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The Zambezi Society and The Biodiversity Foundation for Africa are working as partners within the African Wildlife Foundation's Four Corners TBNRM project. The Biodiversity Foundation for Africa is responsible for acquiring technical information on the biodiversity of the project area. The Zambezi Society will be interpreting this information into user-friendly formats for stakeholders in the Four Corners area, and then disseminating it to these stakeholders.

THE BIODIVERSITY FOUNDATION FOR AFRICA (BFA is a non-profit making Trust, formed in Bulawayo in 1992 by a group of concerned scientists and environmentalists. Individual BFA members have expertise in biological groups including plants, vegetation, mammals, birds, reptiles, fish, insects, aquatic invertebrates and ecosystems. The major objective of the BFA is to undertake biological research into the biodiversity of sub-Saharan Africa, and to make the resulting information more accessible. Towards this end it provides technical, ecological and biosystematic expertise.

THE ZAMBEZI SOCIETY was established in 1982. Its goals include the conservation of biological diversity and wilderness in the Zambezi Basin through the application of sustainable, scientifically sound natural resource management strategies. Through its skills and experience in advocacy and information dissemination, it interprets biodiversity information collected by specialists like the Biodiversity Foundation for Africa and uses it to provide a technically sound basis for the implementation of conservation projects within the Zambezi Basin.

THE PARTNERSHIP between these two agencies was formed in 1996 as a result of mutual recognition of their complementarity. They have previously worked together on several major projects, including the biodiversity component of IUCN's Zambezi Basin Wetland project and the evaluation of biodiversity in Tete province described in detail in the first Four Corners TBNRM Biodiversity Information Package.

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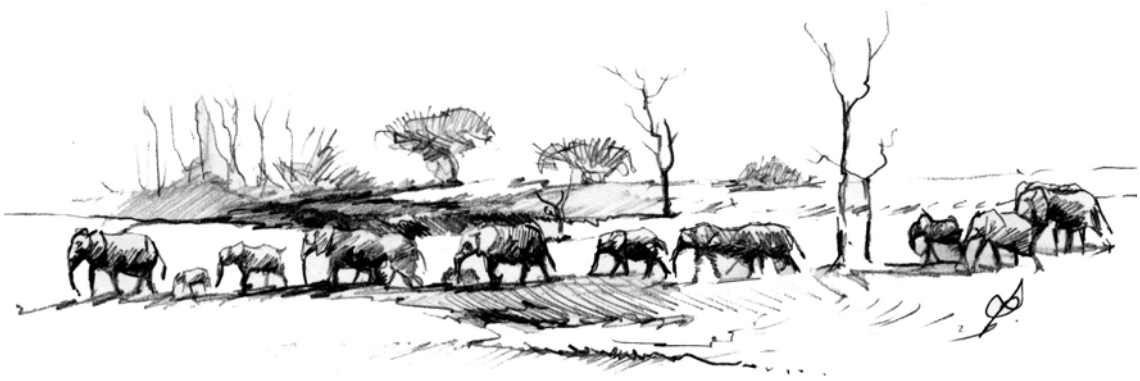

CHAPTER 14. ELEPHANT MOVEMENT AND CONSERVATION IN THE FOUR CORNERS TRANSBOUNDARY AREA

Richard Hoare

14.1 INTRODUCTION

The African Elephant is the largest terrestrial animal and, as a source of both meat and ivory, has attracted the attention of hunters from Palaeolithic times to the present. The lives of elephants and humans are inextricably linked - where there is war or conflict, modern weapons, poverty and drought, elephants also suffer. However, it was only in the latter part of the last century that conservationists started to express concern over the continental decline of elephant populations. While there were dramatic decreases in the elephant populations in East and Central Africa, the regional populations in southern Africa were increasing. The reasons for the increase were a combination of effective protection from illegal hunting (or poaching), the development of permanent water supplies during the dry season, and the species' inherent growth rate of up to 6% per annum.

The Four Corners area includes the largest remaining contiguous population of African Elephant on the continent. For this reason alone it is worthy of study. But with this density of megaherbivores come the problems of overabundance and a complex series of effects on the natural environment, such as damage to vegetation. Increasing human populations and activities, particularly subsistence farming, have amplified the human-elephant conflict. As elephant populations become more and more constrained so the need for 'safe corridors' between protected areas becomes even more important. The development of any useful trans-boundary conservation initiative has to take these corridors and conflict into account.

This chapter reviews the historical and current knowledge of elephant populations and movements in the Four Corners area. Where known, elephant movements within and between countries are discussed. Levels of exploitation, both legal and illegal, are examined with respect to each country's official capacity to protect the species and control the export trade. Future concerns are expressed together with conservation recommendations.

14.2 HISTORICAL KNOWLEDGE OF ELEPHANT DISTRIBUTION AND MOVEMENT

Campbell (1990) outlines the historical decline of elephant populations throughout the nineteenth century in southern Africa, both from suspected climate change and over hunting, noting that by 1890 the populations were probably at an all time low. By 1900 it was necessary for foreigners in present-day Botswana to obtain a licence to hunt elephant and Batswana required permission from their chief. The twentieth century saw a re-establishment, but probably not a significant re-expansion of elephant populations in areas formerly cleared of the species.

There is little further information on elephant populations in Botswana until some specific elephant-related research was undertaken in the 1960s and 1970s, concentrating on Chobe National Park (NP) and surrounding areas.

Simpson (1978) established retrospectively through interviews that elephant moved into the Serondella area after 1945, moving from west to east starting at Siyele, spreading eastwards into the present park by the early 1950s, and increasing along the Chobe River over the previous 30

years. A feature of the current elephant distribution (1969-71) was a gradual concentration at the river as the dry season progressed and a subsequent dispersal with the advent of the rains.

Elephant occur throughout northeastern region of Botswana and Child (1968) noted that they make considerable seasonal movements based on the availability of surface water during the dry season and seasonal fruiting of trees such as the marula (*Sclerocarya birrea*) and mugongo (*Schinziophyton rautanenii*). This movement was reflected in well-defined elephant paths, especially those leading to pans. These paths are conspicuous both on the ground and on aerial photographs. Many lead from the southern Chobe area across Ngwezumba River and east and southeast from Mababe towards the Zimbabwe border between Panda-ma-Tenga and Sibanini River. Child (1968) recorded considerable mortality in a drought year (1965) but maintained the overall population was increasing.

A two-year study was conducted by Sommerlatte (1975) on the number and distribution of elephants and their effect on the vegetation. He suggested a population of 5000-6000 for the entire Chobe NP and noted that areas dominated by mopane and *Acacia* were favoured by elephant. A high density occurred along the Chobe River during the dry season. Resightings of marked elephants indicated a large-scale migration of cow herds to the Chobe River in the dry season, and from here towards the Ngwezumba River during the wet. The distances involved were 60-70 km, while individual bulls were resighted up to 120 km from their initial location.

Elephants have continually increased in abundance in north-west Matabeleland due to the provision of artificial water for game. When the then Wankie Game Reserve was proclaimed in the 1920s, its management pursued a policy of providing artificial water in order to concentrate game for tourist viewing. As early as the 1940s it was apparent that this strategy had led to spatial concentration of previously widely-scattered elephants and that the population was therefore able to achieve sustained annual growth (Davison 1977). Similar provision of artificial water occurred when cattle ranches became hunting concessions in the 1960s and 1970s, further expanding the year- round elephant range.

14.3 PRESENT ELEPHANT DISTRIBUTION AND NUMBERS

The Four Corners area includes the largest remaining contiguous population of African Elephant on the continent. For this reason alone it is worthy of study. But with this density of megaherbivores come the problems of overabundance and a complex series of effects on the natural environment, such as damage to vegetation. Increasing human populations and activities, particularly subsistence farming, have amplified the human-elephant conflict. As elephant populations become more and more constrained so the need for 'safe corridors' between protected areas becomes even more important. The development of any useful trans-boundary conservation initiative has to take these corridors and conflict into account. Botswana has the largest elephant population and elephant range in the project area and occupies the central geographical position in this range, having borders with all countries of interest (Figure 14.1).

14.3.1 Elephant Numbers

The following data (Tables 14.1a, 14.1b, 14.1c, 14.1d) show the known population numbers and trends from aerial survey estimates in the project area. National surveys are co-ordinated as much as possible. From 1993-95 the ELESMAP project (Figure 14.1) closely co-ordinated elephant aerial survey operations and data analysis in southern Africa. The Four Corners area holds the largest contiguous savanna elephant range in Africa (approx 127,000 km^2) with the continent's largest surveyed populations (estimates of around 175,000 animals). The Angolan range, about which there has been no information for over 20 years, is excluded from these figures. It is however currently being surveyed in 2003 (M. Chase, pers. comm. 2003).

Table 14.1a. Northern Botswana elephant estimates.

Northern Botswana elephant range[1]: 73,000 km^2		
Year	**Population Estimate (CI)**	**Source**
1987	40530 (± 33%)	Gibson *et al*. 1998
1989	59896 (± 29%)	Gibson *et al*. 1998
1990	55835 (± 36%)	Gibson *et al*. 1998
1991	68771 (± 26%)	Gibson *et al*. 1998
1993	79033 (± 18%)	Gibson *et al*. 1998
1994	78304 (± 22%)	Gibson *et al*. 1998
1995	77916 (± 23%)	Gibson *et al*. 1998
1996	89227 (± 15%)	AED 1998
2002	122678 (± 14%)	DWNP Botswana

[1] Dry season surveys only; whole wildlife range surveyed is 122,000 km^2.

Table 14.1b. North-west Zimbabwe elephant estimates.

North-west Matabeleland elephant range: 25,000 km^2		
Year	**Population Estimate (CI)**	**Source**
1980	20444 (± 34%)	DNP&WLM 2002
1983	25888 (± 27%)	DNP&WLM 2002
1989	27411 (± 33%)	DNP&WLM 2002
1993	27841 (± 28%)	DNP&WLM 2002
1995	30987 (± 19%)	DNP&WLM 2002
1998	35992 (± 16%)	DNP&WLM 2002
2001	49310 (± 12%)	DNP&WLM 2002

Table 14.1c. North-east Namibia elephant estimates.

Caprivi elephant range [1]: 7000 km^2		
Year	**Population Estimate (CI)**	**Source**
1993	5785	AED 1995/Rodwell 1993
1995	4883 (± 25%)	AED 1998
1998	4576 (± 23%)	MET Namibia

[1] Caprivi region east of Okavango River only.

Table 14.1d. South-western Zambia elephant estimates.

South-western Zambia elephant range[1]: 12,000 km^2		
Year	**Population Estimate (CI)**	**Source**
1991	1187 Sioma Ngwezi NP	AED 1995
1996	250 Sioma Ngwezi NP	AED 1998
1997	5250 Kafue NP (whole park)	Fairall 2001
1999	1453 Kafue NP (whole park)	Fairall 2001
2001	2141 Kafue NP (whole park)	Fairall 2001

[1] Southern Kafue GMAs and Sioma Ngwezi only.

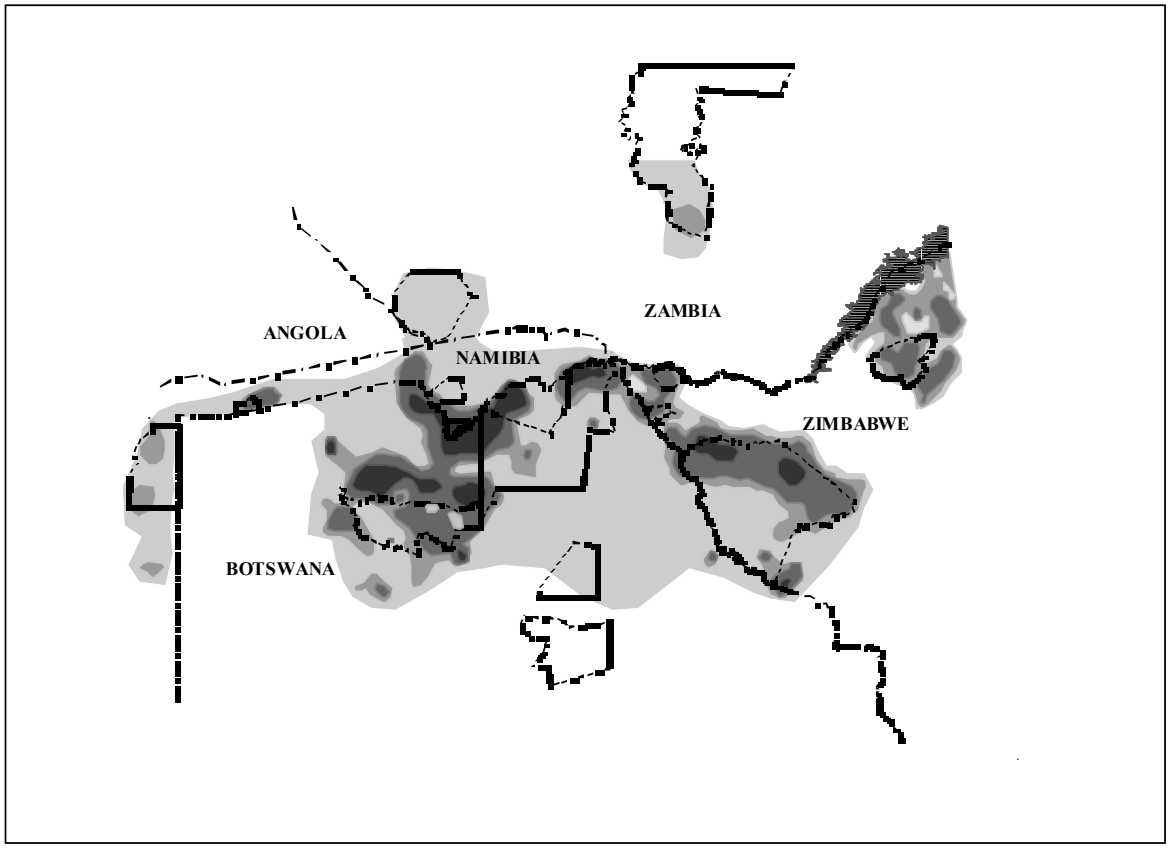

Figure 14.1. Elephant range in the Four Corners Trans-Boundary Area
(Craig 1996a / ELESMAP). Darker shading is the dry season range, paler shading shows overall (wet and dry season) range.

A comprehensive review of the population estimates derived from aerial surveys in northern Botswana from 1973-1995 (Gibson *et al.* 1998) and subsequent data, shows that this area holds probably the largest national population in the 37 elephant 'range states' on the African continent. In comparing the time series of available data up to 1995, Gibson *et al.* (1998) compute a population trend model only from census estimates that are strictly comparable, i.e. those derived from complete and standardized surveys. The sample is 14 surveys (seven wet and seven dry season) stretching from 1987 to 1995. The results estimate a rate of population increase of 6% per annum, which is towards the maximum biological limit for elephants. There are however two caveats to interpreting this figure: (a) gradual improvements in aerial survey technique may detect more elephants and (b) immigration and emigration with neighbouring countries changes numbers in Botswana to some degree.

Other notable features of the population detected by Gibson *et al.* (1988) were a southward and westward extension of elephant range and a degree of sex difference in elephant distribution. Family groups tended to occur in habitats with easier access to water, while bulls were more widely dispersed especially in the drier parts of the range periphery.

The northern Botswana elephant population has increased significantly over the past two decades (Table 14.1a). Elephants have reached a density of almost 1.5 animals per square kilometre within the occupied wet season range (which itself has expanded in recent years) and local densities increase dramatically during the dry season.

Northern Matabeleland in Zimbabwe has one of the most comprehensive census data series for an elephant population on the African continent (Table 14.1b), with latest estimates showing good precision (Dunham & Mackie 2001). The population has been steadily increasing since management culling ceased in the mid-1980s; it is currently estimated at some 49,000 animals.

The Caprivi elephant population has been less well surveyed although some more recent information is not to hand (Table 14.1c). The population is seasonally very mobile but as far as is known appears stable.

Elephant populations in the national parks of southwestern Zambia have seriously declined through poaching. Census has been much less frequent and they have used different methodologies.

Whilst the precision of individual surveys (measured by Confidence Intervals (CI) of national estimates) is improving, census of the entire population does not involve simple addition of these national estimates. Only a long time series of complete, standardized and regular surveys of the entire trans-boundary elephant range (including Angola) could free the estimates from any influences of movements within the range and fully quantify a trend in numbers for the whole population. But this situation would be virtually impossible to achieve in practical terms. However, the available good evidence that the two largest populations in Botswana and Zimbabwe are increasing while much smaller populations in Namibia and Zambia may be stable and decreasing respectively, suggests that the considerable increase in numbers observed overall must indeed be natural.

14.4 MOVEMENTS WITHIN THE BOTSWANA RANGE

Elephants in northern Botswana occupy the area north of 20 degrees latitude, in a 73,000 km^2 range bounded by livestock-rearing areas on the west and south and the Namibia and Zimbabwe borders on the north and east. Within this vast area elephants undertake seasonal movements, congregating in areas of permanent water the northern rivers (the Okavango and the Kwando-Linyanti-Chobe river system) and parts of the Okavango Delta during the dry season and dispersing at the onset of the rains. There is unanimous agreement that availability of surface water is the prime factor regulating the distribution of elephants and restricting their movements, particularly towards the end of the dry season (Calef 1988, Crowe 1995, DNP&WLM 1996, Ben-Shahar 1999).

14.4.1 Dry Season Concentration Areas

In the northern parts of the Botswana range, elephants in the interior of Chobe NP shift from the pans near Shinamba Hills, Ngwezumba River, Goha Hill and Savuti Marsh to concentrate along the Linyanti and Chobe Rivers (Figure 14.2). Also several thousand elephant move from Chobe into the Matetsi Safari area in Zimbabwe (Calef 1988).

In the southern parts of their range, many elephants move out of the Nata area in the dry season. Those from the western part go to the Okavango (the eastern portion of Moremi and the Santiwane-Chitabe area), while those from the eastern portions seem to move into Hwange National Park (NP) in Zimbabwe (Calef 1988).

The region along the Linyanti River, from Sahaile to Zabadianja Lagoon and the western part of the Savuti Channel, supports the largest dry season concentration in Botswana. In the late 1980s this concentration was estimated at 20,000 (Calef 1988). This figure may have risen considerably in line with the overall population increase.

14.4.2 Wet Season Dispersal

Aerial surveys have shown that the wet season distribution of elephants in northern Botswana (Figure 14.3) has been extending southward to Nxai Pan NP (Crowe 1995; Gibson *et al*. 1998), and in 2001 and 2002 small groups were seen in Makgadigadi Pans NP where they are now resident year-round (D. Gibson, pers. comm. 2003). Overall the range contracts northward again towards permanent water as the ephemeral pans dry out.

14.4.3 Movement Studies

Aerial surveys and various radiotracking studies have confirmed the above general pattern of elephant distribution and movement at a finer spatial resolution.

Aerial surveys have highlighted a degree of sexual separation in elephant distribution. Cow herds are by and large restricted to areas which were in close proximity to permanent water bodies. In general, bull herds are more widespread than cow herds, particularly so in the vicinity of the Zimbabwe border (DNP&WLM 1996). Transborder movement along Botswana's northern border with Namibia, as well as along the Zimbabwe border to the east varies with annual rainfall fluctuations (Crowe 1995).

Radiotracking studies have concentrated on studying cow herds (Calef 1990, Verlinden & Gavor 1998). The former study (mid-1980s) found that no elephants radio-collared in the Chobe or Linyanti regions moved into the Okavango. The latter study (1992-1994) found that there

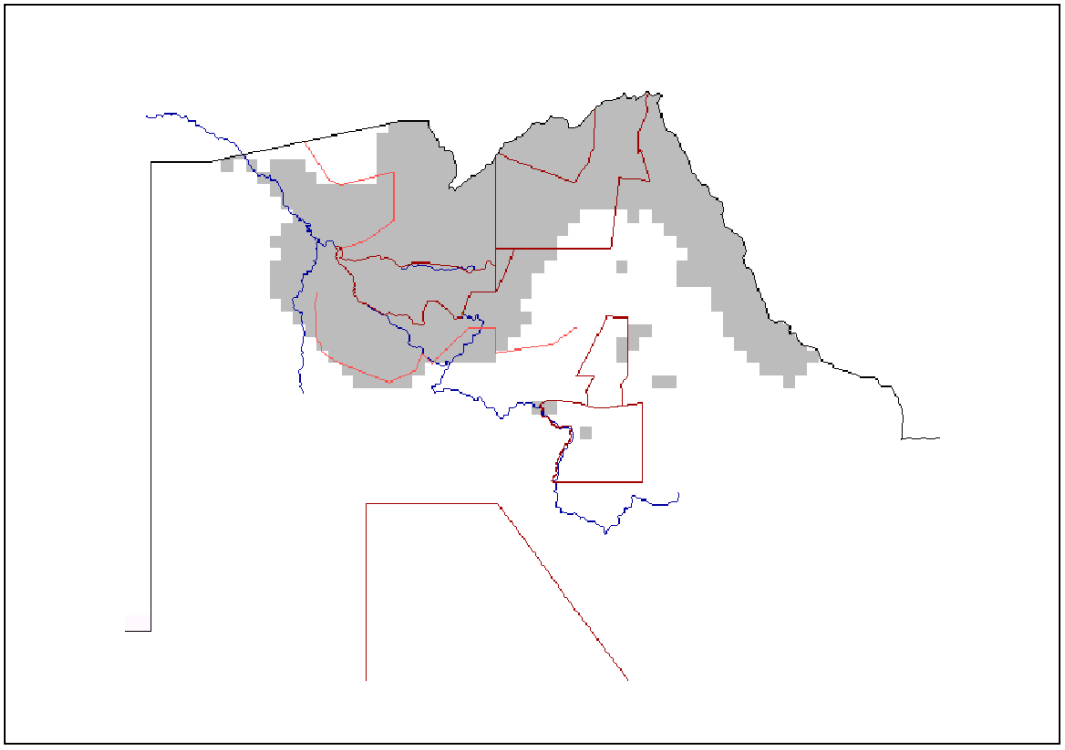

Figure 14.2. Dry season elephant range in northern Botswana

(updated by D. Gibson from DWNP Botswana data; for an earlier version see Gibson *et al.* 1998)

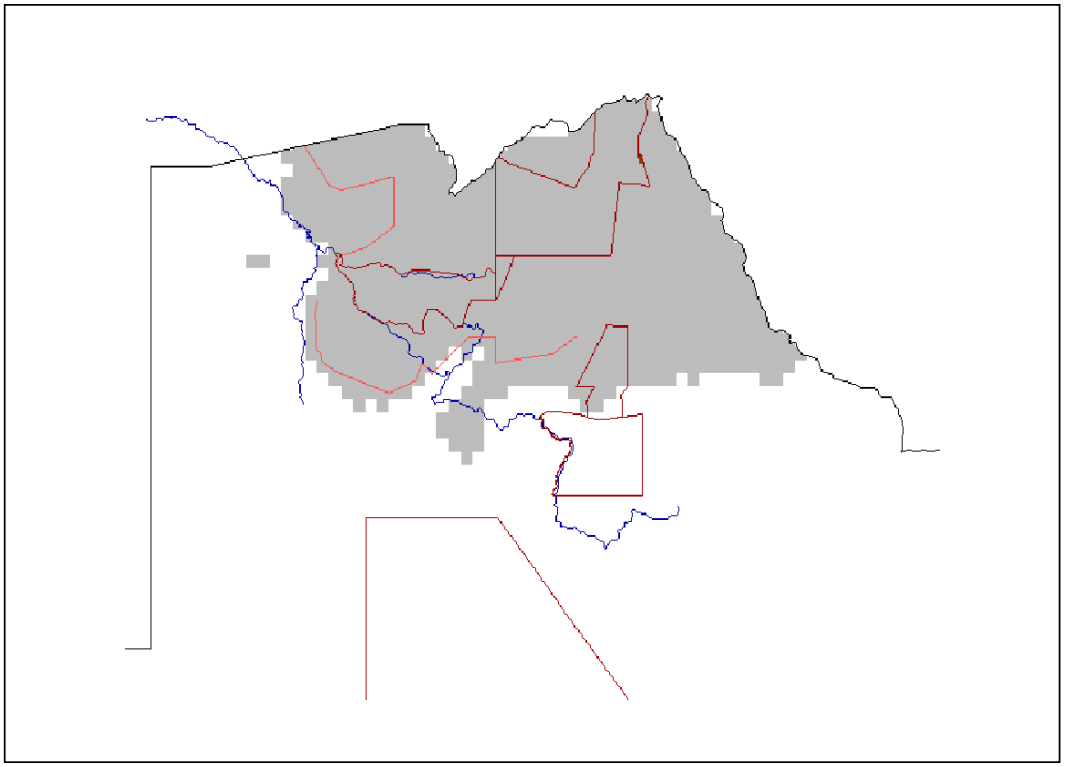

Figure 14.3. Wet season elephant range in northern Botswana

(updated by D. Gibson from DWNP Botswana data; for an earlier version see Gibson *et al.* 1998).

appeared to be resident elephant groups close to permanent water sources, and migratory herds which travel up to 200 km to reach water in the dry season. Migratory herds appeared to move between fixed wet and dry season ranges. Resident herds selected woodland habitats with *Baikiaea, Pterocarpus* and *Erythrophleum*, while the migratory herds selected the generally more nutrient-rich habitats dominated by *Colophospermum mopane*, *Lonchocarpus* and *Terminalia*. Home range increased significantly with increased distance to dry season surface water. The latter study largely confirmed previous findings from movement studies of Botswana elephants and provided direct evidence of cross-border movements.

There is now a third major study in progress that involves radio-tracking cow elephants in northern Botswana (Chase 2002). To date the movement data, restricted to three cows in the Chobe area, has shown that frequent small-scale transboundary movements are common: two cows crossed the river into Namibia and one often ranged into Zimbabwe. Transboundary movements are more common in the wet season.

14.5 MOVEMENTS TO AND FROM THE NORTH-WEST ZIMBABWE RANGE

Data on trans-boundary movement was collected by Conybeare (1991) who used radio-tracking of Hwange NP animals in the early 1980s. He demonstrated a wet season dispersal from Hwange westwards into Botswana and a corresponding dry season contraction of range back into Hwange. Most of the small sample of marked animals that crossed the border (70%) were relocated <20 km into Botswana but the occasional bull moved 60 km or more into that country. This movement pattern is explained by the animals' dry season dependence on Hwange's artificial and natural seep water supplies, and the corresponding wet season release from them to utilise water in natural pans spread widely through the mopane habitat in eastern Botswana.

14.6 MOVEMENTS TO AND FROM THE NAMIBIAN RANGE

The estimated 5000 or so elephant that inhabit the Caprivi region have shown a population recovery from a long period of disturbance due to both war and poaching. The population is believed to stay in the Caprivi from May to December using preferred dry season habitat around the three perennial rivers - the Okavango, the Kwando and the Zambezi. The Caprivi holds half of Namibia's elephants and over half of the Caprivi population occurs along the Kwando River. But there is significant seasonal movement of elephant in the Caprivi region - during the January to April rainy season at least part of this population moves across international borders into Angola, Botswana and Zambia.

Caprivi elephant movements appear to be restricted by human settlements and limited water availability and have been studied directly by radio-tracking (Rodwell 1995). This confirmed that Caprivi elephants are seasonal inhabitants, using the area for dry season range. During this period they are all concentrated in core protected areas of East and West Caprivi. They are found within 30 km of the river frontage of these areas, often in very large herds of up to 500 animals. Of the nine animals radio-collared in August 1993, one moved into Angola and five went into Botswana soon after the December rains began. One of the animals which moved into Botswana is known to have travelled over 150 km from the Kwando River to an area northeast of the Okavango Delta. A seventh elephant moved into Zambia, but returned directly to Namibia.

There are three protected areas in Caprivi - the West Caprivi Game Reserve (which includes almost all of West Caprivi except for a small fringe along the Kwando River) and Mudumu and Mamili National Parks on the southwestern edge of East Caprivi. The area to the west of the

Kwando River now supports the second highest rural human population in the country and human-elephant conflict (HEC) is a problem.

Prior to the1993 survey, West Caprivi had few survey records although East Caprivi had been surveyed almost annually between 1980 and 1990. During the second comprehensive annual aerial census in1994, 95% of the elephants were observed west of the Trans-Caprivi Highway. 1532 animals were seen in the western end (Stratum 1) of West Caprivi; 2953 in the eastern end (Stratum 3) of West Caprivi, 433 in Mudumu NP and 638 in Mamili NP, giving a total of 5556 elephant.

14.7 MOVEMENTS IN THE ZAMBIAN RANGE

There is anecdotal evidence from safari operators of elephant movement between Mulobezi and Sichifulo Game Management Areas (GMAs) south of Kafue NP and the Zambezi River around the Kazangula border area with Botswana (L. Patterson, pers.comm. 2003). This is a distance of some 120 km. There is no further information to hand at present about the likely scale and timing of this movement.

The small Sioma Ngwezi NP elephant population apparently does move through a narrow corridor in a tourist concession down to the Zambezi to drink (L. Patterson, pers. comm. 2003) . It is, however, very unlikely that any connection exists between this elephant population and that in the Kafue area, as the area between has two disincentives for elephant movement - human settlements and vast open grasslands in the Barotseland area on the Zambezi.

14.8 LEVELS OF EXPLOITATION OF ELEPHANT

14.8.1 Sport Hunting

In the Botswana range sport hunting of elephants was stopped in 1983 and reopened 1999. The hunting quotas are divided on an equitable basis between commercial hunting blocks (6 animals each) and communal areas with leased hunting concessions (12 animals each) The total number of elephant hunting licences issued in the last four years is less than 220 annually, of which 65-80% are shot (D. Peake, pers. comm. 2003) The quota is very small, amounting to about about 0.2% of the population.

In Zimbabwe commercial and communal sport hunting concessions in the Matetsi, Gwayi and Tsholotsho areas have elephant on quota. These quotas are set annually and based on the latest aerial census data. Quotas are for elephant bulls only and restricted to levels which are considered sustainable - about 1% of the population (DNP&WLM 1996).

Of the wildlife resources available in the Caprivi, elephants occur in the highest densities and over the widest range, and they presently generate more revenue than any other wildlife species. The sport hunting quota is 12 males per annum - about 0.2% of the population.

There is no legal hunting of elephant in Zambia.

14.8.2 Illegal Hunting (Poaching)

The threat of poaching at present is relatively small in the Zimbabwe and the Botswana elephant range. Carcass counts from aerial census indicate that mortality levels are within normal limits (< 9% is considered to indicate 'normal' mortality levels). In north-west Matabeleland the carcass 'ratio' (a percentage of the number of dead divided by the number of live plus dead) has ranged between 1.2% and 6.4% in the last six years (2001 census: 3.2%) (DNP&WLM 2002). On some

occasions in the past local poaching has raised the carcass counts in certain of the census strata in Hwange NP, but the problem has never become widespread. Other data from the ivory stockpile (e.g. only 18% is from illegal sources) and poaching prosecutions in Botswana (the precise detail of which it is not possible to divulge here) confirm that elephant poaching is not 'biologically significant'.

Similarly, in the Caprivi aerial census carcass counts in the mid-1990s returned a maximum of 1-2% of the live population (0.12% in 1997 and 0.03% in 1996). These are low figures which do not suggest a poaching threat. One year a separate ground-based analysis of elephant carcasses in Caprivi (n =176) showed few animals lived past 45 years. But Caprivi elephants remain vulnerable to poaching due to the proximity of borders and periodic and unpredictable outbreaks of political instability accompanied by military activity. Living space is the greatest threat to the future - neither poaching nor trophy hunting pose significant danger at present.

Elephant poaching is an issue of major concern in the whole of the Zambian elephant range. Although very limited census figures exist for the south-west of the country, they suggest serious population declines in recent years, almost certainly caused by ivory poaching. Concerns about elephant poaching were voiced in the recent CITES evaluation of Zambia (CITES 2002), although these were not acknowledged by the country's own proposal to that body (Republic of Zambia 2002).

14.9 FUTURE CONCERNS

14.9.1 Elephant Impacts on Vegetation

In the Botswana range, up to 75% of the largest savanna elephant population in Africa occupying over 70,000 km^2 may be confined to 10,000 to 12,000 km^2 of this range during the dry months, mostly within 30 km of the permanent water sources of the Kwando-Linyanti and Chobe Rivers.

The spatial patterns of vegetation utilization are influenced by the extent of local elephant aggregations. In the dry season elephant concentration areas in Botswana, there is longstanding concern regarding the effects of elephant impacts on vegetation, and therefore on biodiversity. Simpson (1978) observed that vegetation is subjected to short-term, high-intensity utilization in the dry season when plant biomass is minimal. Such high intensity use at the time when the plant stress is at its maximum has greater negative impact on the habitat. The rapid breakdown of vegetation between Child's 1965 (Child 1968) evaluation and the 1970 survey showed the heavy effect of elephant use.

The effects of elephant browsing in Chobe have even been used as an example of the usefulness of satellite imagery for the analysis of habitat condition (Nellis & Bussing 1990). The pattern of elephant movements which can be assessed from satellite imagery offer insight into the extent of damage the animals may be causing to drier deciduous Zambezi Teak forest areas as they move to and away from the Chobe River.

Ben-Shahar (1999) appears to hold a minority view that while elephants have a significant role in the regulation of the natural processes in this ecosystem, it is unlikely that a future increase in elephant densities will induce irreversible change in habitats. He suggests that the region can sustain a higher population than its current estimate without incurring biodiversity loss.
The opposite and apparently majority view is alarmed at possible elephant effects on certain habitats (Chafota 1996), and advocates that intervention should definitely be considered as limits to 'acceptable habitat change' are deemed to have been exceeded in some areas. Despite the impact the animals have exerted - and continue to exert - on their immediate habitat in the dry

season being a source of much concern, decisions regarding management options are yet to be made. The difficulty is that the debate on acceptable limits to habitat change and elephant effects on biodiversity becomes inconclusive and endless. Ultimately decisions on interventions have to involve a 'value judgement'.

There are also considerable concerns in Hwange NP in Zimbabwe that rising elephant densities are having a worsening impact on vegetation around artificial waterholes. Conybeare (pers. comm. 2002) has recently revisited the sites of his earlier work on this subject and found dramatic changes.

14.9.2 Economic Issues and Concerns

Barnes (1996) analysed economic data related to combinations of elephant use in Botswana since the 1990 CITES Appendix I listing in 1989. He argues forcefully against the ban on the ivory trade, claiming that about half of the potential economic use values of elephants were lost. He also maintains that despite relatively high population of animals existing in the northern region, within 15 years much of the elephant range could be converted to livestock keeping unless local communities can realise high elephant use value. The solution to elephant conservation involves investment in land and management, with appropriate property rights, for the existence of natural elephant populations. Consumptive and non-consumptive use as well as non-use values must be considered and must contribute competitively to rural development.

14.9.3 Human-elephant Conflict

In the Botswana range, human-elephant conflict (HEC) is a problem but is very poorly quantified. Low numbers of animals are destroyed annually on problem animal control (PAC). The current management plan (see section 14.10.2) is examining this issue closely. Botswana operates a compensation scheme for wildlife damage and is one of the very few states to do so.

In Zimbabwe there is some HEC on the eastern extremities of the range in which elephant are periodically destroyed but the total killed is small. The problem is poorly quantified.

In East Caprivi HEC is a serious conservation issue and has threatened to derail CBNRM programmes (R. Diggle, pers. comm. 2003).

There is no up to date information on HEC available for south-west Zambia, except that incidents are known to occur sporadically in settlements upstream from Livingstone.

14.10 THE FUTURE FOR ELEPHANTS IN THE FOUR CORNERS AND CONSERVATION RECOMMENDATIONS

The status of this large population somewhat refutes the uninformed but widely-held view, particularly prevalent in the developed world, that elephants are an "endangered species". Indeed, they are so successful in parts of this range (Botswana and Zimbabwe) that they are likely to be adversely affecting other species of fauna and flora.

The situation in Namibia and Zimbabwe is, however, vulnerable to political instability and complacency should be avoided. In Zambia there needs to be a considerable improvement in elephant management in the south-west of the country to reverse the population declines. Hence there is a distinct north-south divide in this population in which the future of the southern range looks secure, but the northern range is threatened by expansion of human settlement along the Zambezi and the widespread threat of illegal hunting. The serious elephant population declines

seen in Zambia could easily spill over into the Caprivi and even Zimbabwe if political instability spreads or further declines in conservation capacity are experienced.

14.10.1 Official Capacity in Conservation

Official capacity for conservation and management in all four range states is weak. Any appropriate efforts to improve this should be welcomed and supported. Zambia is thought to have a stable elephant population whose potential increase, like other countries in the range, is not being realized. The capability of the wildlife authority in Zambia has been seriously compromised in recent years by political interference (CITES 2002). However, recent improvements suggest the situation is changing for the better. The wildlife authority (ZAWA) is aware that it has to improve census and law enforcement for elephants and other wildlife. ZAWA's restructuring and capacity-building needs to be supported by external financial and material help, particularly in the areas of law enforcement, census, CBNRM and human-elephant conflict mitigation.

14.10.2 National Elephant Management Plans

The process of national elephant management plans should be encouraged. The Caprivi region and south-west Zambia would benefit from this process in the respective countries.

Clearly the Botswana elephant population raises contrasting management concerns caused by its abundance, as testified by copious literature and repeated meetings on the subject. An extensive review of the 1991 elephant management plan for Botswana that was only partially implemented, is presently being undertaken (DG Ecological Consulting 2003).

The major issues identified for management through a consultative process involving all stakeholders are:

- mitigation of human-elephant conflict
- elephant-induced environmental change
- increasing the economic benefits from elephant utilization
- law enforcement.

The draft plan is due to be completed in the second half of 2003.

Zimbabwe does not have an elephant management plan tied to any specific date. However, the country has been a leader in this field and extensive official documentation on this vast subject (for example, DNP&WLM 1996a, 1996b, 2002) contain the principles and strategies which the authorities use to try to implement or promote in all elephant range areas.

14.10.3 Movement Issues and Studies

Movement is not a major conservation issue with this transboundary population as it does not reflect massive loss of range to agricultural expansion. Elephant movements are still largely 'natural', occurring mainly in response to environmental influences. The most important area where a study of elephant movement is required is in southern Kafue - Kazungula area. This has been proposed (Fairall & Kampamba 2001) and should be supported.

But if this elephant population is to be a flagship for cross-boundary conservation issues, the permanence of the north-south spatial divide on the Zambezi should be closely examined. High levels of human settlement and activity along the river may threaten the future of elephant range continuity across the Zambezi.

14.10.4 Human-elephant Conflict

HEC is a growing problem on the edges of the elephant range in all countries. It needs to be quantified and managed. Comprehensive guidelines for approaching this complex problem are available (AfESG 2001).

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