

ANNEX 1

Tables 1-6: Baseline status as at 30/06/04

In reading tables 1-6, please note the following:

- (BW) is the ISO country code (ISO 1366)
- ✓ means that the data are available
- MM/YY indicates the month and year when the data should be available
- 2004 indicates the data will be available during 2004
- 2005 indicates the data will be available during 2005
- Civil strife indicates data not available due to that reason
- ? indicates waiting for an update from the site
- NC indicates that the 12 months data has still to be confirmed
- * indicates budgetary constraint

Table 1: Southern Africa – Baseline status as at 30/06/04

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (12 months)	Influencing factor site dossier	Effort assessment	Remarks
Chobe (BW)	✓	✓	2004	✓	
Cahora Bassa (MZ)	✓	✓	2004	✓	
Niassa (MZ)	✓	✓	2004	?	Lack of capacity
Etosha (NA)	✓	✓	2004	✓	
Caprivi (NA)	✓	✓	2004	✓	
Kruger (ZA)	✓	✓	2004	✓	
S. Luangwa (ZM)	✓	✓	2004	✓	
Chewore (ZW)	✓	✓	2004	✓	
Nyami N. (ZW)	✓	✓	2004	✓	

Table 2: West Africa – Baseline status as at 30/06/04

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (12 months)	Influencing factor site dossier	Effort assessment	Remarks
Pendjari (BJ)	✓	✓	2004	✓	
Parc W (BF)	✓	Sep. 2004	2004	Sep. 2004	
Nazinga (BF)	✓	Sep. 2004	2004	Sep. 2004	
Comoe (CI)	Civil strife	Civil strife	2004	Civil strife	
Marahoue (CI)	✓	Civil strife	2004	Civil strife	
Tai (CI)	✓	Civil strife	2004	Civil strife	
Kakum (GH)	✓	✓	2004	✓	NC

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (12 months)	Influencing factor site dossier	Effort assessment	Remarks
Mole (GH)	✓	✓	2004	✓	NC
Ziama (GN)	Dec. 2004	?	2004	?	
Sapo (LR)	Civil strife	Civil strife	2004	Civil strife	
Gourma (ML)	✓	✓	2004	✓	
Babah Rafi (NE)	2004*	✓	2004	✓	Ground count
Sambissa (NG)	2004*	✓	2004	✓	Aerial survey
Yankari (NG)	2004*	✓	2004	✓	Aerial survey
Niokolo Koba (SN)	✓	?	2004	?	Less than 10 eles
Keran (TG)	✓	✓	2004	✓	
Alternate sites					
Park W (BJ)	✓	✓	2004	✓	
Red Volta (GH)	2005	2005	2005	2005	Only recently a site
Park W (NE)	✓	✓	2004	✓	
Fazao (TG)	2005*	Dec. 2004	2004	Dec. 2004	

Table 3: East Africa – Baseline status as at 30/06/04

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (12 months)	Influencing factor site dossier	Effort assessment	Remarks
Gash Setit (ER)	✓	✓	2004	✓	
Elgon (KE)	2004*	✓	2004	✓	Forest survey
Samburu/L. (KE)	✓	✓	2004	✓	
Akagera (RW)	✓	✓	2004	✓	
Ruaha (TZ)	✓	✓	2004	Sep. 2004	
Selous (TZ)	✓	✓	2004	✓	
Murchison F. (UG)	✓	✓	2004	✓	
Q.Elizabeth (UG)	✓	✓	2004	✓	
Alternate sites					
Meru (KE)	✓	✓	2004	✓	
Tsavo (KE)	✓	✓	2004	✓	
Katavi (TZ)	✓	✓	2004	✓	
Tarangire (TZ)	✓	✓	2004	✓	
Elgon (UG)	2004*	✓	2004	✓	Forest survey

Table 4: Central Africa – Baseline status as at 30/06/04

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (12 months)	Influencing factor site dossier	Effort assessment	Remarks
Bangassou (CF)	2004	?	2004	?	Lack of staff
Dzanga-S. (CF)	2004	✓	2004	✓	
Sangba (CF)	2005*	Dec. 2004	2004	Dec. 2004	
Boumba Bek (CM)	2004	✓	2004	✓	
Waza (CM)	✓	✓	2004	✓	
Nouabale.N (CG)	2004	✓	2004	✓	
Odzala (CG)	✓	✓	2004	✓	
Garamba (CD)	✓	✓	2004	✓	
Kahuzi-B (CD)	Civil strife	✓	2004	✓	Area cover increasing
Okapi (CD)	✓	✓	2004	✓	
Minkebe (GA)	2004	✓	2004	✓	
Lope (GA)	✓	✓	2004	✓	
Zakouma (TD)	✓	✓	2004	✓	
<i>Alternate sites</i>					
Salonga (CD)	2004	✓	2004	✓	
Virunga (CD)	2004	?	2004	?	
Mont Alen (GQ)	2005*	2005	2004	2005	Lack of staff

Table 5: South Asia – Baseline status as at 30/06/04

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (6 months)	Influencing factor site dossier	Effort assessment	Remarks
Garo Hills (IN)	✓	✓	2004	2004	
Chirang-R. (IN)	March 05	✓	2004	2004	Prev. surv. unreliable
Eastern Dooers (IN)	✓	✓	2004	2004	
Shivallik (IN)	✓	✓	2004	2004	
Mysore (IN)	✓	✓	2004	2004	
Yala (LK)	2005	✓	2004	2004	
Wilpattu (LK)	2004	✓	2004	2004	
Suklaphanta (NP)	✓	✓	2004	✓	
Samchi (BT)	2005	2004	2004	2004	
Chunauti (BD)	✓	✓	2004	✓	

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (6 months)	Influencing factor site dossier	Effort assessment	Remarks
<i>Alternate sites</i>					
Deomali (IN)	March 05	Sept 04	2004	2004	
Dehang P. (IN)	✓	✓	2004	2004	
Mayurbhanj (IN)	✓	✓	2004	2004	
Niligiris (IN)	✓	✓	2004	2004	
Wyanad (IN)	✓	✓	2004	2004	
<i>Note: The levels of illegal killing are based on good quality pre-MIKE data.</i>					

Table 6: South East Asia – Baseline status as at 30/06/04

Geographical scope	Population survey available 2000 onwards	Levels of Illegal killing (6 months)	Influencing factor site dossier	Effort assessment	Remarks
Mondulkire (KH)	2005	2005	2004	2005	
Bukit Barisan (ID)	✓	2005	2004	2005	
Way Kambas (ID)	✓	2005	2004	2005	
Nam Phui (LA)	2005	2005	2004	2005	
Gua Musang (MY)	2005	2005	2004	2005	
Alaungdaw K (MM)	2005	2005	2004	2005	
Salakphra WS (TH)	2005	2005	2004	2005	
Cat Tien NP (VN)	✓	2005	2004	2005	
<i>Alternate sites</i>					
Cardomom (KH)	2005	2005	2004	2005	
Xishuangbanna (CN)	✓	2005	2004	2005	
Teso Nilo (ID)	2005	2005	2005	2005	
Kluang District (MY)	2005	2005	2004	2005	
She U Daung (MM)	2005	2005	2004	2005	
Kuibiri NP (TH)	2005	2005	2004	2005	

Figure 1: Example of Site Dossier for Boumba Bek (Cameroon)

Influencing factors	Spatial data themes	Description	Source of information
Ecosystem/habitat	Vegetation	Dense moist forest	Existing maps&Site visit
	Baies	Present	WWF reports
	Topography	Lowland with some outcrops	Wildlife Department Notes
Adjacent land use	Land cover	Logging concessions and hunting zones	MINEF map, CA parks map
Human access	Roads	No roads inside the site	MINEF map, CA parks map
	Rivers, water bodies	Only at the borders of the site	MINEF map, CA parks map
	Human trails	Yes, many	Local information
	Airstrips	Absent	
	Railways	Absent	
Human population pre	Permanent settlements	Very poor near northern&eastern borders	MINEF map, CA parks map
Availability of water	Hydrography	Many permanent rivers	Existing maps&Site visit
Land tenure systems	Land ownership	State property	Law
	Traditional land	No	
	Forest&Mining concessions	Logging concessions around the site	MINEF map, CA parks map
	Protected areas	Yes	
	Projects and schemes	Future National Park	MINEF
	Development infrastructure	No	
Tourism activities	Tourist sites	No	
Research activities	Research stations&sites	Bio-monitoring at the baies/raised hide	WWF reports
Wildlife management	Park infrastructure	2 offices, 3 work stations	MINEF, WWF reports
International borders	Proximity	No	
Civil/military conflict	Conflict zones	No	
Elephant population le	Surveys	Yes by MIKE	Blake report
Elephant/Human confli	Incident reports	Yes, but not documented	SO reports
	Topography	Lowland	SO reports
	Temporary settlements	Permanent villages outside	SO reports
	Population density	Small	SO reports
	Migration	Yes between Lobeke and Boumba Bek	Local information
Development activities	Livestock pressure	No	
	Informal resource use	Hunting	
History of illegal killing	Incident reports	Not documented	
Cross-border incursion	Incident reports	No	
LEM levels	Patrol effort	Several patrols per month	WWF reports
	Site-level LEM	Several patrols per month	WWF reports
	Carcass returns	Not documented before MIKE	
Ivory trade patterns	Traffic routes	Not documented	

ANNEX 2

An example from an aerial survey of encroachment (i.e. a change in land use) being the main factor in explaining the absence of elephants

Figure 2A: Elephant distribution (2003)

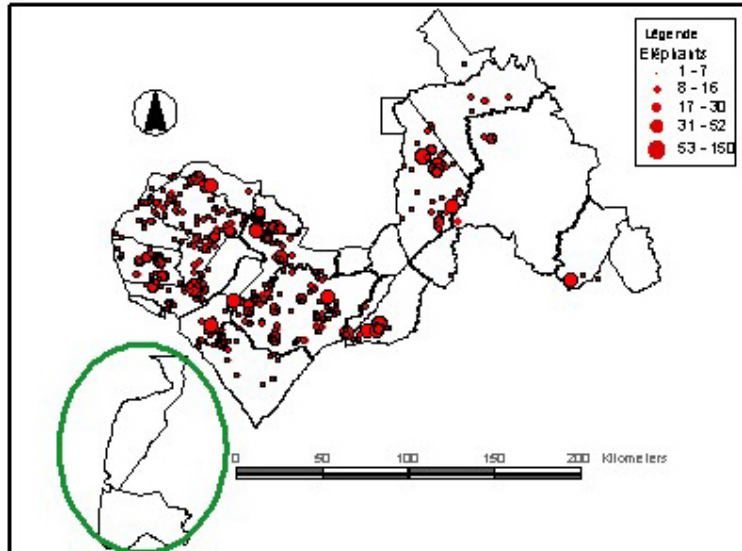
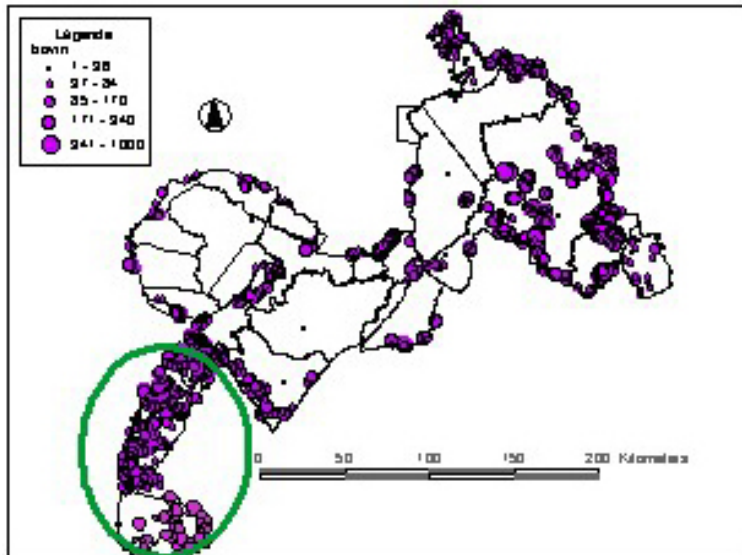


Figure 2B: Cattle distribution (2003)



ANNEX 3

Analysis of MIKE data as a baseline requirement

Summaries of monthly patrol data by year from 10 sites drawn from a 2000 - 2003 period have been used to test the appropriateness of using a generalised linear model (McCullagh and Nelder 1989). Data available included the number of carcasses found, the number of illegally killed carcasses found and total kilometers covered by the patrol (used as a simple measure of search effort). Two analyses were carried out, one exploring the change in the number of carcasses found through time, per unit search effort, and the second exploring the change in the proportion of carcasses that were illegally killed through time. Statistical analysis was carried out using the statistical software R, available from www.r-project.org

Regression models were used to explore the dependence of carcass counts on time and site differences. Since the response variable, number of carcasses, was a discrete count, Poisson regression models (McCullagh & Nelder, 1989) were appropriate. The log of total number of kilometers covered on patrol was used as an offset (to account for variable effort). Elephant population density, site and effort¹ were included in the model, so that the assessment of change in the number of carcasses through time can be made on a comparative basis as it is expected that the number of carcasses found would

- increase with patrol effort
- increase with elephant population density
- vary in accordance with different site characteristics, e.g. habitat.

For the moment, it was only possible to use total number of kilometers covered by patrol as a basic proxy for patrol effort and to incorporate differences between sites by using site as a single "catch-all" variable². Population density was derived from the most recent population surveys for the sites in question.

After adjusting for these three variables, the change in the number of carcasses found through time was explored both averaged over all ten sites and for individual sites. Figure 3 (see below) illustrates the changes at those sites that have at least two years of data, after adjusting for effort and population density. This figure demonstrates that by using this method of analysis, it is possible to extract the change in the number of carcasses found through time for each site. In this case some sites show a decrease in the number of carcasses found through time, whilst others show an increase.

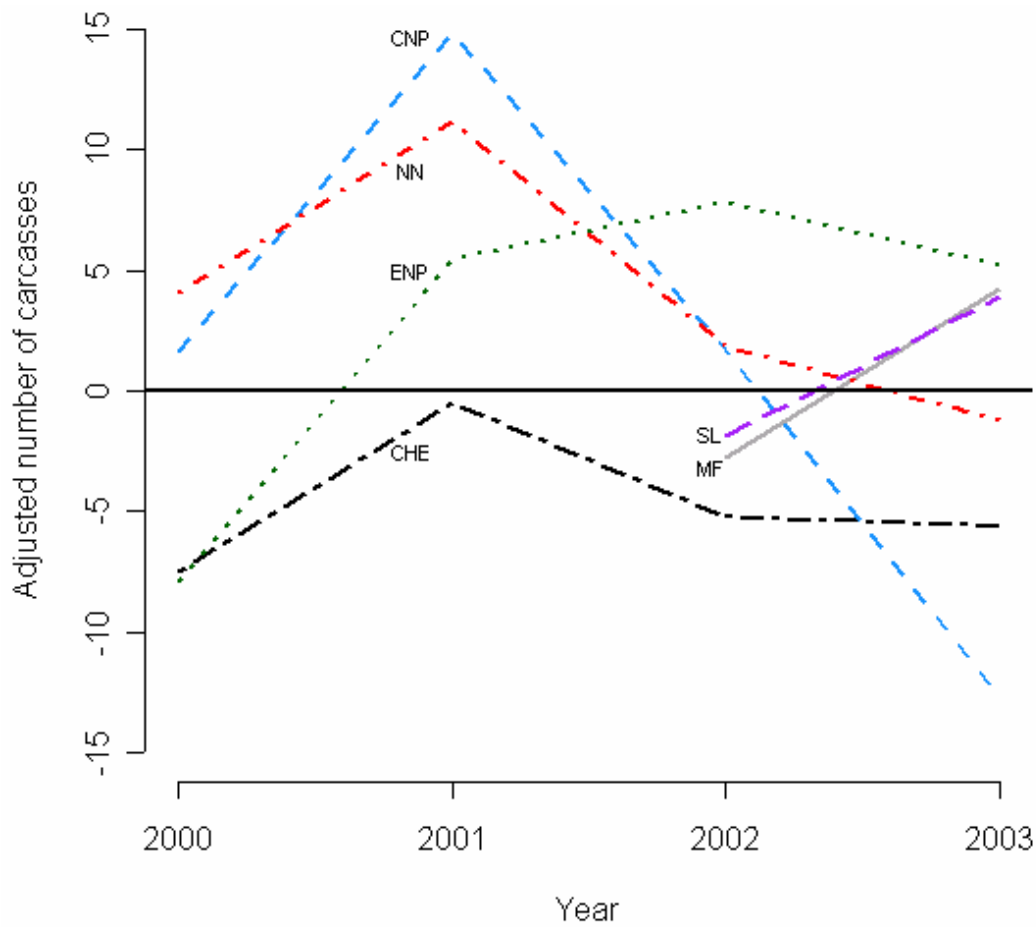
The number of carcasses resulting from illegal killing was regarded as a binomial variable (conditional on the total number of carcasses found), so the proportion of carcasses found that were illegally killed was analysed using binomial logistic regression (McCullagh & Nelder, 1989). In the event that no carcasses were found in a particular year at a site, that year was excluded from this analysis for that site. Again adjustment for site differences was made using site as a single explanatory variable. However no adjustment for effort was made on the basis that the number of illegally killed elephants and the total number of carcasses would increase with effort in the same manner, albeit that this is based on the assumption that the probability of detecting an illegally killed elephant is the same as the probability of detecting an elephant that died by another cause. Elephant population density turned out to be not significantly associated with the proportion illegally killed, and was therefore dropped from the model. After adjusting for site effects, the way that the proportion of illegally killed carcasses changed through time was explored. For this purpose a generalized additive model (Hastie and Tibshirani, 1990) was fitted with a smooth for time. This indicated that a linear trend adequately described the change over time. The result in Figure 4 (see below) of fitting a linear logistic regression model with Site and a linear Year effect resulted in a significant downward trend. This trend was estimated after excluding sites for which only one year of data was available; the sites remaining were CHE, CNP, ENP and NN.

¹ *The log of total patrol distance was included as an offset (McCullagh & Nelder, 1989) to account for variable effort. Elephant population density and site were included as explanatory variables.*

² *Differences between sites that are likely to affect carcass counts will be best expressed as a variety of site characteristics as illustrated in Figure 1. This will eventually allow the separate effects of these characteristics to be estimated or tested. These variables are not yet available, however, so for the time being "site" was accounted for in statistical models by including it as a categorical variable. Thus, if a site effect is found, it will not be possible to distinguish which of the site characteristics are responsible.*

Figure 3: Adjusted number of carcasses for each site through time

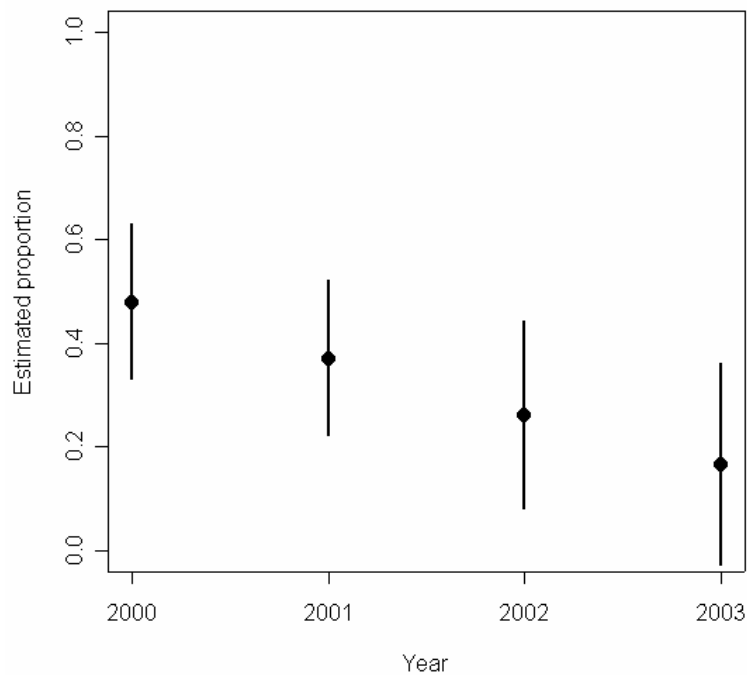
The horizontal line at zero represents the hypothetical situation where there are no differences between sites or between years. The graph shows the deviation from this situation after adjusting for effort and elephant population density.



CHE = Chewore, CNP = Chobe National Park, ENP = Etosha National Park, MF = Murchison Falls, NN = Nyami Nyami, SL = South Luangwa National Park

Figure 4: Estimated proportion of illegally killed elephants, 2000-2003

The estimates are the result of fitting a logistic regression model with Site and Year as explanatory variables. Error bars are approximate 95% confidence intervals.



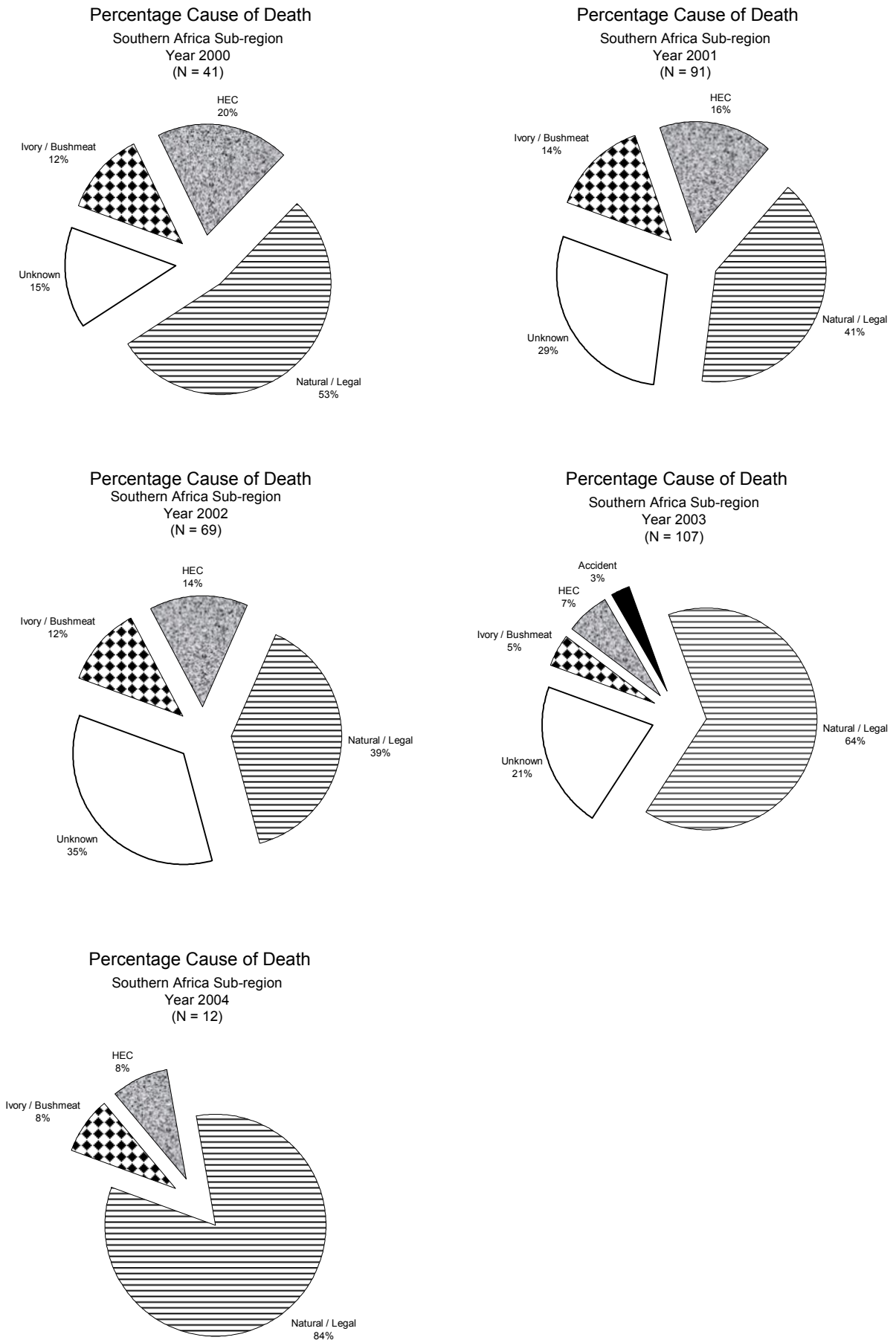
The estimates are given in the table below:

Year	Estimated proportion illegally killed	95% confidence interval
2000	0.48	0.33, 0.63
2001	0.37	0.22, 0.52
2002	0.26	0.08, 0.44
2003	0.17	0.00, 0.36

Note: This figure relates only to data from Chewore (Zimbabwe), Chobe (Botswana), Etosha (Namibia) and Nyami Nyami (Zimbabwe)

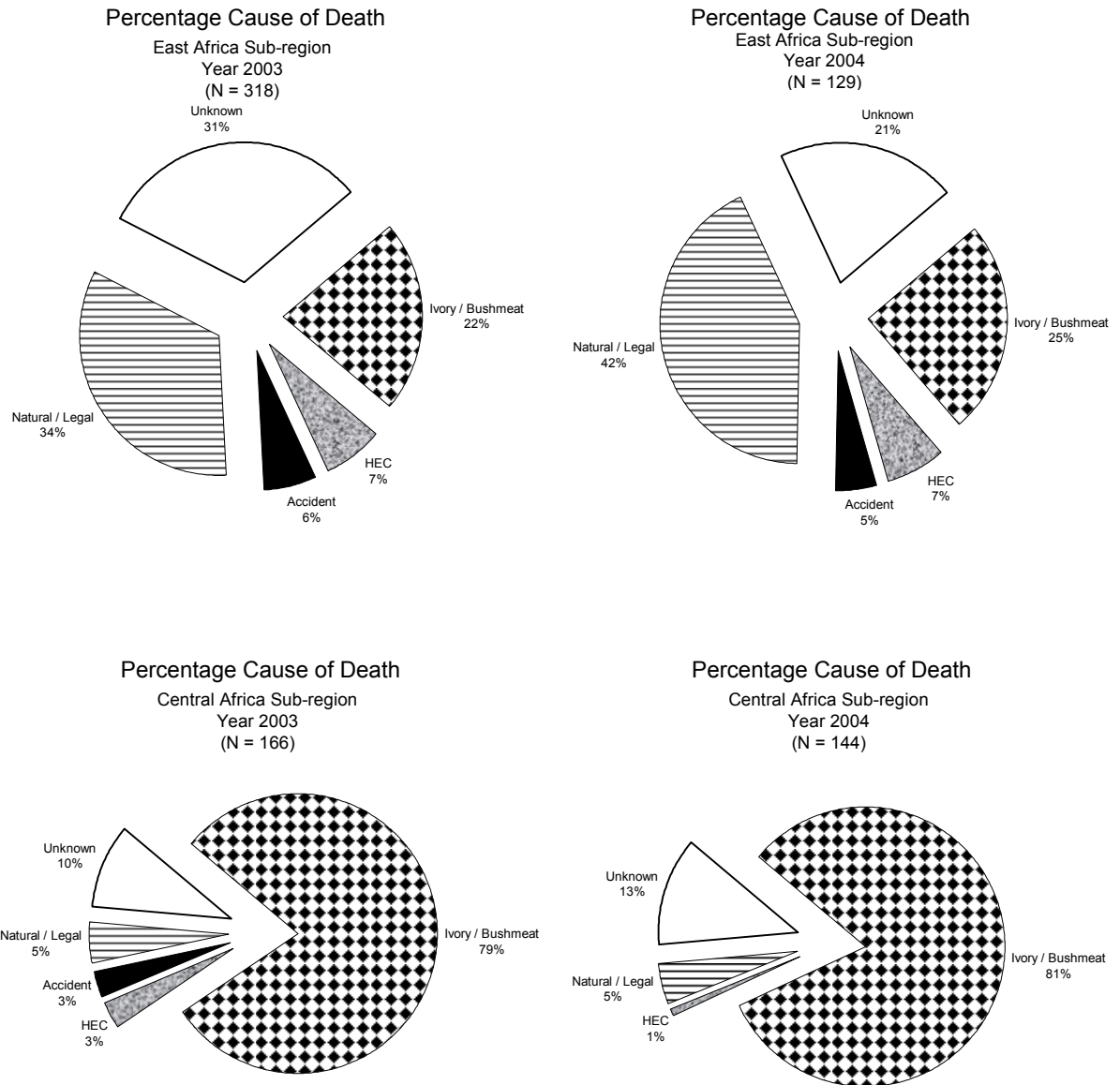
ANNEX 4

Figure 5. Percentage cause of death in Southern Africa 2000 to 2004 (June)



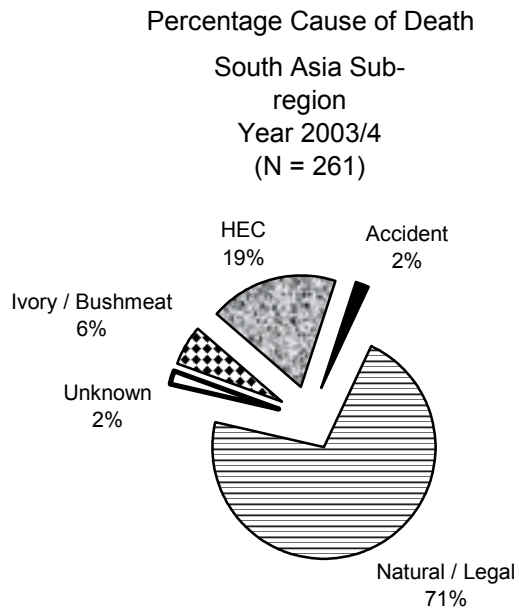
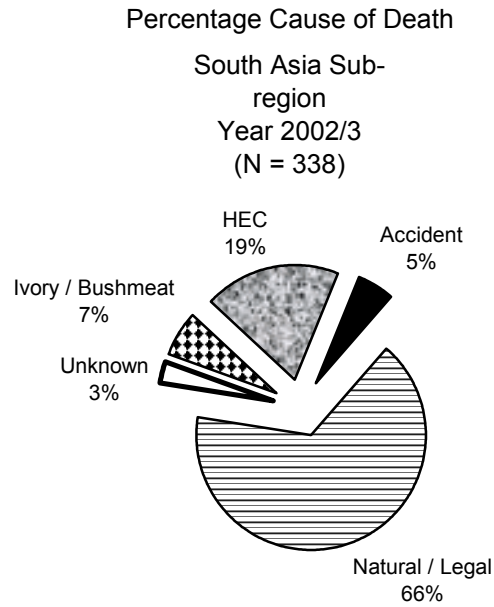
ANNEX 5

Figure 6. Percentage cause of death for East and Central Africa Sub-regions 2003 & 2004 (June)



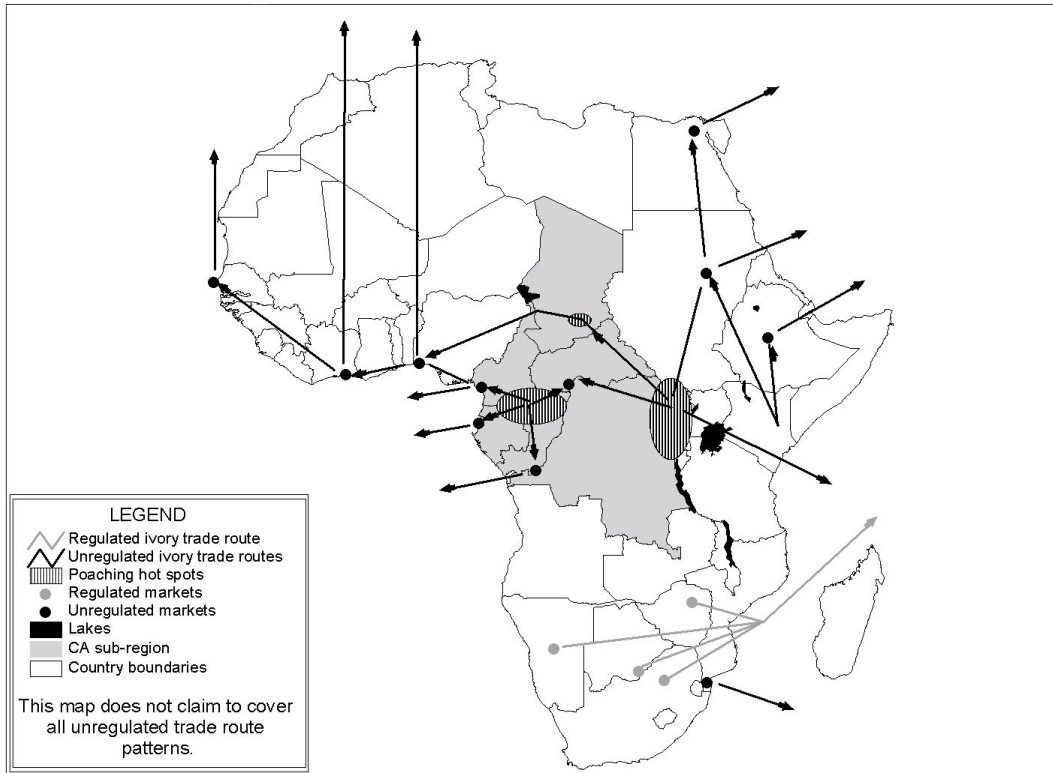
ANNEX 6

Figure 7. Percentage cause of death for 1 Asia Sub-region 2002/3 & 2003/4



ANNEX 7

Figure 8: Current understanding of Ivory Trade Patterns



ANNEX 8

References

- Blanc, J.J., Thouless, C.R., Hart, J.A., Dublin H.T., Douglas-Hamilton, I., Craig, C.R. and Barnes, R.F.W. (2003). African Elephant Status Report 2002: an update from the African Elephant Database. IUCN/SSC African Elephant Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.
- Courouble M., Hurst F. and Milliken T. (2003). More Ivory than elephants: Domestic Ivory Markets in Three West African Countries. TRAFFIC International, Cambridge, UK.
- Hastie, T.J. and Tibshirani, R.J. (1990). Generalized Additive Models. Chapman & Hall, London.
- Hunter, N., Martin, E. and Milliken, T. (2004). Determining the number of elephants required to supply current unregulated ivory markets in Africa and Asia. *Pachyderm* 36: 116-128.
- Martin, E.B. and Stiles D. (2000). The Ivory Markets of Africa. Save the Elephants, Nairobi, Kenya and London, UK.
- McCullagh, P. and Nelder, J.A. (1989). Generalized Linear Models (2nd edition). Chapman & Hall, London.
- Milliken, T., Burn, R.W. and Sangalakula, L. (2002a). A report on the status of the Elephant Trade Information System (ETIS) to the 12th meeting of the Conference of the Parties. CoP12 Doc 34.1, Annex 1. CITES Secretariat, Geneva Switzerland.
- Milliken, T. Burn, R.W. and Sangalakula, L. (2002b). An analysis of the spatial aspects of the elephant product seizure data in ETIS; a report to the 12th meeting of the Conference of the Parties. CoP12 Doc. 34.1, Annex 2. CITES Secretariat, Geneva, Switzerland.
- Milliken, T., Burn, R.W. and Sangalakula, L. (2002c). An analysis of the trends of elephant product seizure data in ETIS; a report to the 12th meeting of the Conference of the Parties. CoP12 Doc. 34.1, Annex 3. CITES Secretariat, Geneva, Switzerland.
- Wood S.N. (2004), Multiple smoothing parameter estimation and GAMs by GCV, www.stats.bris.ac.uk/R.