability of foreign exchange and limited raw ivory on the local market. Unfortunately the records for "embargoed" ivory on offer have not been kept separate, except for auctions nos. 14 and 16 in 1985 and 1986. In both cases similar sized exportable raw tusks, paid for in foreign exchange, mostly by foreign buyers, attracted higher prices (Table 2). Figure 1 shows that, although Martin's conclusions may have held from late 1982 to mid-1984, this was unlikely thereafter. By late 1984 prices realised on auctions were similar to those attracted by international tenders, which were suspended in 1985.

The average weight of tusks on offer in Zimbabwe is low (Tables 1 and 2) as much of this ivory emanated from elephant population reduction exercises and the destruction of problem animals. The small ivory is particularly attributable to the age distribution frequency in Zimbabwe's elephant populations, which are tending to expand, and partly to deliberate avoidance of killing males with large ivory during both types of management actions.

**Figure 1.**
Average prices of ivory per kg obtained in sales by tender and auctions.




In view of the suggestion of Martin, E. (1984) that domestic ivory prices are warped by characteristics of the Zimbabwean economy, both the ZW$ and the US$ values are included in. Figure 1. Similar patterns emerge with differences due to the hardening of the US$ and the softening of the ZW$.

Figure 2 examines the average prices paid per kilogram of ivory, sold by auction and tender since 1961 and includes the real prices based on the value of the ZW$ in 1970, adjusted by the cost of living index for higher income households. Clearly

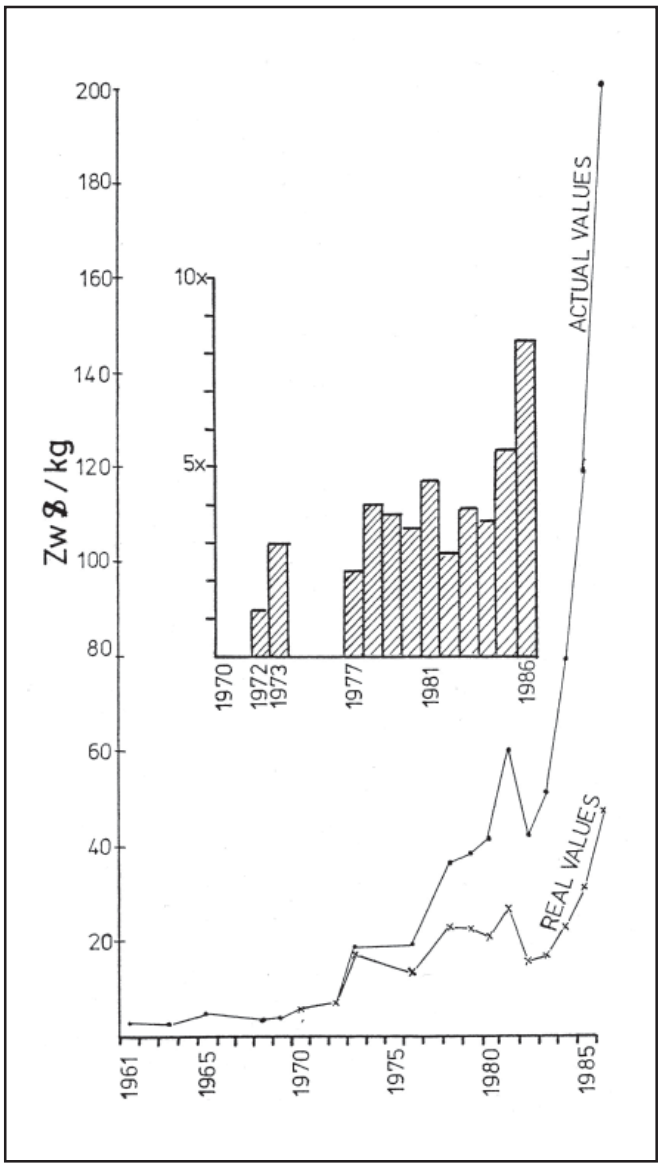
**Table 2.** The value of ivory sold on auction sales in Zimbabwe

| Auction No. | Year | Month | No. Tusks | Mass kg | Mean Mass tusk kg | Mean prices per kg by tusk size 2kg ZW$ | 3kg ZW$ | 4kg ZW$ | 5kg ZW$ | 10kg ZW$ | 15kg ZW$ | 20kg ZW$ | 25kg ZW$ | 30kg ZW$ | 35kg ZW$ | Total Price ZW$ | Us$ | Mean Price per kg ZW$ | (US$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1977 | 5 | 890 | 3 313 | 3.7 | 12 | 14 | 15 | 16 | 22 | 19 | 0 | 0 | 0 | 0 | 49 120 | 75 842 | 14.8 | (22.9) |
| 2 | 1977 | 11 | c.1 073 | 2 622 | c.2.4 | 0 | 0 | 0 | 26 | 27 | 0 | 0 | 0 | 0 | 0 | 66 911 | 102 110 | 25.5 | 38.9) |
| 3 | 1978 | 3 | c. 878 | 3 339 | c.3.8 | 21 | 19 | 20 | 21 | 35 | 35 | 40 | 37 | 0 | 0 | 69 630 | 102 725 | 20.9 | (30.8) |
| 4 | 1978 | 8 | | 3 436 | c.3.9 | 34 | 40 | 41 | 42 | 52 | 50 | 63 | 63 | 0 | 0 | 159 947 | 237 033 | 46.6 | (69.0) |
| 5 | 1978 | 10 | 1 409 | 4 779 | 3.4 | 32 | 33 | 35 | 34 | 58 | 56 | 56 | 69 | 66 | 0 | 201 577 | 295 188 | 42.2 | (61.8) |
| 6 | 1979 | 6 | 1 706 | 3 980 | 2.3 | 37 | 40 | 42 | 50 | 60 | 54 | 60 | 65 | 62 | 79 | 171 541 | 252 142 | 43.1 | (63.4) |
| 7 | 1980 | 5 | 911 | 4 646 | 5.1 | 39 | 33 | 36 | 44 | 50 | 47 | 48 | 47 | 69 | 0 | 193 752 | 307 292 | 41.7 | (66.1) |
| 8 | 1981 | 6 | 1 697 | 7 788 | 4.5 | 46 | 47 | 47 | 50 | 59 | 68 | 71 | 0 | 0 | 0 | 473 667 | 508 605 | 60.8 | (65.3) |
| 9 | 1982 | 9 | 1 908 | 8 367 | 4.4 | 25 | 30 | 35 | 37 | 50 | 64 | 78 | 92 | 107 | 0 | 450 198 | 580 756 | 53.8 | (69.4) |
| 10 | 1983 | 6 | 1 365 | 3 682 | 2.7 | 31 | 37 | 42 | 45 | 65 | 85 | 104 | 123 | 143 | 163 | 215 032 | 217 183 | 58.4 | (59.0) |
| 11 | 1983 | 11 | 467 | 3 952 | 8.5 | 27 | 35 | 41 | 46 | 66 | 85 | 103 | 122 | 140 | 158 | 240 297 | 218 670 | 60.8 | (55.3) |
| 12 | 1984 | 5 | 1 273 | 4104 | 3.2 | 25 | 40 | 57 | 68 | 79 | 84 | 92 | 105 | 126 | 0 | 286 688 | 243 685 | 69.9 | (59.4) |
| 13 | 1984 | 10 | 646 | 4 359 | 6.7 | 55 | 67 | 77 | 84 | 110 | 113 | 118 | 123 | 127 | 0 | 439 297 | 298 722 | 100.8 | (68.5) |
| 14 E ) | 1985 | 3 | 1 758 | 4 862 | 2.7 | 43 | 51 | 58 | 64 | 93 | 114 | 130 | 143 | 152 | 0) | 392 447) | 251 166) | 80.7 | (51.7) |
| 14N/E) | | | | | | 77 | 86 | 93 | 98 | 116 | 126 | 136 | 145 | 155 | 0) | ) | ) | | |
| 15 | 1985 | 10 | 720 | 4410 | 5.8 | 69 | 82 | 93 | 102 | 138 | 162 | 178 | 192 | 203 | 0 | 539 941 | 318 565 | 130.4 | (76.9) |
| 16 E ) | 1986 | 5 | 1 368 | 5 698 | 4.2 | 100 | 104 | 124 | 134 | 173 | 205 | 238 | 251 | 281 | 302) | 871 466) | 496 736) | 152.9 | (87.2) |
| 16N/E) | | | | | 132 | 140 | 148 | 156 | 189 | 240 | 244 | 265 | 292 | 314) | ) | ) | | | |
| 17 | 1986 | 11 | 775 | 5 792 | 7.4 | 114 | 141 | 164 | 185 | 253 | 213 | 231 | 334 | 351 | 366 | 1 435 155 | 832 390 | 247.8 | (143.7) |

E = embargoed Ivory; N/E = non-embargoed ivory.

**Figure 2.**

Actual and real values of ivory per kg (actual values are prices paid for ivory in the year of purchase; real values are these amounts converted to 1970 ZW$ values, according to the high income category cost of living index).




the value of ivory sold has increased in real terms since 1970, the relative annual values in those years in which there were sales being indicated in the insert.

As to be expected the value of ivory per kg increased with the sizes of the tusks (Table 2), with the increase rapid for tusks of from 1 kg to 5 kg, but slower for those from 5 kg to 35 kg. Intuitively, an accelerated rate of increase may have been expected in the unit value of larger tusks, due to their scarcity value, but present data were too thin to test this hypothesis.

**Hide and other parts and derivatives**

For many years little attention was given to the recovery of elephant products other than ivory, although local communities made, and still make, extensive use of the meat whenever it becomes available. Social costs due to damage to crops, stored grain, water supplies and the like were often exaggerated in order to have elephants destroyed for their meat. This and a desire to hunt elephants among responsible officials was often sufficient incentive for the destruction of many animals, even when ivory prices were low and all financial returns accrued to the exchequer.

Increasing attention has been given to the collection of hide, meat and other products, since the late 1960's, in response to their marketability. Panels of hide of uniform thickness are removed, flensed and salt dried in the field. After being tanned and finished they provide attractive durable leather favoured for such items as high-class footwear, brief cases, ladies' handbags, luggageware and golf bags.

Meat is cut into thin strips, brined and sun-dried in the field to provide a highly palatable form of protein, with a substantial shelf life without refrigeration, It is popular with many local people, especially those with a low income. Well prepared feet, for the curio trade, and tails, to provide hairs for personal adornment, are a small but significant contribution of growing importance to the overall value of an elephant carcass.

Child (1983 and 1984) describes the processing of carcasses in the field from elephant reduction programmes and Child (1983) and Child and Nduku (1986) provide estimates of the costs of such operations. At 1986 values these amounted to some ZW$25 750 (US$15 450) for the killing, collection of scientific data and ivory, and ZW$53 830 (US$32 300) for the recovery and field processing of other products from 1 000 head culled at the rate of 40 animals per day. It thus costs about ZW$80 (US$48) to cull and process an average elephant under difficult field conditions in a large but efficient culling operation. This compares with a rough estimate of ZW$390 (US$235) to recover and process products from a single large bull shot, for example, on a hunting safari.

Available hide prices are listed in actual and real terms in Table 3, from which it is clear that this is a valuable commodity of growing importance. Until 1986 hide was sold by the Department of National Parks and Wild Life Management on its own account and on behalf of local Communal Land communities by tender. Merchants, professional hunters and others sold both small and larger quantities by negotiation, both inside and outside Zimbabwe where there are restrictions on the export of field dressed hide.

There are reasons to believe that prices remained depressed in spite of an obvious keen interest in a scarce and profitable

**Table 3.** Average value of elephant products sold by Govern ment in 1976 to 1986

| | Dry hide/kg | | Ivory/kg | | Dry meat/kg | | Calves, each | |
|---|---|---|---|---|---|---|---|---|
| | Actual | Real | Actual | Real | Actual | Real | Actual | Real |
| Year | ZW$ | ZW$ | ZW$ | ZW$ | ZW$ | ZW$ | ZW$ | Zw$ |
| 1976 | | | | | 0.78 | | | |
| 1978 | | | 36.68 | 22.93 | | | | |
| 1979 | 3.90 | 2.17 | 38.25 | 21.25 | | | 1 051 | 584 |
| 1980 | 4.02 | 2.01 | 41.70 | 20.85 | | | 800 | 400 |
| 1981 | 3.25 | 1.41 | 60.80 | 26.43 | 1.40 | | 320 | 139 |
| 1982 | 3.29 | 1.22 | 42.49 | 15.74 | | | 600 | 222 |
| 1983 | 2.21 | 0.71 | 51.63 | 16.65 | 1.72 | 0.55 | | |
| 1984 | 3.40 | 0.95 | 79.90 | 22.83 | 1.90 | 0.54 | 700 | |
| 1985 | 4.40 | 1.16 | 119.10 | 31.34 | 2.05 | 0.53 | 900 | |
| 1986 | 15.68 | 3.73 | 200.75 | 47.80 | 2.75 | | 400 | |
| | | | | | | | 1 200 | export |

Actual = ZW$ value in year of sale; Real = ZW$ value in 1970

commodity, because of one or a combination of the following:
— the tender system and a limited local market;
— Government's lack of knowledge of prevailing world market conditions;
— the restrictions on the free export of field dressed hide;
— uncertainty as to the quantity of hide to be sold and the timing of sales each year; and
— the limited number of merchants and tanners, within Zimbabwe, interested in elephant hide.
This is a complex topic. It includes scales of trade, price linkages between elephant, ostrich and crocodile hide, fashion trends and the like. Suffice it to note that with the introduction of the first hide auction in 1986, there was a welcome increase in producer prices, which previously had not maintained their real dollar values in some years.

There is a ready market for fresh elephant meat, but it is usually impracticable to recover and sell it in bulk. Lightly brined sun-dried meat is a much more practical and profitable proposition, although less so than hide. Both fresh meat and hide are highly perishable, so that during carcass recovery there is often need to sacrifice some meat in the interests of the urgency to process hide.

It is policy in Zimbabwe to sell some 50% of the meat from a cull in a protected area cheaply to surrounding people for their domestic consumption, in order to encourage goodwill and a local appreciation for the protected area. While this is an interesting subject with many facets, it is outside the theme of this paper.

Prices realised for other meat, which is still sold by Government in bulk by tender, are indicated in Table 3. They have moved from around ZW$0.10 - 0.20 per kg in 1971 ano 1972 to over ZW$2.0 in 1985. In real terms this is a 3 to 4-fold increase in 13 years.

In 1982, the Department was able to dispose of some meat, pluck and bones (with meat attached) from a cull, fresh to a contractor who recovered it from the field where the elephants were shot. Prices paid were: meat, ZW$0.42 (equivalent to ZW$0.57 in 1986) per kg, or with considerable wastage, ZW$46.20 per average carcass; bones ZW$0.04 per kg; and pluck ZW$0.18 per kg.

During the mid to late 1970s it was not economical to collect and prepare elephant feet for the curio trade, and legs were skinned right down to the soles of the feet. Since about 1983 prices have improved and in 1986 selected field-prepared front feet were worth about ZW$40 (US$24) each on the wholesale market. Similar hind feet realised about half this price.

Depending on the lengths and quality of the hairs, salted elephant tails are worth between ZW$5 to ZW$25 each, when sold in bulk. it is probable that with more attention, including the selection and grading of hairs, this sum could be increased substantially.

The experience of the Department of National Parks and Wild Life Management in the marketing of elephant products over the years indicates:

— most elephant products are increasing in value in real terms;
— the terms of trade for most elephant products would appear to have remained as favourable or to have been more favourable than those for commonly produced agricultural produce;
— as with most productive enterprises, attention to quality control and the development of markets benefits profitability;
— marketing products by open auction is to be preferred to a tender system and both are preferable to the arbitrary setting of fixed unit prices; and
— the profitable marketing of products requires a thorough understanding of the market and regular information on changing market conditions.

**Whole Carcasses**

Besides recovering products from elephant population reduction exercises itself, the Department of National Parks and Wild Life Management has called upon contractors to do so. Contracts are awarded by tender and are limited to those commercial companies with the skills and specialised equipment needed. Unless the contractor is efficient and his recovery of products can keep pace with the projected rate of offtake, he will suffer financially and useful raw materials will be wasted to the detriment of the economy; management goals may not be achieved if the culling rate has to be reduced to prevent excessive wastage. The last is especially important as culling has always been determined by the requirements of ecosystem conservation in Zimbabwe, where profitability is a second level consideration.

The contractor is entitled to all the products of the elephant carcasses where the animals are shot, except the ivory which remains state property. For this he either pays a flat rate per carcass or a sliding scale depending on the sizes of individual animals shot. He makes his profit from the sale of the products that he recovers and processes.

Contractors are required to co-operate in the collection of scientific data for monitoring reduction programmes and contracts may require that 50% of the processed meat remains Government property; to be sold cheaply to local people for their domestic use only. The last precaution is necessary as there have been cases where local businessmen have purchased the cheap offer and then promptly sold it at a healthy profit to merchants. This does nothing to benefit local people or encourage their acceptance of a neighbouring park. Employing a contractor to recover carcasses is less profitable to the management authority, but it does -absolve the authority of substantial capital and recurrent costs and the associated financial risks. It also obviates the need to acquire expertise in a range of skills that are more appropriate to the private sector. Provided the interests of the contractor remain strictly subservient to the management objectives of the authority, it becomes a question of establishing the best combination of private and public sector involvement needed to achieve the goals of a particular exercise.

**Live Animals**

The live animal trade in southern Africa is now big business due to a growing realisation of the value of wildlife and the desire to stock depleted habitats. There is also an increasing number of reputable organisations, such as zoo-parks, that require stock. The capture of calves for these purposes is a valuable source of revenue and a useful means of demonstrating the economic value of elephants.

Recently weaned calves of a suitable size for transportation (i.e. with a shoulder height between 42" and 48") and in the ratio of 1 male to 4 females, find a ready market. Landholders wishing to stock their land, who are not faced with using air transport, will accept bigger animals.

In either case the calves are sold by the Department where they are captured in the field. The purchaser must then

recover the calves, acclimatize them to pens and rear them under field conditions until they can be moved to more permanent quarters.

In Zimbabwe calves are sold for ZW$600 (US$360) each to dealers and for ZW$300 to local landowners. This is less than the ZW$700 and ZW$9C0 charged in 1984 and 1985 and probably less than could be expected on a competitive market. It is, however, substantially more than the carcass values of the animals and it assists the authorities to ensure their welfare after sale. Keeping live animals is expensive and dealers should be permitted a reasonably generous mark-up so that high standards of animal care can be insisted upon. Taking these considerations into account as well as the desirability of stocking large properties in the country with elephants, the Department has preferred modest fixed prices for calves to be exported and even lower prices for those to be relocated elsewhere in Zimbabwe.

**Hunters' Trophies**

Elephants, especially large bulls with big ivory, are very attractive to high-paying sportsmen and where these people are foreigners this attracts valuable foreign exchange. In Zimbabwe such bulls are sold in two ways. Safari outfitters pay a fixed trophy fee (Figure 3) on behalf of their clients, while other bulls are included in the bags of individual hunts sold to the public direct. Until 1986, when these hunts were auctioned, they were sold by tender and separate bids were invited for the bulls. From hunts with similar quotas, but for an elephant bull, Child (1986) was able to estimate that the addition of the elephant increased the value of a hunt by an average of ZW$9 509 (range ZW$6 631 to ZW$14 860). These "free-market" prices, where available, are also included in Figure 3.

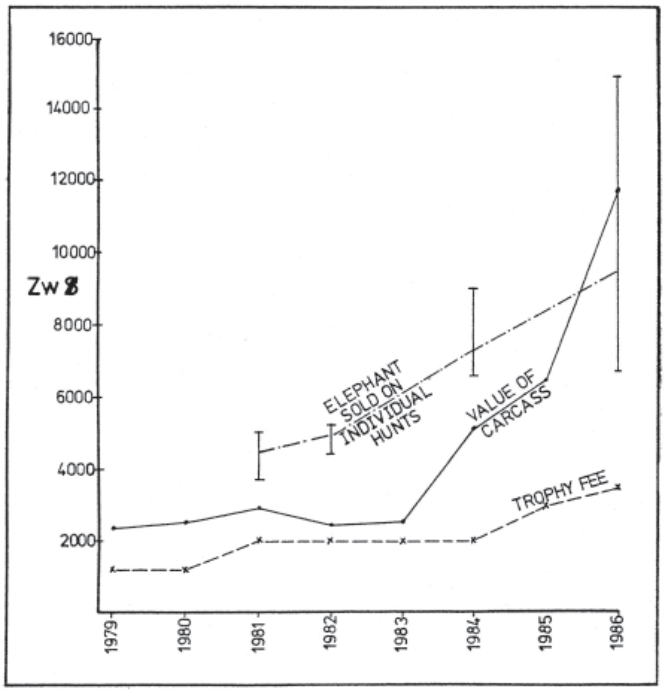



**Figure 3.**

The prices obtained for an average bull elephant (i) if sold to a safari operator at a fixed trophy fee; (ii) if its products are sold separately at the market values for each product; (iii) if sold by tender to a member of the public for an individual non-commercial hunt ("free-market" price).

With skillful marketing, the opportunity to hunt an elephant can be used to extend a safari by 5 to 7 days. At ZW$830 (US$500) per day this adds ZW$5 000 (US$3 000) to the trophy fee for the animals, making each bull worth ZW$10 500 in direct foreign exchange in Zimbabwe. The safari hunting industry was worth something over ZW$6.0 (US$3.8) million in 1985 and the industry claims, with merit, that this figure would have been much lower without elephants. Selling expensive hunting would have been much more difficult on highly competitive international markets, and the effects of this would have extended beyond those safaris offering elephant trophies. It has been estimated that each elephant bull attracted some ZW$42 000 (US$26 000) worth of business.

Animals sold on individual hunts to members of the public, who may be either residents of Zimbabwe or foreigners (the latter paying for their hunts in foreign exchange), attract more than the basic price bid at the auction. It has been estimated that participating in these 14-day hunts costs the hunter at least ZW$150 (US$90) per day in travelling and other incidental expenses and these costs are much greater if the hunter has to hire vehicles and equipment. A portion this additional ZW$2 100 per hunt, which benefits the economy at the local and national level, is attributable to the elephant trophy, over and above the average of ZW$9 509 paid for the right to hunt it.

Thus, there is little difference in the direct income generated, whether a bull is sold to a safari client, or on an individual hunt to a member of the public. If the availability of a bull is in fact worth ZW$42 000 in foreign business to the safari industry, then the main disparity lies between the, greater return it can earn in foreign exchange by being reserved for a safari client and the reduced benefits (ZW$4 000) that this will produce for the landholder selling it.

## DISCUSSION

The fact that elephants and elephant products sell on different—markets, and the importance of elephants to the overall wildlife industry, pose many dilemmas for the wildlife manager. Both the spirit and the word of the Parks and Wild Life Act, 1975, favour the producer receiving a fair return from the correct use of his wildlife. This is necessary if the resource is to achieve its comparative economic advantage and to compete successfully for space with other systems of land use.

For most species the trophy fees exceed the carcass value so that, with the addition of services charges for guiding and the like, recreational hunting 'becomes an ecologically and economically efficient way in which to use wild populations. With the high carcass value and relatively low trophy fees applicable to elephants in Zimbabwe, this does not apply to elephant populations.

Some 89% to 96% by value of the products from a trophy class bull can be exported in the field dressed state. This destroys any argument that the added return in foreign exchange from using a bull for safari hunting justifies the prejudice of the landholder and a breach of the spirit of the legislation. On the other hand, selling safari hunting is the most feasible marketing strategy for the Increasing number of ranchers and peasant communities converting from a livestock economy to a wildlife economy. This trend is highly desirable for wildlife and for human welfare in Africa, especially in those large parts that are

suited Only to pastoralism and wildlife.

An obvious solution would be to increase elephant trophy fees to above their carcass value, but the safari industry claims that this would be counter-productive. There would be strong market resistance among international sportsmen who, although coveting tusks as trophies, view them as just that, ignoring their intrinsic value as ivory. Conversely the high prices paid for elephant bulls on recent open markets in Zimbabwe suggest that the market resistance may be less severe than anticipated by the safari industry.

Government reactions anywhere tend to be in response to popular outrage. Safari clients are viewed as among the richest people in the world and many emanate from wealthy countries in the North. It should not be surprising if their investment in ivory was seen to be at the expense of some of the poorest people in the world. Such a situation, is too close, for comfort, to the age-old foreign exploitation of Africa's elephants and her people.

The problem is exacerbated by the fact that producers and the national economy could be seen to benefit more from selling elephant bulls differently. This results from:

– the rather intangible advantage to all safari hunting of being able to offer elephants on a few hunts; and

– a general lack of appreciation of the significance of hunting in promoting economic wildlife management and its potential to assist Africa out of its present environmental and economic dilemma.

For example, on the surface there is every advantage, in reserving the ivory presently taken by safari clients and directing it to the domestic carving industry. This enterprise pays producers better prices and employs local craftsmen to enhance the value of the raw material at home. Zimbabwe can presently harvest around 50 bulls a year on a sustained basis, worth ZW$525 000 in direct earnings from safari clients (trophy fee + service charge). If each animal yielded 50 kg of ivory this offtake would provide 16.7% of the carvers' annual needs of 15 tonnes and would be worth ZW$1.3 million in potentially exportable finished ivory. In this regard the carving processed by craftsmen and the trophy sold by the professional hunter are analogous finished products in the form desired by the market. If this were not so, safari clients would be less reluctant to sell their trophies.

Obviously this example is an over-simplification to illustrate the different markets on which ivory sells, but which nevertheless Influence each other. Carvers and safari hunters actually tend to complement each other to the advantage of ivory prices. While craftsmen make extensive use of small ivory and some favour cow ivory hunters seek the biggest bull ivory available.

This discussion seeks only to define better how to sell elephants and their products to best advantage to the country. Answers are elusive and solutions will probably emerge from the marketplace provided this remains free of artificially imposed constraints. It must also remain sensitive to the interests of the producer. Likewise, if 50 elephant bulls really do generate foreign safari business worth ZW$2.1 million, then this fact should be substantiated and publicised. Such information could be vital in evolving a rationalised, diversified national marketing strategy aimed at optimising the return from the resource.

The rising value of elephants, in the main due to rising product prices, is in the best interests of the species. Already it justifies increased emphasis on elephant management at the national level. When these improved financial returns benefit local people, offsetting the social costs they now bear and providing a profit, elephants will be in a strong position to compete for space and hence to survive in numbers outside protected areas.

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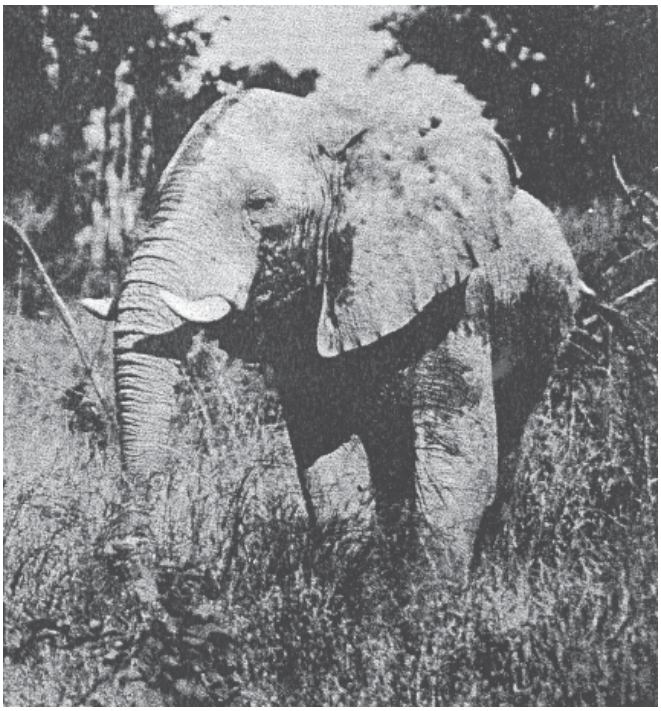

# Elephants of the Dzanga-Sangha Dense Forest of South-western Central African Republic

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## INTRODUCTION

The Dzanga-Sangha Dense Forest Reserve in southwestern Central African Republic (CAR), covering an area of approximately 4 000 km$^2$ in the Sangha Economique Prefecture (Figure 1), contains the highest known population density of elephants remaining in the dense forest zone of Africa (Table 1) (Carroll, 1986a; Western, 1986 a). Elephant density estimates, measured by dropping counts (Wing and Buss, 1970; Short, 1983; Jachmann and Bell, 1979) indicated a range of 0.016 to 2.63 elephants/km$^2$ in the northern regions surveyed by Carroll (1986a) (Figure 2). The southern region surveyed by Fay (1987) indicated a much lower elephant density of 0.064/km$^2$. Both **Loxodonta africana africana** and **L. a. cyclotis**, as well as an apparent intergrade between these subspecies, are represented in this area (Carroll and Hulberg, 1982; Carroll, 1986a). This has recently been rereported by Western (1986b). This intergrading of elephant subspecies in CAR is discussed by Blancou (1958) (in Meester and Setzer, 1971). These two subspecies and their intergrades exist sympatrically throughout CAR and were commonly observed in the Manovo-Gounda-Saint Floris National Park, close to the northern Sudanese border (Carroll and Hulberg, 1982). This is likely due to climatic and habitat fluctuations throughout the past 10 000 years as described by Western (1986b). Currently gallery forests extend from the dense forests of the

Congolese basin northward into the Chadian basin, forming a forest-savanna mosaic throughout CAR. These gallery forest corridors are extremely important in the biogeographical distribution of CAR's flora and fauna (Carroll and Hulberg, 1982; Fay, 1987).

The existence of the pygmy elephant (L. a. pumilo) in these forests is discussed by several authorities in Meester and Setzer (1971) and remains entirely without evidence. These alleged pygmy elephants have again recently been doubted by Western's observations (1986a,b) of forest elephants in the Dzanga clearing. He observed what he described as a class pygmy elephant enter the clearing, approach an adult female cyclotis and begin nursing. Due to the poor visibility of the habitat and the large inter-individual distance between fore elephants when travelling and foraging in the dense forest, well as the early tusk development of this subspecies compared with'**africana**, immature individuals of **cyclotis** may have been considered a separate race. Western observations lend support to earlier conjectures (Morrison Scott, 1947; Petter, 1958; Pfeffer, 1960) that the pygmy elephant is a juvenile forest elephant, but do not confirm its non-existence. Although I also doubt the existence of pygmy elephants after nearly six years of ecological work in the CARs savannas and forests, I do not feel that Western single observation at Dzanga ends the debate. Dzanga is saline pan in the middle of non-inundated primary and secondary lowland forests (Carroll, 1986a). The pygmy elephant is reported to be a creature of the inundated swam p forests which exist in abundance in the extreme south of CA and western Congo, but not around Dzanga. Careful observations in these underexplored and almost inaccessible Congolese swamp forests will be necessary to end this controversy.

**Table 1**. Density of elephants (Loxodonta africana) in forest or partially forested habitats.

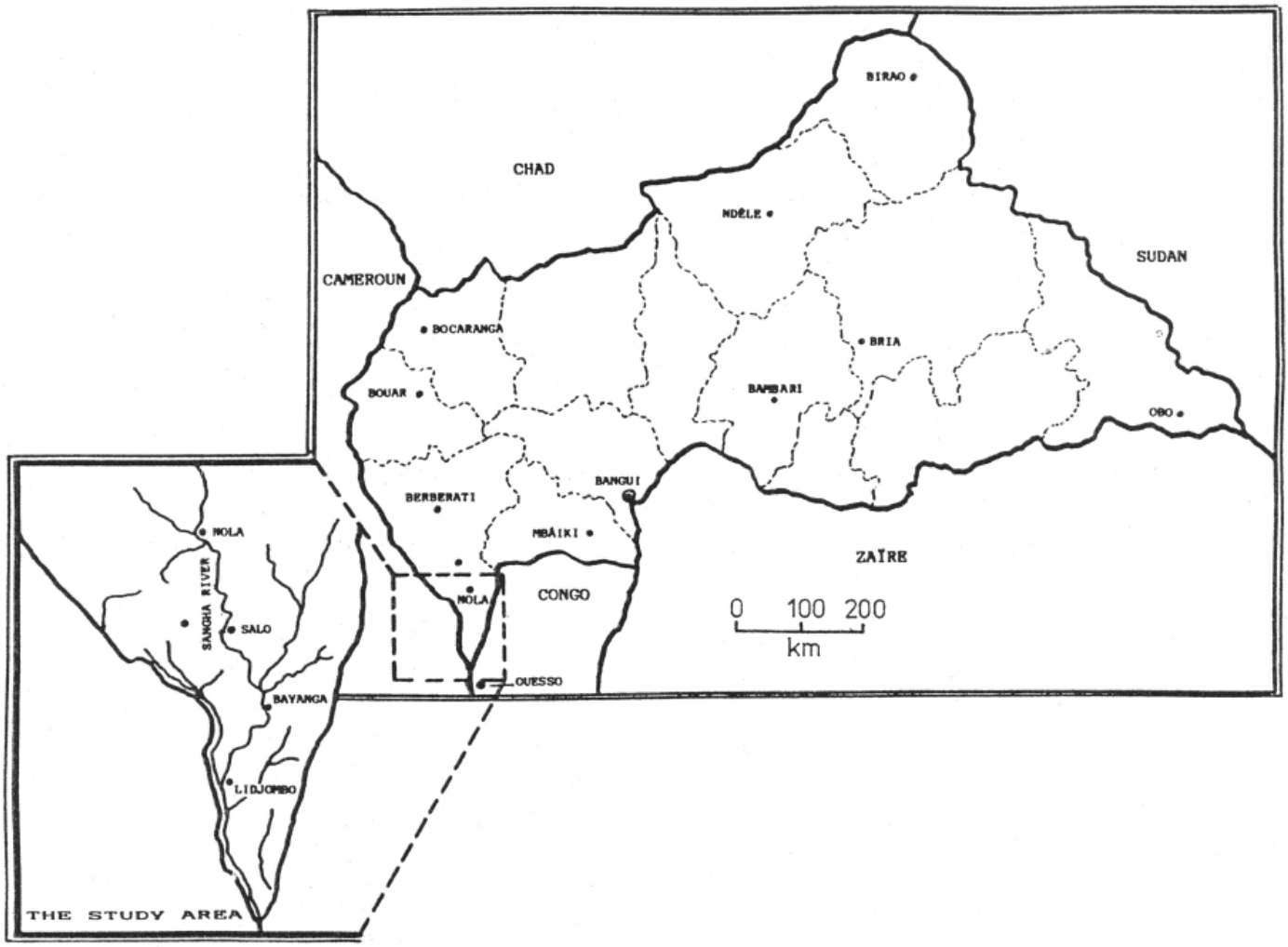
| Density km$^2$ | Locality | Habitat | source |
|---|---|---|---|
| 0.76 | Kibale Forest, Uganda | Rainforest, thicket, grassland | Wing and Buss (1970) |
| 0.53-0.84 (wet season) 2.11-3.16 (dry season) | Budongo Forest | Moist semi-deciduous rainforest | Laws, Parker, Johnstone (1975) |
| 0.67 | Kilimanjaro, Tanzania | Rainforest, softwood plantations | Afolsyan (1975) |
| 0.15-0.33 (wet season) 0.29-0.58 (dry season) | Bia National Park, Ghana | Rainforest | short (1983) |
| 0.28-0.68 | Kasungu National Park, Malawi | Brachystegia woodland | Jachmann and Bell (1979) |
| 0.16-2.63 | Southwestern CAR | Moist semi-Deciduous dense forest | This study |

The small body size and straight- to backward-pointing tusk typical of **cyclotis** may be adaptations to facilitate movement in the closed dense forest habitat. Forest elephants observed penetrating dense vine thickets proceed with their heads down, tusks into the body, deflecting the tangled vegetation as they tunnel through. Why the apparently faster tusk development in **cyclotis** than in **africana**? The reason unclear but perhaps Gould (1986) has an explanation in h essay on dwarfism. He states that a decline in body size often far outstrips decrease in many particular features. Dwarf always seem to have some body parts that are proportionate larger than those of related nondwarfed species of the same overall body size. He relates this phenomenon to development in dwarfed hippos and othodontic problems humans —why not elephants?

## ELEPHANTS AND FORESTS IN CAR

Elephants play, the role of a keystone species having profound effect on forest ecology (Wing and Buss, 1970 Short, 1983; Kortland, 1984; Calvert, 1985). The "bulldozer" actions of elephants may truncate succession in secondary patches in lowland African forests (Wing and Buss, 1970 Kortland, 1984; Calvert, 1985; Carroll, 1986b; Western, 1986a Fay, 1987), resulting in a multi (dis)-climax community, the stability of which depends on several factors, including grazing pressure (Belsky, 1986a,b,c and references therein Elephants create tree fall gaps (Brokaw, 1985; Carroll, 1986a,b Fay, 1987), thus increasing the number of gaps. They may also play a significant role in maintaining stands of particular species (Laws et al., 1975). particularly members of the families marantaceae (Guillaumet, 1967) and Zingiberaceae (Calvert, 1985), many of which are of

**Figure 1**. The Central African Republic and study area.




paramount importance to the gorilla for food and nesting material, as well as to other forest wildlife (Carroll, 1986a,b; Fay, 1987). Elephants in southwestern CAR maintain, enlarge and possibly create marshy clearings within the forest in their search for minerals, forage and water. These herbaceous marshy clearings are of major importance for bongo, buffalo, sitatunga, bush pig, giant forest hog and a host of forest wildlife and bird species. The highest density of elephants in the study area was ng the region of these marshy clearings. Many of the major elephant trails simply connect these clearings. The vast network of elephant trails are the major thoroughfares of the Aka Pygmies inhabiting these forests. The combined effects of high winds, lightning, landslides, honey gathering, agriculture, logging and elephant activities maintain the forest in a state of dynamic dis-equilibrium and are likely partially responsible for the great diversity of the floral and faunal communities of the African dense forests. Although no detailed analysis of herd structure and population dynamics has yet been made, observations at Dzanga and other marshy clearings show all age and sex categories represented, many 'gros porteurs' as well as young. Forest elephants seem to travel ng small family groups or individually, forming larger aggregations at these open clearings. In one such aggregation of 60 elephants at the Dzanga clearing, 12 young elephants one year" old or younger were noted. indicating significant reproduction.

**DENSITY ESTIMATES**

During the course of ape nest count transects, elephant droppings were counted in a 5m wide strip in an effort to estimate elephant density in the study area. Descriptions of elephant dropping count sampling techniques are detailed in Wing and Buss (1970), Short (1983) and Jachmann and Bell (1979). In this study, no estimates of dropping deterioration or accumulation rates for the CAR forests were made. Data for elephant dropping deterioration and elephant defaecation rate were taken from Wing and Buss (1970). Dropping density was simply divided by 1360 (deterioration = 80 days x defaecation rate = 17 droppings/elephant/day). Estimates of dropping deterioration vary considerably in the studies mentioned, and from rainy season to dry. It is assumed that conditions affecting dung deterioration in Kibale Forest, Uganda (Wing and Buss, 1970) are similar to those of the study area. The raw data on dropping densities can be easily adjusted if refined factors are determined.

Table 2 indicates the overall elephant density estimated from the regions sampled by Carroll (1986a) was 0.86 elephants/km$^2$ with a range of densities of 0.016 to 2.63. Including the lower density figures in the areas sampled by Fay (1987), the overall density is reduced to 0.60 elephants/km$^2$. Several factors may account for the lower densities estimated for these southern regions. One may be methodological. Fay's sample was taken during the rainy season, in July and August, while those taken by myself were

**Figure 2.** Sample blocks in study area.

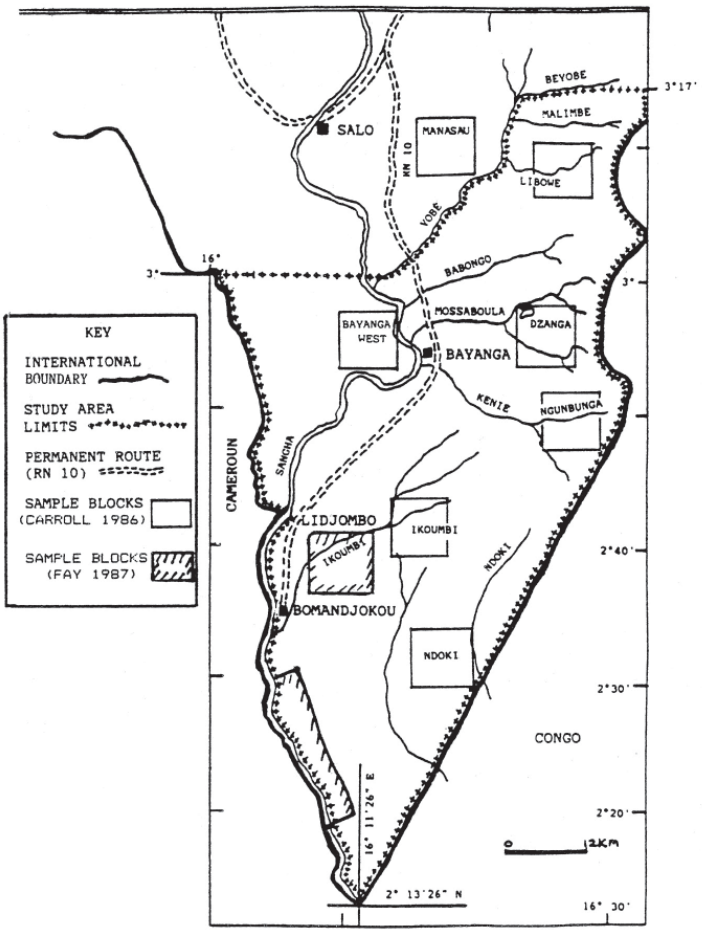



**FIgure 3.** Dzanga-Sangha Dense Forest Reserve (proposed).

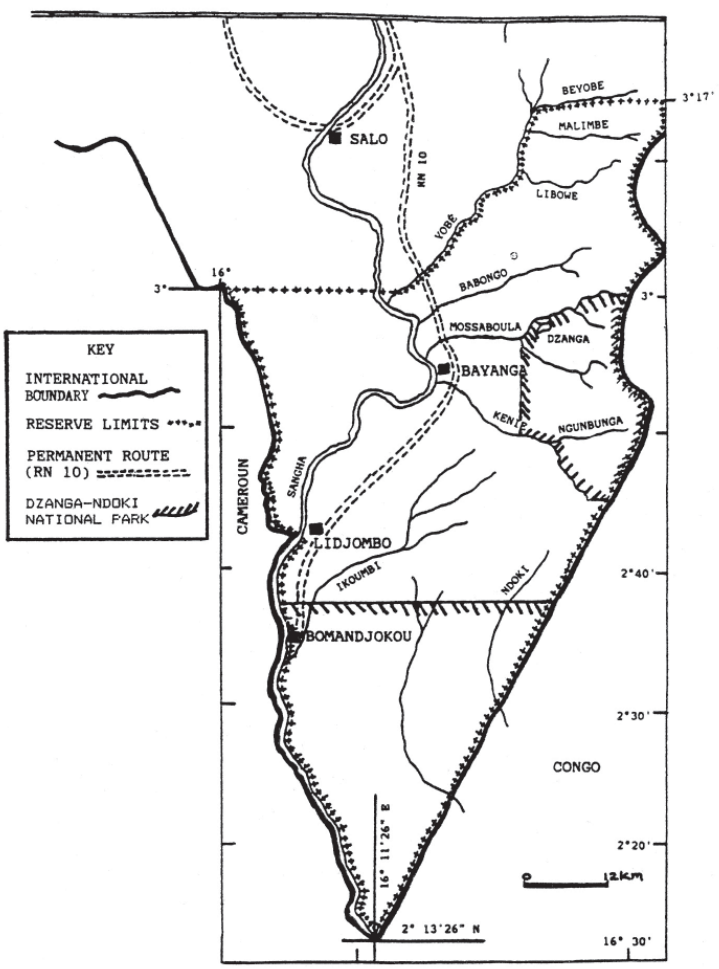



**Table 2.** Elephant density from dropping counts (transect width 5 m, dropping duration = 80 days, droppings/elephant/day = 17)

| Sector | No. ofdroppings | kmsampled | km² | Dropping/ km | Density/ km² | No. of Elephants |
|---|---|---|---|---|---|---|
| Libowe | 972 | 76.4 | 0.38 | 2557.8 | 1.88 | 188 |
| Ikoumbi | 100 | 61.5 | 0.31 | 322.6 | 0.24 | 24 |
| Manasau | 8 | 71.4 | 0.38 | 22.2 | 0.016 | 1.6 |
| Ndoki | 70 | 65.1 | 0.33 | 212.12 | 0.156 | 15.6 |
| Kenie | 250 | 14 | 0.07 | 3571.4 | 2.63 | 263 |
| Dzanga | 879 | 77.9 | 0.39 | 2253.85 | 1.66 | 166 |
| Baywest | 293 | 75 | 0.38 | 771.1 | 0.57 | 57 |
| Mean | | | | 1387.31 | 1.02 | 715.2 |
| Total | 2571 | 441.3 | 2.21 | 1163.35 | 0.36Z | |
| Reserve estimate | | | 4000.00 | | | 3440 + /- 928 |
| Section 1 (Fay) | 51 | | 0.55 | | | 0.068 |
| Section 2 (Fay) | 42 | | 0.52 | | | 0.059 |
| TOTAL | 2665 | | 3.29 | 810 | 0.60 | 2382 + /- 643 |

between the months of November and May, in the dry season. There may be considerable differences in dung deterioration between the dry and wet seasons. A very strong influence on these density figures is the differential poaching pressure throughout the area. Elephants in the far south of CAR and along the southern Sangha river suffer from extreme poaching pressure mostly at the hands of armed Congolese hunters and Hausa merchants. Fay (1987) reports several poaching camps along the Sangha and on its islands as well as around the village of Bolongodi. Carroll (1986a) also reports several tonnes of ivory imported into CAR at Lidjombo. False papers of origin were freely given by the former Police Commissioner of Lidjombo. In the north, considerable poaching pressure along the Yobe river and its tributaries, as well as development and agricultural projects have all but eliminated elephants between the Yobe river and the Salo plateau. Much of this poaching activity is undertaken by highly-placed regional and national authorities or those operating under their protection. This heavy pressure from the north and south may be causing a compression effect of elephants into the interior of the region and may be partly responsible for the extremely high densities in the Libowe area.

The Dzanga clearing is known to the local pygmies as 'the village of elephants'. Oral history and early European visitors indicate that this has long been a major concentration point for elephants. Dzanga, approximately 400 m long and 200 m wide with mineral rich soils, is like the hub of a wheel with elephant trails radiating out in all directions.

Along the Kenie stream, with seven large herbaceous marshy clearings and several saline areas, the highest elephant density in the region was recorded.

In the proposed conservation plan for the region, the area between the Mossaboula and Kenie streams, containing the Dzanga and Ngubunga clearings, will be part of the Dzanga-Ndoki National Park (Figure 3). This sector is approximately 320 km². The primary forest region south of 2 degrees 38 minutes north (approximately 960 km²) will also be given

national park status. The remaining area will be classified as a wildlife sanctuary, with an integrated, multiple-use management programme. Current logging activities, traditional hunting and gathering, sport hunting and diamond searching will be allowed on a controlled basis. Through this integrated management plan we hope not only to provide protection for the elephants, gorilla and other wildlife populations, but also ensure the cultural continuation of the Aka Pygmies and maintain a sustainable resource base for the area.

Elephant populations in the CAR have declined from an estimated 60000 in 1979 (Douglas-Hamilton, 1980) to approximately 15 — 20 000 in 1985 (Douglas..Hamilton *et al.,* 1985). This precipitous decline has been due to very heavy armed poaching, especially in the north and east of the country. This is likely in response to the sharp increase in ivory prices. Poachers from Tchad and Sudan, now armed with automatic weapons from the Tchadian war, have replaced the spear-bearing horsemen in these areas and are systematically emptying the country of elephants. These poachers, up to one year ago, had been complemented by the 'Ivory Collectors', people licensed to buy and retrieve 'found' ivory. The major method in which ivory was 'found' was by supplying local Africans with firearms to 'find' ivory on the hoof. These ivory collectors are largely responsible for the elimination of elephants in the east of CAR in the region of Bangassou. Since supplies have dwindled in the north and east, the collectors began turning to the forests of the southwest for their supplies.

Approximately one year ago, CAR President Kolingba outlawed ivory collection and the hunting of elephants. This action has been greatly applauded by conservationists in the country and we recommend at least a 10-year moratorium on these activities. The elephant populations have been so decimated that they can no longer support hunting, and the re-opening of ivory collection will rapidly re-establish the system of illegal overkill and trafficking of ivory. I urge that in spite of the extreme economic hardship facing this country and the rest of Africa, that the moratorium on elephant hunting and ivory collection in CAR be respected for 10-20 years to ensure the re-establishment of the species and the institution of a rational, workable wildlife policy. I also urge international conservation and development organizations to view these issues not as species-specific, but as broad economic, attitudinal and cultural issues that can only be solved through integrated, culturally consistent and ecologically sound conservation and economic development policies.

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# Numbers, Distribution and Movements of the Nazinga Elephants

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## INTRODUCTION

Of fundamental importance to wildlife management are the numbers of animals and their distribution through time. One measure of this is "occupance", which is derived by multiplying the biomass or numbers by time for any unit area. The usual methods for obtaining information on elephant occupance are aerial surveys and ground surveys. in terms of precision, however, both types of survey are unsatisfactory for the following reasons.

**Uneven distribution** — The sampling error and confidence limits of an estimate are heavily influenced by the distribution of the population being sampled. If the population is clumped, the sampling error is very large. This problem is the most serious limitation in the use of either an aerial or ground survey. Thus, an estimate of elephant numbers will show a large sampling error, because they are so highly clumped. Also, the observations on their distribution may be meaningless if derived - from only one survey.

**Limited visibility —** The tendency to undercount in any type of vegetative cover is usually much greater than is supposed (Caughley et al., 1976). To allow for this bias, a correction factor should be estimated for every type of cover found in the area to be sampled.

Because of the inaccuracy of the data obtained by both aerial and ground surveys, I used the alternative method of fecal dropping counts to assess elephant occupance on the Nazinga ranch. This method, described by Jachmann and Bell (1979, 1984), has three advantages: it estimates the population size, accurately describes the distribution by season, and identifies possible corridors used by elephants when moving across ranch boundaries.

## STUDY AREA

The study area is the 806 km$^2$ Nazinga Game Ranch in south-central Burkina Faso (Figure 1). The mean annual rainfall is about 1 000 mm. The ranch and its ecology were described by Lungren (1975,1985).

## METHODS

### Field Procedures

The dry-season survey was carried out from early February to the end of April 1987, and covered the entire ranch. The field method was simply to lay out an imaginary grid consisting of units 2.7 x 2.7 km, using the existing transect lines that were signposted during earlier research (Fig. 2). At each grid intersection or point, a quadrat of 100 x 100 m was examined for elephant droppings. A total of exactly 100 quadrats was sampled (1 sq km), omitting about 10 quadrats on the perimeter of the ranch, where dropping densities were known to be 0. Each quadrat was covered by a team (two labourers, a laboratory-assistant, and the author) walking at 12.5 m intervals from north to south and back. Each person counted the droppings on his left side only, i.e. between himself and the next person. The distance of 100 m was paced out by the author. The wet-season survey was carried out during the first week of September 1987 and, with the exception of the perimeter roads, covered most of the major roads on the ranch. At intervals of 3 km, the width of the road was measured to the nearest 0.5 m. In this way a stretch of 163 km with a mean width of 3.9 m (0.64 sq km) was examined for elephant droppings. This method assumes that elephants use the road-system on a somewhat similar time-basis as the rest of the ranch (Jachmann, 1984b).

A "dropping" or defecation is defined as one pile of boll. To determine the time period of the accumulation during the dry season, only those droppings that were not scorched by fire were counted. Hence, the period of accumulation began on the day that the particular area was burned. To determine the decomposition rate of elephant droppings at Nazinga, 31 droppings of varying ages from areas from different vegetation characteristics were checked weekly from late January to late March. If more than 90% of the dropping was covered by termite mudcast, it was considered decomposed and was not counted.

**Figure 1.**

South-central Burkina Faso, showing Po National Park, Nazinga Game Ranch and Deux Bale Forest Reserves.

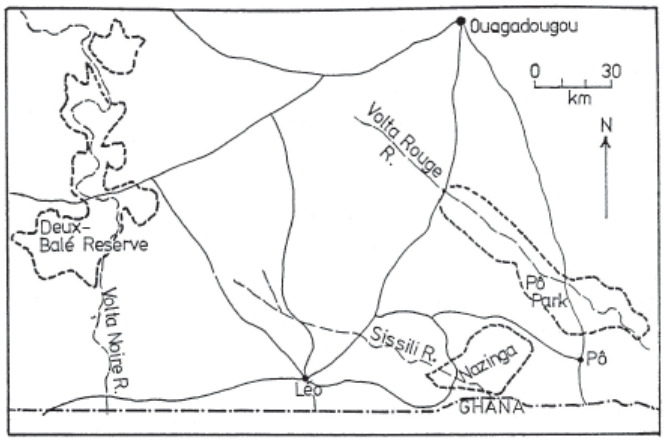



**Figure 2.**

Location of the Nazinga Game Ranch in south-central Burkina Faso. The imaginary grid consists of units of 2.7 x 2.7 km. The black dot in the middle of each unit shows where a quadrat of 100 x 100 m was examined for elephant droppings.

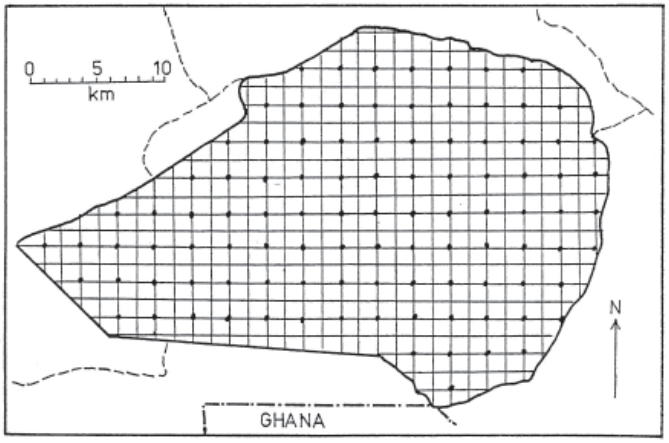
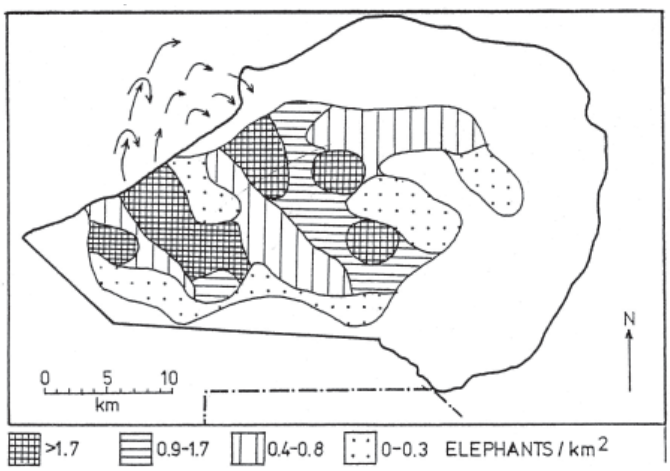


**Figure 3.**

Dry-season elephant distribution at Nazinga Game Ranch. The arrows indicate the nightly excursions outside the ranch. Unshaded portions of the ranch have no elephants.




The dry-season defecation rate of the Nazinga elephants was estimated by following family units and single male elephants on foot for 73 elephant hours. Time of defecation and number of boli per dropping were recorded. In elephants, there appears to be a positive relationship between the amount of grass in the diet (%) and the defecation rate. This phenomenon results from the simple fact that grass consumption is not limited by plant secondary chemicals (Jachmann 1987b) but, to a much lesser' extent, by the rapid rate of throughput, resulting in a decreasing efficiency 'of protein intake. Using the percentages of grass consumed by' elephants during the month preceding the survey (59.4%), in combination with 15.2 elephant observation hours, an estimate of the wet-season defecation rate for the Nazinga elephant population was obtained. Jachmann and Bell (1984) found no significant differences in the defecation rates among the various age classes and between the sexes within a season. Hence we can use mean figures for the Nazinga population.

Elephant movements year-round were studied during both dropping surveys by additional recording of footprints left in the mud (dry season as well as wet season) and by examining the perimeter roads for signs of elephants crossing to areas outside the ranch.

Also four separate trips were made to areas surrounding the ranch, to inquire about recent or former movements of elephants. The first trip was to villages northeast of the ranch, between Nazinga and Po National Park (Ouedraogo Tambi National Park). The second trip was to villages north of the ranch, and the third trip covered the area west of the ranch to the town of Leo. The last trip was to Po National Park, where I both inquired with local rangers and searched a stretch of 12 km of the Volta Rouge River (starting at the main road "N5""and going east) for signs of elephants. Also, on the 1st and 2nd of April, two surveys were flown over the northern area that borders the ranch, to look for signs of elephant movements across ranch boundaries.

**Data Analyses**

The size of the grid was chosen for practical reasons. A 2.7 x 2.7 km grid enabled us to use the existing transect lines. Decomposition of elephant droppings is caused by three principal factors: termites during the dry season, dung beetles and termites during the wet season, and other disturbances throughout the year (i.e. trampling, fire, rain, insects, insect-eaters). During the dry season, droppings accumulate because 'the rate of deposition by elephants is higher than the rate of decomposition by both termites and mechanical disturbances.

The period during which the droppings accumulate during the dry season (T(n)) was accurately determined as being from the time of fire in that particular area until the day of the survey. To estimate the true number of droppings deposited by elephants a correction factor must be applied to account for droppings that disappeared due to decomposition.

For the Nazinga situation we can proceed as follows. The number of droppings counted in each quadrat (D(a)) was multiplied by 729 to give the number of droppings in each 7.29 sq km grid square. To estimate the true number of droppings deposited per day, we applied a correction factor (L(s)) to account for decomposition. We cannot, however, apply this factor to the number of droppings counted during the survey, because the accumulation of the droppings is a continuous process, starting at 0 (t(0)) the day following the fire. An algebraic progression, not included in the original project proposal by Jachmann (1987a), was used to estimate the number of droppings that disappeared. The number of droppings deposited per day per grid square is given by the following equation:

$$X(a) = \sum_{i=1}^{T(n)} \frac{729.D\ (a)}{((1 - i.\ L(s)) + \ldots (1 - T(n).L(s)))}$$

where: X(a) is the number of droppings per day in the ath grid square (a = 1 to 100),

T(n) is the accumulation period, which varies from 70 to 120 days,

D(a) is the number of droppings counted in the ath quadrat,

L(s) is the correction factor, i.e. fraction of droppings disappearing per day.

The number of elephants represented by the number of droppings deposited per day can now be estimated for each grid square by dividing X(a) by the dry season defecation rate or the number of droppings deposited per day per elephant (R(s)). The final equation is as follows:

$$N = \sum_{a=1}^{n} \sum_{i=1}^{T(n)} \frac{729.D\ (a)}{(((1 - i.L(s)) + .. (1 - T(n).L(s)))).Rs}$$

where, N is the estimated popuation size of elephants.

An alternative solution is to assume an oscillation around a steady state of the actual quantities of fecal droppings. This means that the rate of deposition equals the rate of decomposition halfway through the wet season. The equation is as follows:

$$N = \frac{D(n).\ \left[\log_e 2\right]}{\left[t(1/2)\right]} \Big/ R(s)$$

where, N is the estimated population size of elephants, D(n) is the total number of droppings on the ranch on the day of counting,

t(1/2) is the time at which half of the original dung is unrecognizable (year-round), and R(s) is the defecation rate for that specific season.

## RESULTS AND DISCUSSION

### Estimation of Elephant Numbers

The late dry-season defecation rate (R(s)) for the Nazinga elephants was estimated as 14.14 droppings per elephant per day, whereas the late wet-season defecation rate was estimated as 27.2 droppings per elephant per day. The mean number of boli per defecation for the dry season was 6.1. In Malawi, Jachmann and Bell (1984) found a dry-season defecation rate of 15.7 droppings per elephant per day, with a mean of 5.6 boli per dropping. Their" observations were based on 147 elephant hours in the miombo woodlands of Kasungu National Park. In Uganda, Wing and Buss (1970) gave an estimate of 17.0 droppings per elephant per day, with an average of 6.3 boli per dropping. Thus, our findings at Nazinga correspond well with observations from other parts of Africa. The dry-season decomposition rate (L(s)) was estimated to be 0.59% per day. Droppings that were more than 90% covered with mudcast were considered decomposed. The t(1/2)) or the time at which half of the droppings is unrecognizable was estimated to be 82.7 days.

A year-round estimate of the decomposition rate must include the wet season rate of decomposition, which was found to be five times faster than that of the dry season (Jachmann and Bell, 1984). Assuming this also applies to Nazinga, we can estimate the year-round t(1/2) as being 49.6 days.

The dropping count method gave three population estimates. The number of elephants present on the ranch during the dry season was estimated by the first solution to be 396 (range 323 - 469). The steady state solution provided an estimate of 353 (range 276 - 430). Also, a preliminary estimate for the wet season gave a figure of 420 (range 0 - 910). See Table 1 for comparison with earlier population estimates.

The wide range of each population estimate from the aerial and ground 'surveys, and a seasonal shift in elephant distribution in combination with different sampling periods,

**Table 1.** Summary of elephant population estimates at Nazinga Game Ranch from 1980 to 1987.

| Year | Estimate | Range[1] | Assessment | Source |
|---|---|---|---|---|
| 1980 | 40 | – | subjective | C. Lungren (pers. comm.) |
| 1982 | 300 | 0 — 669 | aerial | Bousquet (1982) |
| 1985 | 32S2 | 0 — 725 | ground | O'Donoghue (1985) |
| 1985 | 6303 | 304 — 956 | ground | O'Donoghue (1985) |
| 1987 | 396 | 323 — 469 | | dropping (dry season, this ms.) |
| 1987 | 353 | 276 — 430 | | dropping (dry season, this ms.) |
| 1987 | 420 | 0 — 910 | dropping | (wet season, this ms.) |

1. The range is based on the standard deviation
2. Estimate using Fourier series
3. Estimate using modified Haynes

make it difficult to compare the various estimates of elephant numbers. Because of the widely overlapping ranges of the population estimates we cannot describe any trend in elephant numbers from 1982 to 1987. As I will argue in the next section, however, the circumstantial evidence suggests an increasing elephant population, primarily as a result of immigration from areas outside the ranch.

### Dry Season Elephant Distribution

The Nazinga elephants have a restricted distribution during the dry season of November to May (Fig. 3). There are several factors contributing to this, of which water availability and poaching seem to be the two most important ones. The small range near permanent water that the Nazinga elephants show during the dry season is similar to the dry-season behaviour of elephants in Kenya and Malawi (Leuthold, 1977; Jachmann, 1983). This can be easily understood in terms of a cost/benefit analysis. During the dry season, food is scarce and of a low quality, If an elephant then has to spend much of its limited energy searching for or commuting to water, it would benefit little or not at all from its extensive range. Therefore, during the dry season, an elephant should expend as little energy as possible, using part or" most of its reserves built up during the former wet season. The elephant should occupy a small area near permanent water. This is the reason why calf mortality is high during the second half of the dry season, which is the nutritional 'bottle-neck' of the year.

In Nazinga permanent water within the Sissili and Dawevele Rivers, where since the early 1980's several dams have been constructed, forms the basic framework for the elephant range. Not all the areas with permanent water, however, are occupied by elephants. Throughout the year, water is available at a dam in the north east as well as along the Sissili River in the extreme south. During the dry season, however; no elephants frequent these areas on a regular basis, most likely due to a high level of illegal activity.

The areas of the ranch where most illegal activity was observed from 1982 to 1986 are mainly in the north, southeast and southwest (Fig. 4). The figures show the number of offences (animals shot, poachers seen or arrested, snares or traps collected) per" sq km. During the dry season, the areas that are frequented by poachers are mostly avoided by elephants, so I postulate a cause and effect relationship. A similar phenomenon was also observed in Kasungu National Park, Malawi (Jachmann, 1983).

As a result of limited waler availability and heavy illegal activity during the'dry season, elephant movements across ranch boundaries are restricted to nightly excursions in the northwestern area only (Fig. 3). During these nightly foraging trips, the elephants usually follow the small stream east of Sia village, passing east of Wiri and Kouna, and returning at Natiedougou. Some elephants continue to Kontioro before returning to the ranch (Fig. 3). This area northwest of the ranch was checked by airplane twice, flying parallel transects 2 km apart. No elephants were observed during the daytime searches.

### Wet Season Elephant Distribution

The wet season elephant distribution at Nazinga appears to extend outside the ranch's boundary (Fig. 5). This observation is based on footprints and other signs of elephant presence found during both dropping surveys and in four trips covering the perimeter roads, without paying attention to relative

**Figure 4.**

Areas in and around the Nazinga Game Ranch, where from1982 to 1986 illegal activity was observed. The figures show the number of offences per km$^2$.

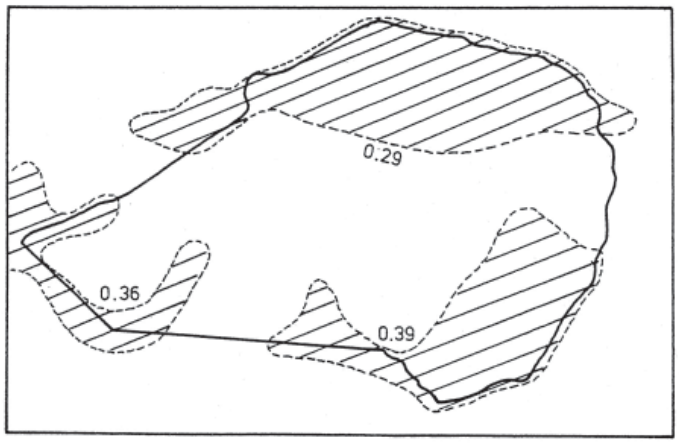
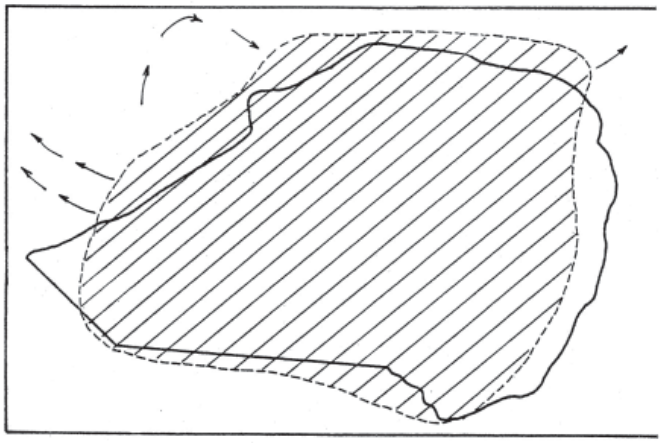



**Figure 5.**

Wet season elephant distribution (line enclosing crosshatching), including movements across the boundaries of Nazinga Game Ranch. Compare with the dry-season distribution in Figure 3.



abundance. Hence, the figure shows only that some movements outside the ranch occur, but there is no assessment of how much of the elephant population this involves. At the onset of the rains, as soon as water availability and forage plants are no longer a limiting factor, elephants disperse in all directions. They are capable of sensing local rainstorms over considerable distances, moving to and utilizing these areas on an opportunistic basis. At Nazinga, the early wet season dispersion appears to be greatly influenced by poaching activities, because the grass is still short and the visibility is relatively good. Later in the season, when the grass has reached its maximum height and the visibility is poor, elephants can also infiltrate the areas that are regularly frequented by poachers. Dispersion during the wet season, however, is a necessity to cope with nutritional stress and to build up new energy reserves. At the same time the elephants reduce their impact in the areas on which they depend for dry-season survival. Preliminary observations, however, show that the places of highest density remain the same year" round, although the absolute densities decrease in the wet season.

**Movements**

To fully understand the present seasonal movements of the elephants occupying the Nazinga Game Ranch, we must begin with the early 1970's. The area under consideration is the south-central part of Burkina Faso, between the rivers Volta Rouge in the east and the Volta Noire in the west (Fig. 1). About 1973, Po National Park contained approximately 260 elephants (Heisterberg, 1976), whereas the Nazinga area'contained a few elephants on a seasonal basis only (C.G.'Lungren, pers. comm.). The Po elephants appeared to disperse further to the peripheral areas of the park as the wet season progressed and halfway through the wet season the elephants were noted leaving their usual dry-season areas entirely and not returning for several months (Heisterberg, 1976). According to local people living in the villages not far from the Sissili River (i.e. west of the Nazinga ranch, north of Leo, and east of the Deux Bale Forest Reserves), in the early 1970's many elephants passed by and raided their crops during the second half of the wet season. Elephants appeared to come from the west as well as from the east.

By 1980, fewer elephants passed by the villages northwest of the ranch. Since 1983, only one family unit of 6 was observed (at the end of August 1986) near the Sissili River, just north of the village of Sissili. All along the usual migration route villagers note that they either have not seen elephants for a long time (since the mid-1970's), or that on only a few occasions they saw elephant tracks or the animals themselves. An F.A.O. survey in 1981 to 1982 estimated that 150 elephants still lived in the Deux Bale region (Bousquet, 1982).

Over the past three years (1985 to 1987) no elephants have been observed in Po National Park, with the exception of the tracks of three elephants crossing the Volta Rouge River from south to north halfway through the wet season in 1986 (local rangers, pers. comm.). On the 29th April 1987,! searched a 12 km stretch of the Volta Rouge, starting at the main Po-Ouagadougou road, for signs of elephant presence. Only some footprints were found that seemed to be at least several years old. Permanent water was available at various locations. Considering the information given above, I hypothesize the following. During the dry seasons of the early 1970's, one clan of elephants occupied the Po National Park and another clan occupied the Deux Bale Forest Reserves. In the wet season, the elephants occupying Po Park migrated west along the Nazinga River and continued along the Sissili River, whereas the Deux Bale elephants migrated eastward. Some genetic exchange might have taken place when large aggregations of elephants from both conservation areas met in reproductive arenas. When the grass became less palatable, both clans returned to their dry-season ranges within the conservation areas.

After the period of drought **in** the early 1970's, many Peul (Fulani) herdsmen with their remaining cattle moved southward from the Sahel region, from an annual rainfall area of 200 to 600 mm. Together with the Peul, the Mossi occupying the drier northern parts of the Mossi Plateau migrated to the southern wet savanna (lower Sudan zone and upper Guinea zone) where the rainfall of 700 to 1 100 mm is more reliable. The result was a progressive settlement of the area between the Volta Rouge and Volta Noire Rivers, where land was cleared for cultivation and cattle. In addition, in this southern region, foreign-aid

programmes were started to combat onchocerciasis (river blindness, spread by a black fly **Simulium** sp.) and trypanosomiasis (sleeping sickness, spread by the tsetse fly **Glossina** sp.). The increasing area of land brought under cultivation, the growing numbers of cattle, and the heavier poaching of elephants on their yearly trek resulted in fewer elephants migrating as far as halfway through the region between the Volta Rouge and Volta Noire Rivers. By 1977, elephants still moved from east to west and vice versa, but on a limited scale (Fig. 6). The elephants coming from Po Park each year passed the Nazinga area where, with the continuation of the Nazinga project, the protection from illegal activity was better each year. Also, the construction of the first dams in the early 1980's provided water year-round that is of increasing quantity. This probably resulted in a gradual shift of elephants, formerly occupying Po Park during the dry season, but now remaining in Nazinga on their way east at the end of the wet season. During the F.A.O. survey in 1981-1982, 500 (range 0 to 1 100) elephants were estimated in the Po Park and Nazinga region during the dry season (Fig. 6). This shift in movements continues to the present, and the final outcome is presented in Fig. 6. The Deux Bale elephants still occupy the same area, and most likely only a few elephants make wet season excursions going east. The Po Park elephants apparently all moved to the Nazinga Game Ranch which has become their permanent dry-season base. Very likely, within a few years, the ranch will become their permanent year-round base.

Not all elephant movements towards former" wet-season and dry-season ranges have come to a standstill. The two observations, one of a family unit near the village of Sissili, coming from the east (August, 1986) and the footprints of three elephants crossing the Volta Rouge River going north (August, 1986) are evidence. According to our findings there probably still are some elephants leaving the ranch during the wet season, although their numbers may be few.

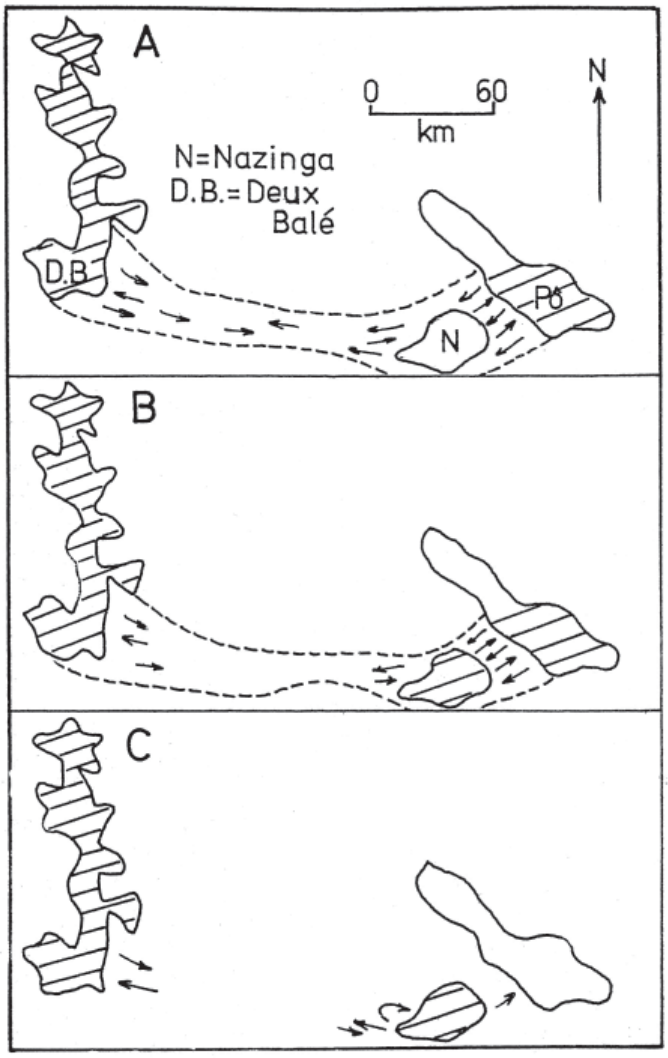
**CONCLUSIONS**

During the dry season, elephants tend to occupy a limited area near permanent water. At the onset of the rains, and throughout most of the wet season, elephants disperse and use resources that are avail able only temporarily, thereby reducing the impact on the dry-season foraging areas. Water availability and poaching appear to be major factors determining elephant occupance. Because poaching is a serious problem outside as well as along the periphery of the ranch, I hypothesize that most of the elephants occupying the greater" Nazinga area can be found on the ranch during the latter part of the dry season. This period is therefore the most suitable time of year to obtain an accurate estimate of the maximum number of elephants occupying the ranch. Thus, the two estimates of 353 and 396 elephants, suggesting a population of about 350 to 400 elephants must be reasonably accurate accounts for the Greater Nazinga area in early 1987. The wet season population estimate of 420 elephants is a less accurate account than the population estimate for the dry season. The somewhat higher number for the wet season and the small difference between the estimates of both seasons, however, indicate that during the wet season only few elephants may leave the ranch for extended periods.

In future years, elephant movements across ranch boundaries probably will be more and more restricted to safe nightly excursions within a limited area. Over the past 15 years the

**Figure 6.**

Elephant distribution (crosshatching) and hypothesized pattern of migration (arrows) during the wet season of 1977 (A), 1982(B), and 1987(C). The broken line indicates the limits of the elephant range. For place names see Figure 1.




elephants along the Volta Rouge River have been restricted to a decreasing area, of which the last five years (1 983 to 1987) was the most important period. Population parameters such as the age at reproduction maturity, the calving interval or period between two succeeding oestrus periods, and calf mortality will be influenced accordingly (Jachmann 1980, 1985, 1986). These three population parameters change with the density of the population. The density in turn affects the food availability through food competition amongst the members of a clan (Jachmann 1987b). The age at reproductive maturity or first conception is the slowest changing parameter, changing over the subsequent generations and having a time lag of 10 to 20 years. The calving interval most likely changes within the lifetime of a cow (Jachmann, 1986) and thus has a shorter time lag. Calf mortality is the first fast-acting parameter influencing-population density. My prognosis is an increasing calf-mortality rate over the next five years, after which an increasing age at first conception in combination with a lowered fecundity in older females will partly take over.

**ACKNOWLEDGEMENTS**

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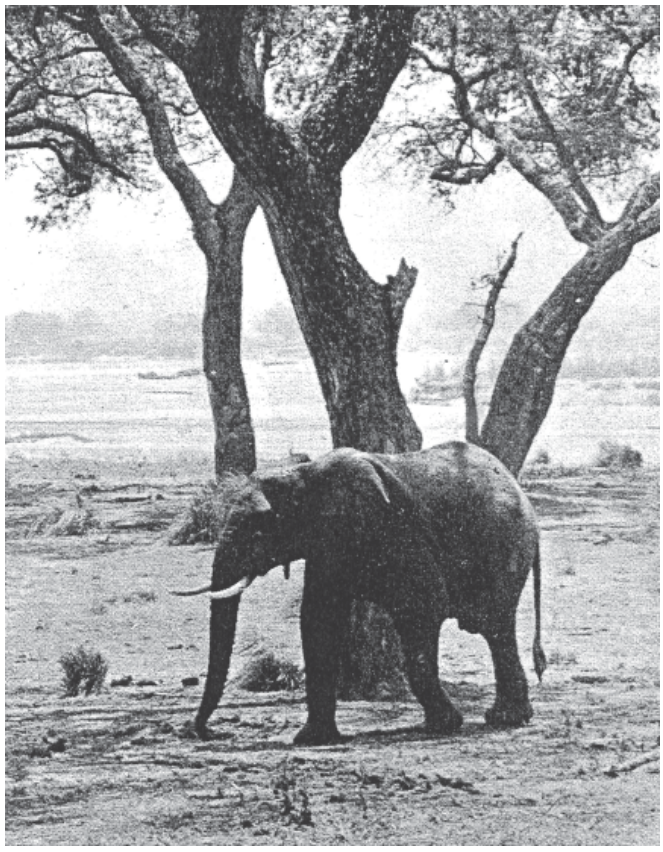

## Northern White Rhinos Born At Garamba

Two more northern white rhino calves (**Ceratotherium simum**cottoni) were born in Garamba National Park, Zaire, in September-November 1987. This brings the known number of northern white rhinos at Garamba to 21.

During a series of rhino recce flights in June we had been able to distinguish one more male, bringing the number at that stage to at least 19. The new calves were seen in a series of flights carried out in December. Only 15 of the known individuals were seen on these flights. We therefore cannot be certain that none were poached during the previous few months when the rehabilitation project aircraft and the research aircraft were out of action, a fact which was known to the local people. However, it is extremely rare that we were able to find all individuals in one series of flights. **ng** particular, it is virtually impossible to find them when the grass is still taller than the rhinos themselves, as it is at the end of the year. We found no carcasses or other signs of poaching in the southern section occupied by rhinos, and none has been reported from foot patrols in the area.

The known population of 21 consists of 5 adult males, 5 adult females, 2 sub-adult males which are almost physically (but not yet socially) adult, 2 slightly smaller sub-adult males and 1 sub-adult female that were born in 1983, one male juvenile and one female juvenile that were born in 1985 and have left their" mothers on the birth of new calves, 1 juvenile female born in 1985 that is still with her dam, 1 juvenile female born in 1986 and **2** unsexed infants born in 1987.

Nine calves are known to have been born and survived the 4.5 years since our IUCN/WWF/FZS/UNEP survey in March 1983, a year before the Garamba Rehabilitation Project started; this rate of reproduction considerably exceeds that in captivity under present conditions. Only 3 of the 5 known adult females had calves at heel when the project started but for nearly 2 years all 5 have been with juveniles. The mothers of the 2 newest calves had other calves at heel and the recent births were after intervals of 29-30 and 31-33 months since the previous births. Other observed interbirth intervals in the Garamba population (for 2 females, including one of the mothers of the new calves) were between 24 and 30 months.

The IUCN/WWF/FZS/UN ESCO Garamba Rehabilitation Project has completed its initial 3 years and has been extended for a further 3 years. The improvements to the park and the increase in the rhino population have fully justified the decision to protect the animals within, their natural habitat, but the operations in the park still rely heavily on international aid. A long-term continuation of some form of aid and the development of tourism to improve the park's income will continue to be important for the survival of the rhinos and the park.

Two separate sightings of northern white rhinos have recently been reported from Southern National Park in Sudan (P. McClinton and A. Guillet, pers. comm.). While this confirms that some still remain in Sudan, the current political situation there means that very little can be done about them and the best hope for the survival of the subspecies in the wild remains with Garamba.

**Kes Hillman-Smith**
*Parc National de la Garamba*

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## NEW AERSG CHAIRMAN

In December, David Cumming retired from the Zimbabwean Department. of National Parks and Wildlife Management in order to establish the WWF Multispecies Animal Production Systems Project (based in Zimbabwe), and also stepped down as Chairman of AERSG. The Chairman for the next IUCN triennium will be David Western, and the AERSG office is therefore moving back to Nairobi. The previous AERSG Scientific/Executive Officer, Raoul du Toit, is now undertaking a WWF-funded rhino monitoring project in the Zambezi Valley, Zimbabwe.

The address for correspondence for the AERSG Chairman and secretariat is:

African Elephant and Rhino Specialist Group, P.O. Box 62884, Nairobi, Kenya.

The aim of *Pachyderm,* the AERSG Newsletter, is to offer members of the group, and those who share its concerns, brief research papers, news items and opinions on issues directly related to the conservation and management o1 elephant and rhino in Africa. All readers are invited to submit articles (up to 3 000 words), black and white photographs and 'graphics for publication; articles may be edited. Material published in *Pachyderm* does not necessarily reflect the views of AERSG, SSC, IUCN or any organisation supporting AERSG.

**This issue was edited by Raoul du Toit and David Cumming.**